THE AMERICAN CENTENARY:

A HISTORY OF THE PROGRESS

OF THE

REPUBLIC OF THE UNITED STATES

DURING THE

FIRST ONE HUNDRED YEARS OF ITS EXISTENCE.

BY

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TO

MY FELLOW WORKERS

WITH BRAIN AND HAND

THIS BRIEF RECORD OF THEIR ACHIEVEMENTS

IS RESPECTFULLY DEDICATED

BY THE AUTHOR.
INTRODUCTION.

In making this brief outline of the progress of our country during the one hundred years which have elapsed since the Declaration of Independence on Thursday, the 4th of July, 1776, I have confined myself almost entirely to the history of that progress, and omitted definitions of processes.

I have first taken a general view of the Civil and Military transactions in the Republic during that period. This is followed by a consideration of the progress in Agriculture, the foundation of all other industries, and of Manufactures which are its indispensable coadjutors.

Commerce, the legitimate offspring of Agriculture and Manufactures, is next considered in its various phases and alliances. It is the chief architect of civilizations; and in its train follow its children, Literature, Education, Science, Fine Arts, Religion and the Benevolent and Social Institutions which mark our era.

While this is the general order in the construction of the work, full latitude has been given, at every point, for the introduction of topics that seemed to belong more especially to another division, but which found relevancy to the subject in hand. By this means the usual dullness of statistics has been relieved by the current narrative, and, as I trust, a more acceptable volume for the general reader has been made.

In order to give a clear conception of progress among our industries and institutions, selections of model establishments and associations have been made, and detailed accounts of them have been given, that the contrast between them and their predecessors
may be made more conspicuous. To still more deeply impress the conceptions of that progress on the mind of the reader, pictures of the buildings of these model establishments and institutions have been given; and in connection with these, brief personal sketches of their founders or managers have, in some instances, been presented, that the moral causes which have led to these developments, may be more distinctly understood.

This work abounds with statements of alleged facts. For facts I have diligently sought at the best sources of information, such as the latest official reports issued from the Executive Departments of our National Government. These reports have been freely furnished by the respective heads of those departments. The statistics of industrial establishments and of institutions have been furnished by the responsible heads of each; and for the miscellaneous facts I have consulted the best authorities at my command. In the statements of quantities, round numbers approximating to absolute exactness, have been used; and in a few instances they are the products of careful estimates.

In the preparation of this work I have sought to make it so credible that it will always be considered a faithful outline picture of the general condition of the Republic at the end of the first century of its existence; also to give it a spirit and aspect that shall make it acceptable to all classes of readers.

Benson J. Lossing.

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CHAPTER I.

THE Poet is often a Prophet. Philip Freneau, (sometimes called "the poet of the Revolution," while he was a student in the College of New Jersey in 1771, wrote a dialogue in blank verse, to be spoken at his graduation, in which the destiny of America was fore-shadowed. In that dialogue Leander says:

"Say, shall we ask what empires yet may rise,
What kingdoms, powers, and States where now are seen
Mere dreary wastes and awful solitude—
Where Melancholy sits, with eye forlorn,
And Time anticipates, when we shall spread
Dominion from the North, and South and West,
Far from Atlantic to Pacific shores,
And shackle half the convex of the main?
A glorious theme! But how shall mortals dare
To pierce the dark events of future years,
And scenes unravel, only known to fate."

Acasto answers:

"This might we do, if warmed by that bright coal
Snatched from the altar of seraphic fire
Which touched Isaiah's lips—or if the spirit
Of Jeremy and Amos, prophets old,
Might swell the heaving breast. I see! I see
A thousand kingdoms raised; cities and men
Numerous as sand upon the ocean shore!
The Ohio soon shall glide by many a town
Of note; and where the Mississippi stream,
By forests shaded, now runs sweeping on,
Nations shall grow, and States not less in fame,
Than Greece and Rome of old! We, too, shall boast
Of Alexanders, Pompeys, heroes, kings
That in the womb of Time yet dormant lie,
Waiting the joyous hour of life and light."
That prophecy, spoken years before the independence of the English-American colonies was declared, is now history. At the end of a century from the time of its utterance, the most earnest hopes indulged by Patriots then, have been fulfilled; the most glorious dreams of the Prophets of that time have become realities.

When the Continental Congress had adopted the Declaration of Independence, they perceived that the act invested the colonies with national dignity, and implied the necessity for asserting national sovereignty. Accordingly in the afternoon of that eventful day, the 4th of July, 1776, they resolved "That Dr. Franklin, Mr. J. Adams, and Mr. Jefferson be a committee to prepare a device for a seal for the United States of America." The genesis of the seal then decreed, was discovered by the writer, in the archives of our national State Department, in the year 1854. It was in the form of manuscript minutes of the proceedings of the several committees who from time to time had the matter in charge. They were accompanied by pen-and-ink drawings of devices by Du Simitiere, a French artist then living in Philadelphia.

The original committee made a brief report in August following, but they had not agreed upon a device. The struggle for independence was then becoming more and more serious and doubtful, and the subject was allowed to slumber until March, 1779, when a new committee was appointed. They reported in May, when the subject was recommitted to them.

It again slept until April, 1782, when peace seemed near and the life of the young nation was almost assured. Then a new committee was appointed, and a month later they reported an unsatisfactory device, when the Congress referred the matter to Mr. Thomson, their Secretary, with discretionary power, and he employed William Barton, of Philadelphia, to make a design.

At about that time Mr. Thomson received from John Adams, then in London, a simple device suggested by Sir John Prestwitch, an English baronet and an antiquary of some note. It was adopted by Congress on the 20th of June, 1782—about six years after the original committee was appointed. The art of seal-engraving, now so perfect in the United States, was not then practiced in America, and the dies for the seal were cut in Paris under the supervision of Dr. Franklin.

The design of the Great Seal of the Republic now, is the same as that adopted then—a spread eagle bearing on its breast our national shield: in its beak a scroll with the words E PLURIBUS UNUM: in its right talon an olive-branch, a symbol of Peace, and in its left a bundle of thirteen arrows, a symbol of the United States and of War: the crest, a glory breaking through a cloud and surrounding a cluster of stars, forming a constellation. A part of the original device was for the reverse of a pendant seal, a form not now used in this country.
The declaration of independence and the provision made for a seal—the emblem of sovereign authority—were the significant ceremonials at the birth of our Republic a century ago. They decreed a struggle and promised triumph. The struggle was ended and the triumph was achieved thirteen years afterward when the nation was firmly established upon the solid foundations of a Constitution which the people, the source of all political sovereignty, approved as the supreme law of the land.

That struggle, as every student of our national history knows, was long and fearful. It was a seven years' passage-at-arms. The well-disciplined and equipped forces, civil and military, of a compact, insular Kingdom containing ten million inhabitants, with immense resources in men, money and munitions—the acknowledged "mistress of the seas," and the home of a high civilization—fought for the mastery with the crude, undisciplined and half-armed yeomanry, at first, of the colonists of that strong kingdom, less than three million in number. They were weak in military resources, and were scattered along a thousand miles of sea-coast. They possessed but few arms and a very small supply of munitions of war; and even in the fiercest of the struggle they were not absolutely united in political feeling or social relations, yet they were strong in the sense of the saying that

"Thrice armed is he who hath his quarrel just."

The colonists were not revolutionists. They fought not to acquire liberty, for that they already possessed by prescriptive right. They struggled to defend their natural and chartered liberties, and the rights asserted at Runnymede five hundred years before, and which every British subject claimed to be his lawful treasure.

For the space of ten years they begged the mother country to be just toward her trans-Atlantic children. She blindly refused. She attempted to destroy their liberties by ungenerous legislation; the colonists—her children—resisted by equally peaceable measures. She attempted by force of arms to deprive the Americans of their charters, and to make them submit to be slaves; the colonists resisted by force of arms.

The king and the parliament were the aggressors. They were the revolutionists. The colonists waited patiently for justice and reconciliation, until there was no longer a shadow of hope for either. Then a congress of representatives of the resisting provincials, assembled in the Pennsylvania Statehouse in Philadelphia, in the large audience room since known as Independence Hall, passed a resolution on the 2d of July, 1776, in the following words:

"Resolved, That these colonies are, and of right ought to be, free and independent States; and that all political connection between us and the State of Great Britain is, and ought to be, totally dissolved."
The State-house in which the Congress were then assembled is well preserved, in the form seen in its likeness portrayed in the frontispiece to this volume; and the room in which that important resolution was adopted by the Congress, has been carefully restored to the condition in which it was a hundred years ago. It is also the room in which another act of representatives of the people of the freed States, no less important than that which decreed their independence, was performed, namely, the debating, adopting and signing, in 1787, of the National Constitution of government under which we live.

The passage of the resolution was followed two days afterward by the Declaration of Independence, in which that resolution was embodied. The one hundredth anniversary of that event is the American Centenary.

The great Declaration imposed grave duties upon the people, political, civil, and military. Systems of self-government were imperatively demanded. Almost a year before, Dr. Franklin had submitted to the Continental Congress a plan for a national confederation, but it was not acted upon. In May, 1776, when the Congress were glowing with a sudden desire for independence, they recommended the several Colonies to form State governments. New Hampshire had already anticipated this action by adopting a constitution as early as January, 1776, to go into effect whenever Congress should recommend such action. Seven other Colonies followed the example during 1776, but Massachusetts, the most zealous of all for self-government, was the tardiest of all in embracing the privilege in a constitutional way. That province did not form a State government until March, 1780. The royal charter of Connecticut was deemed sufficient for the time. Rhode Island clung to the royal charter obtained by Roger Williams, and that was the constitution of the State until 1842.

State governments being established, a National government was essential as a bond of union when the stronger bond of common danger should be weakened by peace. A few days after the resolution for independence was introduced into Congress, a committee were appointed to prepare a form for a confederate government. The committee soon reported a scheme. It was discussed until in August (1776), when it was laid aside, and the subject was not called up until the spring of 1777. During the ensuing summer and autumn, the topic occupied much of the attention of the Congress. At the middle of November, Articles of Confederation were adopted, and were submitted to the State legislatures for ratification. Those bodies were very tardy. It was difficult to harmonize conflicting interests. The States were unwilling to surrender power, and the ratification was delayed until March, 1781.

The confederation so formed, was a simple League of States. The Congress could not exercise national functions under it, and it was soon discovered
that the free and independent States were yet in need of a National government. The strong bond of common danger had sufficed to preserve the union of the colonies so long as the war lasted. When peace came the Confederation, a weak and complicated machine, rapidly tended toward anarchy and dissolution. British statesmen saw the weakness and refused to send a representative of their government hither, and would not enter into fair commercial relations with the Americans. They expected to see the colonists gladly resume their allegiance to Great Britain.

Early in the struggle for independence the Continental Congress organized a sort of civil government for what was then supposed to be a temporary purpose. So uncertain was the result that, as we have seen, the colonists struggled on for six years without a constitution of government, and without a seal, the token of national sovereignty. The functions of government were administered by committees chiefly.

Having authorized the emission of Bills of Credit, the Continental Congress, late in July, 1775, appointed two treasurers to manage the public finances. At about the same time a postal-system was established with Dr. Franklin as Postmaster-general. In the following autumn they authorized the creation of a navy, and gave its management to a Naval or Marine Committee. In June, 1776, a Board of War and Ordnance was established, and to it was entrusted the general management of military affairs. Early in that year a Treasury Board was created, and after the ratification of the Articles of Confederation in the spring of 1781, a Superintendent of Finance (Secretary of the Treasury) was appointed. At about the same time a Secretary of War and Secretary of Foreign Affairs (the latter to perform the duties of our present Secretary of State) were appointed. Such were the general features of the civil government of the United States during their struggle for independence, and until the reorganization of the government under the National Constitution, in 1789.

The American army, at the beginning of the struggle, was composed of volunteers. After the affair at Lexington and Concord, in April, 1775, the farmers of New England, in every variety of civil costume and every sort of arms in their possession (and many without arms), hastened toward Boston to the number of fifteen or twenty thousand, to confine the British soldiery to the peninsula. They were organized into an army under General Artemas Ward. They were afterward adopted by the general Congress as a Continental Army, and early in July, (1775) General Washington took the chief command of them.

The enlistments, at first, were for short terms, and this produced a constant fluctuation and embarrassment. Then they extended the time to one year, and finally "for the war." At first there was very little uniformity in the clothing, even among the officers. Their fire-arms were all flint-locks,
and many of them were fowling-pieces. After awhile the regiments were
tolerably uniformed, especially those who were enlisted "for the war." Their
costume was generally of the following description:

The General and his staff—Blue coat with buff facings and cuffs; coat
lined with buff, and buff waistcoat and breeches. The general wore a white
stock; a cocked hat without a plume, but with a black ribbon cockade. His
epaulettes were gold. He and his staff had their coat-tail flaps hooked, and
fastened with hooks and eyes, and wore whole boots. The staff had black
stocks, and the buttons of all were polished yellow metal.

Infantry—Blue coats of modern length (coatee of Light Infantry) with
red facings, cape and cuffs and white metal buttons. The coats were lined
with white. They had white waistcoats and breeches; black stocks; black
cloth half-gaiters, and caps with red and white plumes. The officers wore
cocked hats with white and red plumes; crimson silk sashes tied around
the waist under the coat, and silver epaulettes.

Artillery—Long blue coats with yellow metal buttons and red facings,
capes and cuffs. The coats were lined with red. They wore red waistcoats;
white breeches; cloth half-gaiters; cocked hats with blue and red plumes.
Officers wore cocked hats, crimson sashes, black stocks, and gold epaulettes.

Washington's Life Guard, a select corps organized early in the war for
the protection of head-quarters, the person of the chief when in camp, the
army papers, money-chest, et cetera—wore blue coats with white facings and
linings, and white metal buttons; black half-gaiters; white underclothing;
stiff hats with blue and white plumes, and white epaulettes. The officers
wore cocked hats, crimson sashes, et cetera.

The Cavalry generally consisted of what were termed Light Horsemen,
and were largely employed as videttes and scouts. They never numbered
in the aggregate, more than sixteen hundred men. Their costume, at near
the close of the war, consisted of blue coats with white linings and red fac-
ings. Their swords had black leather sheaths, and on their heads they wore
a sort of helmet, of skull-cap form, with a front, sometimes decorated with
a plume. The Sappers and Miners were dressed the same as the artillery.

We need not pause to consider the military events of the old war for
Independence. The story is familiar to all intelligent readers. The armed
conflict fairly began on Bunker's [Breed's] Hill, in June, 1775; it was ended
in a skirmish on the Stono River, in South Carolina, in September, 1782.
The chief turning-point in the war, in favor of the Americans, was the defeat
and capture of General Burgoyne and his army at Saratoga, in October,
1777. It satisfied Europeans that the Americans could help themselves.
Perceiving this, the French monarch openly proffered his aid, and in Feb-
uary, 1778, acknowledged the independence of the United States and made
with them a treaty of alliance.
The political independence of the Americans was assured when, in October, 1781, Lord Cornwallis and his army were captured at Yorktown, in Virginia, by the combined American and French forces. That event convinced the British government and people, that a further prosecution of the war would be not only useless but cruel. Commissioners appointed by each party negotiated a preliminary treaty for peace and independence; and on the 3d of September, 1783, a definitive treaty was concluded. The British army left our shores on the 25th of November following.

During that war of exactly eight years to a day from the skirmish at Lexington until the proclamation for a cessation of hostilities issued by Washington, the Continental army had on its muster-rolls the names of about two hundred and ninety thousand soldiers. Not one of them, nor the widow of one of them is now living.

A little more than fifty-five thousand of the soldiers were pensioned by our government, by acts passed by Congress respectively in 1818, 1828, and 1832. Almost forty thousand widows were pensioned; of these over thirty-four thousand were married before the year 1794, and three thousand seven hundred and fifty after the year 1800. The last surviving soldiers and pensioners were William Hutchings, of Maine, and Lemuel Cook, of Western New York. The former died on the 2d of May, 1866, at the age of almost one hundred and one years and seven months: the latter died eighteen days afterward, at the age of one hundred and two years. For portraits of these two men, see the American Historical Record.

The United States were not made independent States by their own declaration, nor their prowess, nor by the acknowledgment of the French monarch, nor by the treaty stipulation of the British king, for they did not, by their fundamental law, constitute a nation—only a league of states. They were, inherently, too weak, as we have observed, to exercise sovereign authority or command the respect of other nations as a sovereign power. Leading patriots at once perceived the fatal impuissance of the new republic which received all its vitality and functional powers from thirteen different legislatures, all swayed by clashing interests. Wise and thoughtful men, alarmed, yearned for a more perfect government, and many of these, representing the different States, met in convention in Philadelphia, in the summer of 1787, and there framed our National Constitution. It was finally ratified by the people, and in the spring of 1789, the new-modelled government went into operation with Washington at its head as the first President of the United States. Then the old Continental Congress, which had done such signal service for mankind, expired.

The innate vitality of the new constitution immediately arrested the profound attention of the civilized world. It was seen that the commerce, diplomacy and dignity of the nation were no longer exposed to the caprice
of numerous distinct and clashing legislative bodies, but were guarded by a central power of wonderful energy. Great Britain, France, Spain, and Holland hastened to send diplomatic representatives to the new Republican court, and the world acknowledged that the new-born nation was a power on the earth, positive and tangible.

Washington was inaugurated President of the Republic at the close of April, 1789. The first Congress under the new Constitution, were then in session, and busily engaged in the reorganization of the government, the executive power of which was vested in the President of the Republic, and the Legislative power in a Senate and House of Representatives, the former chosen by the state legislatures, and the latter by the people. They planned a system of revenue to regulate the wretched financial affairs of the country; created the Executive Departments of Treasury, War, and Foreign, and called the heads of these, Secretaries (the latter Secretary of State), and organized a National Judiciary by establishing a Supreme Court with one chief-justice and five associate justices. The choice of men, as a cabinet council, was given to the President, with the consent of the Senate. In the autumn Washington chose this council, when his Secretary of the Treasury, (Alexander Hamilton,) devised a financial scheme which laid the foundations of public credit and national prosperity, deep and abiding. Within two years after the inauguration of Washington, the Republic had taken a proud position in the family of nations. A National Mint was established in 1794; and the same year a National Bank, with a capital of $10,000,000, and a decreed existence of twenty years, went into operation.

During Washington's administration of eight years, the domestic and foreign policy of the government was settled, and hostile Indians on our north-western frontier, were compelled by force of arms, to make peace with our government. Sympathy in this country with the French revolutionists, and the action of our government in the matter, had created violently antagonistic political parties here, known respectively as Federalist and Republican; and an important treaty was negotiated with Great Britain by John Jay. Steps were taken to construct a navy for the defence of American commerce in the Mediterranean sea, which was suffering depredations by North African sea-robbers.

When John Adams succeeded Washington as President in 1797, there was a general belief that war between the United States and France was inevitable. There was a speck of war between them on the ocean, but when Bonaparte became chief magistrate of France in place of the Directory, he settled the dispute amicably, and gladly sold to the United States the French possessions in America. For the sum of $15,000,000, our government bought the vast domain known as Louisiana, which the Spanish government
TROUBLES WITH FRANCE AND ENGLAND.

had lately retroceded to the French. It stretched from the Gulf of Mexico northward, to the present Minnesota, and westward from the Mississippi toward the Pacific Ocean, and added about 900,000 square miles to our territory. Out of that magnificent domain have been carved many of our rich States and Territories beyond the "Father of Waters." At that time Vermont, Kentucky, Tennessee and Ohio had been organized, and added to the thirteen original States in the Union.

Our little navy was employed by President Jefferson, at the beginning of this century, in a war with the Barbary Powers—the North African sea-robbers—who seized our ships and cargoes, enslaved our sailors and compelled our government to pay an annual tribute as the price of ransomed captives. They were not subdued until 1815, when Commodore Decatur, with an American squadron, spread terror among those semi-barbarians, who, forever afterward, kept their brigand hands off American property and American seamen. In a single brief cruise Decatur accomplished what the Christian powers of Europe, up to that time, had failed to do.

For a series of years Great Britain and France disturbed the commerce of the world by their mad attempts to injure each other. By "orders," and "decrees," sea-ports were blockaded and many outrages were committed upon neutrals, by both parties. From their desperate games the Americans suffered much. Great Britain was a special offender. Her government claimed the right to enter the vessels of any nation, in search of deserters from her Royal Navy, and if found, to take them from their concealment and carry them away without leave. This was frequently done on American vessels, and American seamen were often so impressed into the British service.

The solemn protests of our government availed nothing, and it was finally impelled, by self-respect and care for the interests of American citizens, to declare war against Great Britain. This was done by President Madison in June, 1812, and for almost three years there were severe conflicts between the forces of the two nations, on land and sea. These conflicts began and ended on the ocean. The first was between the United States frigate President, Commodore Rodgers, and the British frigate Belvidera, Captain Byron, off Nantucket Shoals, on the 23d of June, 1812—four days after the declaration of war. The fight was indecisive. The last conflict was between the United States sloop-of-war Hornet, Captain Biddle, and the British brig Penguin, Captain Dickenson, near a group of islands in the South Atlantic Ocean, on the 23d of March, 1815, when the British vessel was sent to the bottom of the deep sea.

The disparity between the British and American naval forces at that time was so great that the most sanguine friend of the United States did not believe the latter could stand a moment before the former. The British
navy then consisted of almost nine hundred vessels, with an aggregate of
144,000 men. The public vessels of the United States, exclusive of 170
gun-boats, numbered only 20 (of which only 12 ranked as large vessels) with
an aggregate of little more than 500 guns. It must be remembered, how-
ever, that the British navy was much scattered, for that government had
interests to protect in each quarter of the globe. At the same time, the
American vessels were much scattered, and five of them were laid up in
ordinary.

The British government, statesmen and publicists looked upon the
American marine with contempt. The Constitution (yet afloat), one of the
finest of our war vessels then, was spoken of by a British journalist, as “a
bundle of pine boards, sailing under a bit of striped bunting;” and it was
asserted that “a few broadsides from England’s wooden walls would drive
the paltry striped bunting from the ocean.” The Constitution, commanded
by Hull, was the first to rebuke the arrogance of British cruisers by the
capture of the Guerriere, Captain Dacres, to which an American song-writer
of the time alluded in the following lines:

“Too long our tars have borne in peace,
With British domineering;
But now they’ve sworn the trade should cease—
For vengeance they are steering,
First gallant Hull, he was the lad
Who sailed a tyrant-hunting,
And swaggering Dacres soon was glad
To strike to ‘striped bunting.’”

Letters-of-marque were issued early and freely, and very soon privateers,
to the number of 250, swarmed upon the ocean, the swift-winged Baltimore
clippers, each carrying from six to ten guns, and a single “Long Tom,” being
the favorites. These, with other private armed vessels that went out of the
principal American ports, captured or destroyed 1,500 British merchantmen,
during the war, while the number of American merchant vessels lost in the
same way, did not exceed 500. American commerce, affrighted by the
gathering tempest of war, had fled into ports and found safety there.

During the contest the public and private vessels of the United States
captured or destroyed 56 British vessels of war, mounting 886 cannon, and
2,360 British merchant vessels, mounting nearly 8,000 guns. The British
also lost on the American coast, during the war, by wreck or otherwise, 29
armed ships, mounting about 800 guns. The Americans lost in all, 25
armed vessels.

The first conflict of the war on the land, was near Amherstburg, in
Canada, at the middle of July, 1812, between a detachment of General
Hull’s army under Colonel Cass, and British regulars, Canadians and Indians.
The last conflict was a little below New Orleans, on the 8th of January, 1815, between American troops led by General Jackson, and a British army commanded by General Pakenham.

The war began with disaster to the Americans, for General William Hull was compelled to surrender his army and the Territory of Michigan, at the middle of August, 1812; it ended in triumph for the Americans, for Jackson drove the British army to their ships in January, 1815. There had been between the beginning and the ending some severe encounters by fleets and armies, on the ocean and on the lakes; along the northern frontiers; near the National Capital; in the Gulf region and along the sea-board. The Capitol and the President's house in Washington City, with precious documents and other things, had been burned by the British, and the President and his cabinet had been put to flight. Much blood and treasure had been wasted; but the United States did not secure the object for which war had been declared, namely, immunity from Search and Impressments, by a treaty. Because of the failure to do this, the opposition pointed to the result with exultation as the fulfillment of their prophecies. Keen satires, sallies of genuine wit, and pointed epigrams, with hits like the following, were aimed at the administration and the friends of the war:

"Your commerce is wantonly lost,
    Your treasures are wasted and gone;
You've fought to no end, but with millions of cost,
And for rivers of blood you've nothing to boast
    But credit and nation undone."

But much that was exceedingly valuable, had been gained by the Americans—advantages more precious than any mere material good. They had won the profound respect of the nations, and established the positive and permanent independence of their country of British domination, for they had taught, by their valor on the ocean, even the "Mistress of the Seas," the useful lesson that the young Republic of the West, the offspring of her oppression, would no longer tolerate insult and injustice, nor suffer its sovereignty to be questioned without resenting the affront.

The treaty of peace did not guarantee immunity from Search and Impressment, but the bold achievements of our navy secured that immunity for all time, for Great Britain was compelled, reluctantly, to acknowledge that in the new nation she had a formidable rival for the sovereignty of the ocean. It was a Second War for Independence, and victory, complete and abiding, was gained at the cost of one hundred million dollars, and thirty thousand lives lost in battle and other casualties incident to war.

During the war the Algerines had resumed depredations upon American commerce in the Mediterranean sea, under the impression that our navy
had been destroyed by the British. They were undeceived by the sudden appearance of Decatur with a conquering squadron, in the summer of 1815, already alluded to. That cruise gave full security to American commerce on those seas, and greatly elevated the character of the government of the United States, in the opinion of Europeans.

James Monroe, Mr. Madison’s Secretary of State, was the successor of that gentleman in the Presidential chair in 1817. The commencement of his administration was hailed as the dawn of an era of good feeling. The partisan animosities between the Federalists and the Republicans began to fade, and these very soon disappeared as distinct political organizations, others of different names and creeds taking their places. The administration of Mr. Monroe was marked by an immense expansion of the material growth of the nation, and a conflict of opinion upon a great moral and political question which was finally the cause of a terrible civil war.

The nation was $80,000,000 in debt at the close of the war of 1812-15, much of which was paid during Monroe’s administration. Necessity had caused the establishment, during the dark days of the embargoes on commerce and actual war, of manufactures in America, but when that war ceased, and the fabrics of Europe came to our country in large quantities and at low prices, there was wide-spread disaster among the American manufacturers, that called loudly for the remedy of a Protective Tariff on goods imported from abroad. Thousands of manufacturers were compelled to seek other employments.

Beyond the Alleghany mountains lay millions of fertile acres, inviting the tiller. Agriculture beckoned unfortunate bankrupts and others to her fields. Homes in the East were deserted for awhile. Domestic emigration flowed over the great hills into the valleys of the Ohio and Mississippi in a broad and vigorous stream. Before the close of Monroe’s administration of eight years, in 1825, four new States on the borders of the Great River, and one in the East had been added to the Union. The cession of Florida to the United States by Spain, at about the same time, added 67,000 square miles to our domain. Manufactories were springing up in the East, and old homesteads were fully occupied; and the first great conflict between the promoters and opposers of the slave system of labor—the moral, social, and political question just referred to—had been fought, and settled by a compromise.

The first national effort to check the extension of the area of slave labor in this country, was made in the year 1787, when the region northwest of the Ohio River ceded to the United States by Virginia and other States, was organized into a territory, with a stipulation that slavery should never exist within its borders. That question was not again raised until 1819, when the people of the Missouri Territory (a part of the
Louisiana domain) asked for its admission into the Union as a State. A
bill for that purpose was introduced into Congress, which contained a pro-
vision forbidding the existence of slavery in the new State, when it should
be admitted. One of the most violent of the debates yet heard in the House
of Representatives on the subject of slavery now occurred, in which some
extreme doctrines and foolish threats were uttered on both sides. There
was a good deal of adroit management by the party leaders, who showed
much dexterity in trying to avoid a compromise which had been agreed to
at a previous session, one party wishing to have Missouri admitted as a
slave-labor state, and the other party desiring it to enter as a free-labor
state.

Compromise seemed to be the only door through which Missouri could
possibly enter at that time; and Henry Clay moved a joint committee to
consider whether or not it was expedient to admit Missouri into the Union,
and if not, what provision, adapted to her actual condition, ought to be
made. The motion was adopted; a committee was appointed, and the
result was that early in 1821, it was agreed that slavery should be per-
mitted in Missouri and all territory south of thirty-six degrees and thirty
minutes, north latitude, and prohibited in all territory north of that line.
This agreement, known as the Missouri Compromise, accomplished the
admission of that Territory as a State of the Union. That Compromise
was respected for more than thirty years, when, in 1854, it was violated.
During this great debate, when the people of the Union were first decidedly
and vehemently divided on the subject of slavery, a member of Congress
from Georgia said, prophetically, "a fire has been kindled which all the
waters of the ocean can not put out, and which only seas of blood can
extinguish."

The annexation of Florida to the English-American domain, the exten-
sion of the western boundaries of the Republic to the Pacific ocean by the
purchase of Louisiana, and the partition of the newly acquired territory
between the slave and free-labor systems then prevailing in different sections,
by the consent of the friends of both, marked a new era in our political
history. It was believed by more hopeful men that the vexed question of
slavery which had produced irritations in and out of Congress from time to
time ever since the adoption of the National Constitution, was set at rest
forever by the Missouri Compromise, and that thenceforth perpetual peace
and prosperity would be the happy destiny of our people.

Like all other compromises, between individuals and communities having
strong antagonistic convictions, the result of peculiar circumstances, or edu-
cation and habits of daily thought, this agreement only postponed indefi-
nitely the conflict, which the moral philosopher knew to be inevitable. Each
party to the arrangement still believed the other to be radically wrong;
and while each was willing to yield for the sake of present peace, their convictions remained the same—a fruitful soil for the growth of future demonstrative antagonisms, as we shall observe presently, as deep-rooted as ever, for "He that's convinced against his will, Remains to be convinced still."

It was at about this period that our government took decided and effective action for the suppression of two piratical establishments on our Southern coasts. One of them was near the mouth of the St. Mary's river, in Florida, and the other was at Galveston, in Texas. They carried on a clandestine trade in slaves; and under pretence of authority from some of the Spanish republics of South America, they were endeavoring to wrest Florida from the dominion of Spain. Late in 1817, our government sent a military force to take possession of Amelia Island, the rendezvous of the pirates on the Florida coast, and broke up the nest. The establishment at Galveston was soon afterward abandoned, and no unlicensed buccaneers have since appeared in our waters.
CHAPTER II.

DURING the administration of Mr. Monroe, the Spanish American Republics in Central and South America, were recognized by our government as independent States, and in a message to Congress the President said: “As a principle the American continents, by the free and independent position which they have assumed and maintained, are henceforth not to be considered as subjects for future colonization by any European power.” This is known in our political vocabulary as “The Monroe Doctrine,” and has been maintained by our government from that day to this.

John Quincy Adams succeeded Mr. Monroe as President. His administration was a very quiet one—a calm before a tempest—the precursor of the stormy administration of General Andrew Jackson, his successor. The great interests of agriculture, commerce, manufactures and the national relations with the Indian tribes, were adjusted during Mr. Adams’s administration. There was a little flurry at the beginning caused by the clashing of the authority of the State of Georgia with that of the National government, in regard to the lands of the Indians within that commonwealth. At about the same time the great work of internal improvement in the State of New York, the Erie Canal, was completed.

Before the close of Adams’s administration, the American System, as the imposition of tariffs for the protection of American manufactures was called, was perfected as a national policy. It pleased the manufacturers of the North, but displeased the cotton-growers of the South, and much trouble ensued. The people were prosperous; they were at peace with all the world, and their national debt was nearly extinguished.

Jackson was an energetic, self-willed and honest man. He regarded the United States Bank, which had been rechartered in 1816, as a dangerous institution, and he opposed its recharter with great vehemence from the beginning of his administration. In 1832, he vetoed a bill passed by Congress for that purpose, and the bank expired by limitation, in 1836. Meanwhile the President had caused the removal from that bank, of the government deposits, to the State banks, when a bubble of apparent prosperity was inflated by speculators who could procure loans of money easily.
It was followed by a collapse, and a wide-spread panic, financial confusion and commercial distress.

Jackson's foreign policy was as energetic as that at home, and it greatly increased the respect for the United States, among all the governments of Europe.

Out of the movements in Georgia, and by the national government, for the expulsion of the Indians from that State, grew much animosity toward the white people, among the dusky tribes of the Gulf region; and when, in 1835, measures were taken for the forcible removal of the Seminoles—a warlike people inhabiting the Everglades of Florida—to a country west of the Mississippi river, these savages flew to arms. A war was begun that continued about seven years.

Martin Van Buren was Jackson's successor. The country was suffering severely from the commercial revulsion just mentioned. Within the space of two months after Van Buren entered upon his official duties, there were mercantile failures in the city of New York alone to the amount of $10,000,000—a very large sum forty years ago. Nearly the whole four years of Van Buren's administration was spent in efforts to remedy this evil, and to this end the Independent Treasury system, for the custody of the public funds, was adopted. It remained in operation until the breaking out of the late Civil War.

The conflict with the Seminoles continued until 1842, at a cost to our government of full $40,000,000, and to our people of thousands of precious lives. Meanwhile the peaceful relations between the United States and Great Britain were disturbed by disputes concerning the boundary between our republic and the British province of New Brunswick, and by the active sympathy of the citizens of the United States along the northern frontier, with insurrectionary and revolutionary movements in the Canadas. But the difficulties were soon amicably adjusted.

At the close of Van Buren's administration our national government had been in full operation fifty years. The number of the States had doubled; and the population had increased from about three and a half million of all colors, to seventeen million. It was an important point in our national history—a departure for new ways. A magazine writer of that day, remarked: "The great event of Mr. Van Buren's administration, by which it will be hereafter known and designated, is the divorce of Bank and State in the fiscal affairs of the Federal government, and the return, after half a century of duration, to the original design of the Constitution." That divorce was temporary, and the reunion has been productive of healthy offspring.

General William Henry Harrison, who succeeded Mr. Van Buren, with John Tyler as Vice President, lived only a month after his inauguration. At his death Tyler became President. The most important event of his
administration was the conclusion of a treaty with the authorities of Texas (a revolted colony of Mexico and then a sovereign State), for its annexation to the United States. The treaty was not ratified by the Whig Senate, and the “Texas Question” became a prominent political issue. The annexation was advocated by the pro-slavery men, because it would strengthen their political position in the Union, and allow a field for the expansion of the slave system of labor. Chiefly for the same reasons, it was opposed at the North. The friends of the measure soon obtained the control of the Democratic party, who, in 1844, elected James K. Polk, of Tennessee, to the Presidency of the Republic, as an avowed friend of annexation. Joint resolutions of Congress for the nuptials were adopted early in 1845, and on the 4th of July following, that state surrendered its sovereignty and entered our union, the United States agreeing to pay the debts of the State, amounting to $7,500,000.

A war with Mexico, which claimed jurisdiction over her revolted colony, was the result of the annexation of Texas. Preparations had been made for it by the President and his Cabinet. Santa Anna was then an exile in Cuba. Secret arrangements were made with him to betray his country into our hands. The plan was simple. The President was to send a strong army of observation toward the frontier of Mexico. Santa Anna was to go into that country, when an army for defence should be gathered near the Rio Grande. That army would be sure to “pronounce” for him. The war was then to begin. The President was to send a force sufficiently large in numbers, to make a surrender of the Mexican army to it, at some propitious moment, respectable. This Santa Anna was to do; and for the service was to receive a large sum of money from the secret-service fund in the hands of the President.

The Army of Observation was sent into Texas under General Taylor, and Slidell McKenzie, of our navy, was sent to Cuba to perfect the arrangement with Santa Anna. Instead of going to his retreat secretly, McKenzie, vain as a peacock, rode out of Havana at noon-day, in a volante, fully dressed in the uniform of a United States naval officer. This folly disconcerted the well-laid plan. After this public display of a visit from an officer of the United States, Santa Anna could not go into Mexico, and fulfill his bargain, for the act of a surrender would be too palpably treasonable. This statement I make on the authority of a verbal narrative given to me by the late Senator Thomas H. Benton, in February, 1857.

The war began on the banks of the Rio Grande, in April, 1846. It went on. Many troops were sent to General Taylor, who entered Mexico, and made a conquering march into the interior. Meanwhile Santa Anna had been permitted (historians have wondered why) to pass through the American fleet, and enter Mexico. He was at the head of an army of 20,000 men in
the winter of 1847, and with these he was repulsed by Generals Taylor and Wool at Buena Vista, with only 5,000 Americans. General Scott soon afterward entered Mexico near Vera Cruz, captured that stronghold in April, and fought his way to the capital, which surrendered to him on the 13th of September.

In the meantime other troops had crossed the continent, captured New Mexico and California, and Colonel Fremont, the skillful path-finder among the Rocky Mountains, who was a gallant leader of the little army, proclaimed the annexation of the latter country to the United States. That was in February, 1848. In the same month a treaty of peace was concluded by which New Mexico, Upper California and the region lying between them, remained a permanent possession of the United States, the latter agreeing to pay to Mexico for the domain, $18,000,000. The same year gold was discovered in California, and thousands of adventurers flocked thither in search of the precious metals. In 1850, after an acrimonious debate in Congress on the subject of slavery, California was admitted into the Union as a free-labor State. The war with Mexico and the settlement of a dispute with Great Britain about the boundary line between the Territory of Oregon and the British possessions, were the most prominent events of the administration of President Polk. By the acquisition of Texas, the Oregon treaty, and the war with Mexico, over 1,000,000 square miles were added to our territory.

The exploits of General Taylor, in Mexico, made him very popular, and in the autumn of 1848, he was elected President of the Republic, with Millard Fillmore as Vice-President. They entered upon their official duties in the spring of 1849. The following winter angry debates in and out of Congress on the subject of slavery, agitated the whole country. The friends of slavery threatened to break up the Union if California should be admitted as a free-labor State. There was wide-spread alarm, when Henry Clay, as in 1832, appeared as a peace-maker. He offered a compromise in a series of measures embodied in one general act, which was known as the "Omnibus Bill," the chief provisions of which were for the admission of California as a free-labor State; the erection of two new territories (Utah and New Mexico) without mention of slavery; the abolition of slavery in the District of Columbia, and a law compelling the return to their masters of all fugitive slaves found in any part of the Republic. The compromise was adopted and the agitation subsided for a while. The last-named provision which made every citizen a slave-catcher, shocked the moral sense of the nation, and in the free-labor States the Fugitive Slave Law was evaded and resisted. A bitter sectional feeling was engendered which grew in intensity as time rolled on.

At that time there was a powerful party in all of the free-labor States,
working for the abolition of the slave system from the whole land. They had begun to organize as early as 1832, to work upon public sentiment solely through moral and religious influences. Two years afterward, their opponents began to use violent means to suppress the agitation, and in some instances life and property were destroyed. In 1835, President Jackson, in his annual message to Congress, recommended the passage of a law prohibiting the circulating of anti-slavery publications through the United States mails, and the House of Representatives adopted a rule not to receive any petitions on the subject. This denial of the right of free speech and of petition, gave vehemence to the efforts of the Abolitionists. They increased in numbers and influence, and in 1845, the obnoxious rule was rescinded. Meanwhile the organization had assumed a political as well as moral character, and in 1840 a "Liberty Party" was formed, which gave nearly 8,000 votes for their candidate for the Presidency of the United States. In 1844, the same candidate (James G. Birney) received over 62,000 votes. These did not include all of the anti-slavery men, for large numbers adhered to the other two political organizations—the Whigs and Democrats.

When the Texas question was before the people, fourteen Northern States protested through their legislatures, by the votes of all parties, against any enlargement of the area of slavery, for they saw the object of the annexation project. And when it was believed that the war with Mexico would end in the acquisition of territory, and a bill was before Congress authorizing the President to use $2,000,000 in negotiating a peace, David Wilmot, of Pennsylvania, moved as an addition thereto, a proviso prohibiting slavery in any territory on the continent of America which should thereafter be annexed to the United States.

The proviso was rejected, but its principles formed a basis of future action, and produced a schism in and secession from the two great parties. The schismatics in the Whig party were called "Free Soilers," and those in the Democratic party were named "Barnburners." These coalesced with the "Liberal Party," and in 1848, the coalition nominated Martin Van Buren for the Presidency of the Republic, and Charles Francis Adams for the Vice-Presidency. The "platform" of the new party proposed not to interfere with slavery where it then existed, but to prevent its extension. "Our calm but final answer is," they said, "no more slave States, and no more slave territory." Van Buren and Adams received over 291,000 votes, but were not elected. The Democratic candidate was General Cass, and the Whig candidate was General Taylor.

While the "Omnibus Bill" was before Congress, President Taylor died, and was succeeded by Mr. Fillmore. The whole weight of the administration of the latter was given in favor of the compromise measures. During his term of office, the peaceful relations between the United States and Spain
were disturbed by expeditions from this country for the liberation of the Cubans from the Spanish yoke. The chief glory of Mr. Fillmore’s administration was the negotiation of a treaty with the government of Japan, by Commodore Perry, by which the commerce of that empire was opened to the world.

Meanwhile a sect of religionists called Mormons had founded a sort of half-independent State among the mountains in mid-continent, where they isolated themselves from the sympathies of the Christian world by practicing polygamy. They defied the government of the United States for a while, and resolved to live a separate and peculiar people. They went there in 1847, and are there yet, in the Utah territory, numerous, rich, and powerful; but their territory is kept out of the Union as a State, because of the polygamous practices of the inhabitants.

In 1852, Mr. Fillmore was succeeded by General Franklin Pierce, of New Hampshire, whom the Democrats had elected President of the Republic. During his administration, the agitation of the slavery question was aroused with greater violence than ever. In the spring of 1854, the Missouri Compromise was violated and virtually repealed by the erection of Kansas and Nebraska Territories north of the prescribed line of latitude, and leaving them open for the introduction of the slave system therein. This measure was extremely offensive to the anti-slavery sentiment of the free-labor States, and the anti-slavery party were greatly strengthened.

Another cause for deep discontent in the North, was the attempt, the same year, to prevent the emancipation of the slaves in Cuba, then contemplated by the Spanish government. Three American ministers in Europe—Buchanan, Mason and Soule—met, by order of the President, at Ostend, in Belgium, to confer upon existing troubles with Spain on account of invasions or threatened invasions of Cuba from the United States. They issued a manifesto, drawn up by Mr. Buchanan, in which they recommended the government of the United States to offer $120,000,000 for Cuba, and in case of the refusal of Spain to sell, to seize it by force of arms, to prevent the emancipation of the slaves. This measure was approved by the President, but he did not think it expedient to attempt to carry it out, because the outrageous proposition had shocked the moral sense of the nation. But expeditions from our country, for overturning the governments in Central America and establishing independent states there ready for annexation, were secretly favored by the government.

These “filibustering” movements distinguished the administration of President Pierce. It was more gloriously distinguished by preparations for building a railway across the Continent; and sadly by civil war in Kansas. That territory, as we have observed, was left open for the introduction of slavery. There was an immediate struggle for its possession, between the
slaveholders and the free-labor States. Emigration, diplomacy, legislation, and brute force were employed in the strife. Civil War was begun, and blood flowed freely in some places. The anti-slavery party finally succeeded, and Kansas was admitted into the Union a free-labor State. So, also, was Nebraska. During Pierce's administration, 30,000 square miles were added to the domain of the Republic by the purchase of the portion of Arizona Territory south of the Gila River, for $10,000,000.

While these violent agitations were going on, the Democrats elected James Buchanan, the author of the "Ostend Manifesto," to the Presidency of the Republic, with John C. Breckinridge as Vice President. Colonel John C. Fremont had been nominated for the Presidency by a new party, called "Republican." It was composed of the anti-slavery men of all parties. Their candidate received over 1,341,000 votes, against 1,838,000 cast for Buchanan, and 874,500 for Fillmore, the candidate of the "American Party," who were avowedly opposed to foreign influence (especially of the Roman Catholics) in our politics.

Around the slavery controversy, as a centripetal centre, Mr. Buchanan's administration revolved. That controversy was carried on with great bitterness of spirit and language, the President giving his influence in favor of the slaveholding interests. The sectional strife was made more fierce by an attempt of John Brown, an anti-slavery enthusiast, to liberate the slaves of Virginia in the autumn of 1859. He was arrested at Harper's Ferry, and near there he was hanged by the authorities of Virginia. This event was the spark that kindled a terrible civil war in our country.

It was during the administration of Mr. Buchanan that communication, by means of the electro-magnetic telegraph, between the United States and Great Britain, was first effected. A cable of wires was stretched across the Atlantic Ocean, and early in September, 1858, the Queen of England sent over it a message to the President of the United States, which the latter answered. The connection was then immediately broken, and remained so until July, 1865, when a new cable was laid, and communication between the two hemispheres has been kept up ever since, by means of the subtle power of electro-magnetism.

In the spring of 1860, a Democratic convention was held in Charleston, South Carolina, to nominate a candidate for the Presidency of the Republic. A schism immediately appeared in that body, caused by an avowed determination of the representatives of the slaveholders to open the territories to their labor system. The Northern Democrats opposed them. The Southerners seceded from the convention. Another meeting was held at Baltimore in June. The two wings could not agree. Again the Southern delegates seceded, and reorganizing in Baltimore, nominated John C. Breckinridge, of Kentucky, for President of the Republic. The regular convention nominated

Already, at the middle of May, a Republican convention at Chicago had nominated Abraham Lincoln, of Illinois, for the high office. The friends of slavery, recognizing him as the anti-slavery candidate, declared that if he should be elected, the slave-labor States would secede from the Union and form a separate Republic. Mr. Lincoln was elected in the autumn of 1860, and the Southern politicians proceeded to execute their threat.

South Carolina took the lead. At a convention held at Charleston on the 20th of December, 1860, it was declared that "the union subsisting between South Carolina and other States, under the name of the United States of America, is hereby dissolved." This was followed by insurrectionary movements. The State forces of South Carolina seized the United States Custom-house, Post-office, and Arsenal at Charleston, and Forts Pinckney and Moultrie in the harbor. Major Robert Anderson, commander of the garrison of the latter, took his little troop of about eighty men into Fort Sumter without orders from his government, and held it. This act caused an enthusiastic rhymer of the day to make "Miss Columbia" say:

"Bob Anderson, my beau, Bob,
When we were first acquainted,
You were in Mexico, Bob,
Because by order sent;
But now you are in Sumter, Bob,
Because you chose to go.
And blessings on you anyhow,
Bob Anderson, my beau.

Bob Anderson, my beau, Bob.
I really don't know whether
I ought to like you so, Bob,
Considering that feather.
I don't like standing armies, Bob,
As very well you know,
But I love a man who dares to act;
Bob Anderson, my beau."

The first overt act of war was committed by South Carolina state troops, who, early in January, 1861, fired on the Star of the West, a steamer sent by the government, with supplies for the garrison of Fort Sumter. This was speedily followed by the passage of ordinances of secession by conventions of six other States. These conventions sent delegates to a general Convention held early in February, (1861) at Montgomery, in Alabama. These organized a provisional government under the title of the Confederate States of America, and chose Jefferson Davis President, and Alexander H. Stephens Vice-President of the inchoate nation. These important move-
ments had been carried on without the sanction of the people of those States, for no ordinance of secession was ever submitted to them.

Mr. Lincoln succeeded Mr. Buchanan in March, 1861. The members of Congress from the "seceded" States had left their seats and joined the seceders in their respective States. In his inaugural address the new President held out the olive-branch of peace and reconciliation; it was rejected with scorn. Armies were gathered in the South for the avowed purpose of establishing a separate republic with slavery for its corner-stone; and early in April, Edmund Ruffin, a white-haired citizen of Virginia, fired a heavy cannon-shot (the first) at Fort Sumter, in Charleston harbor. A furious bombardment from South Carolina batteries followed, and Anderson, having exhausted his provisions, evacuated the fortress and sailed with his garrison for New York, bearing with him the flag of Sumter.

Other forts and arsenals, and the Mint and Custom-house at New Orleans, were seized by the secessionists, and the life of the nation was imperiled. The President called for 75,000 volunteers to save the Republic. They flew to the rescue with alacrity. From the hills and valleys of the East, West, and North, went three hundred thousand men. The clash of arms was soon heard in Virginia, for a great military force had come up from the South to seize the National Capital.

Civil War had now begun. Congress assembled and voted hundreds of thousands of men and hundreds of millions of dollars for the defence of the Union. For the same purpose a powerful naval armament for the ocean was created, and the rivers of the West soon swarmed with gun-boats. American ingenuity was severely taxed, and it responded by marvellous productions. American philanthropy responded to the appeals of patriotism and humanity with unbounded munificence. It is estimated that during the war, the loyal people gave $500,000,000 for patriotic and beneficent purposes, while those opposed to them contributed as freely to their cause.

Among the gifts of the loyal, was food, valued at $200,000 sent to the starving families of factory operatives in Lancashire, England. It was conveyed in a vessel convoyed by an American armed ship to protect her and her precious cargo from destruction by British built, armed and manned privateers, then roaming the ocean under the Confederate flag.

The war lasted four years, and spread over the whole Union south of Pennsylvania and the Ohio river, and east of the Rocky mountains. Thousands of miles of Southern sea-coast were blockaded by national vessels, and more blockade-running vessels from Great Britain were captured than got into ports.

The whole number of men called into the service of the government for the army and navy during the Civil War, was 2,656,552. Of these, 186,000 were colored men, mostly emancipated slaves. Those who, at the later
stages of the war, were drafted, were allowed to pay a commutation fee. The aggregate amount so paid, was over $26,300,000. There were 1,490,000 men in actual service. Of these 60,000 were killed on the field, and about 35,000 were mortally wounded. Disease in camps slew 184,000. It is estimated that about 300,000 Union soldiers perished during the war; and full that number of Confederate soldiers lost their lives. The aggregate number of men, including both armies, who were crippled or permanently disabled by disease, was about 400,000. The actual loss to the country of able-bodied men was full 1,000,000. The slave-labor States lost full $4,000,000,000, including the value of their slaves emancipated and the paralysis of industry; and the National Government was burdened with a debt of almost 3,000,000,000.

When the war ended, there were about a million of men of all arms, on sea and land, in actual service. On the first of June, 1865, the disbanding of the army began, and by the middle of autumn about 800,000 were mustered out. The wonderful spectacle was exhibited for the civilized world of vast armies of men, surrounded by all the paraphernalia of war, transformed in the space of one hundred and fifty days into a vast army of citizens engaged in the blessed pursuits of peace. Major-generals and all grades of subalterns were seen at work in various peaceful avocations, and nature everywhere covered up the scars made by long lines of fortifications, by verdure and shrubbery.

No argument in favor of free institutions and a republican form of government, so potent and conclusive as the result of this terrible war and the sudden transformation of soldiers into citizens, was ever before presented to the judgment and feelings of the nations of the earth. The important political problem of the nineteenth century was solved by our Civil War. Our Republic no longer appeared as an experiment, but as a demonstration.

The political leaders in the slave-labor States had entered upon the contest with the grave misapprehension that Cotton was the king that ruled the commercial world. They believed their potential monarch would compel the British and other European governments to give them their sympathies and material aid. Great Britain and France did so as far and as long as they dared. The British furnished the Confederates with supplies by blockade-runners, and built, victualed, armed and manned one or more powerful vessels to deprecate on American commerce under the Confederate flag. For this offence toward a friendly power, a righteous tribunal caused the British government to pay to that of the United States $15,500,000 in gold in 1872.

Facts and figures had soon undeceived the Confederates and their foreign friends. They had over-estimated the strength of “King Cotton,” and underestimated that of King Corn. The value of the Cotton crop in 1860-'61, was
about $183,000,000; that of wheat, Indian corn, oats, and hay combined—chiefly produced in the free-labor States—was $1,100,000,000. In view of this fact, an exultant loyalist wrote at the close of the contest:

"Cotton and Corn were mighty kings,
Who differed at times on certain things,
To the country's dire confusion.
Corn was peaceable, mild and just,
But Cotton was fond of saying "you must;"
So after he'd boasted, and bullied, and cuss'd,
He got up a revolution.
But in course of time the bubble is bursted,
And Corn is king, and Cotton is—worsted."

The people of the nation were just beginning to rejoice because of the return of peace, when they were saddened by the assassination of President Lincoln in a public place in the National Capital. He had been inaugurated for a second term of office a few weeks before, with Andrew Johnson as Vice-President. The latter now filled Mr. Lincoln's official place. The Executive and Legislative Departments of the government immediately undertook the difficult task of reorganizing the disorganized States of the Union. They very soon differed in their ideas concerning the best methods for accomplishing that desirable end, and became violently antagonistic. Congress passed acts and the President vetoed them, when they were reenacted and became laws by a two-third vote, without the concurrence of the Executive.

Amendments were made to the National Constitution to secure the perpetual freedom of the liberated slaves, and to guarantee equal civil rights to all citizens without regard to race or color. These beneficent measures the President opposed. At length his conduct became so offensive, that in February, 1868, the House of Representatives resolved by an overwhelming majority, "That Andrew Johnson, President of the United States, be impeached of high crimes and misdemeanors." He was arraigned in March before the Senate sitting as a High Court of Impeachment, the Chief-Justice of the United States presiding. The President was acquitted.

During Johnson's administration, which ended in March, 1869, Alaska, a territory in the north-western part of our continent, was purchased of Russia by the United States for the sum of $7,200,000 in gold. This added 500,000 square miles to our domain. By these accessions of territory, our Republic now (1876) covers millions of square miles.

In the autumn of 1868, General Ulysses S. Grant, an eminent soldier of the Republic during the Civil War, was elected to the Presidency, with Schuyler Colfax as Vice President. He was reelected in 1872, with Henry Wilson, Vice President. His administration, which will end on the 4th of March, 1877, has been signalized by the completion of a railway communica-
tion between the Atlantic and Pacific oceans, across our continent; the perfect reorganization of the Union; the trial of a peace policy with the Indians, and distressing wars with some of them in the far West; the settlement of claims against Great Britain, already mentioned; the reduction of taxation and the National debt; the enactment of a law for the resumption of specific payments, suspended since 1861, and the successful survey of a ship canal across the Isthmus of Darien.

In this skeleton outline of the Civil and Military transactions in our country during the last one hundred years, we have glimpses of the marvellous growth of the young nation in strength of population, expansion of domain, and moral and political influence among the powers of the earth. The number of States in 1776 has been increased from 13 to 38, with ten Territories rapidly preparing to be admitted as States. The area of our domain has expanded from 820,680 square miles, to 3,466,166 square miles. Our population has increased from 2,600,000 (including 500,000 blacks) in 1774, to more than 40,000,000. The expansion of our commerce, manufactures, and useful arts, and our progress in scientific discovery, inventions, fine art, literature, the learned professions, and social, moral, religious and benevolent institutions, to the elucidation of which the remainder of this volume is devoted, have been equally marvellous.
CHAPTER III.

The American colonists, at the time when they declared their independence of British rule, were a race of sturdy men and women, in body, mind, and morals. They were the mixed descendants of emigrants from various parts of Europe, chiefly of the Indo-Germanic races, who have always been distinguished for their love of personal liberty, free institutions, and self-government.

The British Islands, Holland and Sweden, and a small proportion of Protestant refugees from France known as Huguenots, furnished a greater part of the immigrants who came here in the seventeenth and eighteenth centuries, to plant homes in a land then inhabited by savage beasts and almost as savage men.

These, the ancestors of the men who struggled for and gained our independence, each brought with them the peculiarities of father-land in manners, customs, modes of thought and religious creeds, and were generally zealous sectarians in theology, sitting in harsh judgment upon the opinions of others. There were Papists and Protestants, Churchmen and Dissenters, Puritans and Cavaliers, Quakers, and various other independent and isolated sects, who came hither, some to enjoy religious liberty among the hills of New England; some to indulge in voluptuous ease in the milder climate of Virginia and the Carolinas; some like the Dutch, in New York, to engage in traffic, and all to better their condition in life.

In their new homes, for a time, these emigrants cherished the ideas of their old dwelling places, and indulged in the old social customs and modes of dress which they had left behind; but distance from their birth-places; contact with others; the attrition of clashing opinions; general freedom from conventional restraints; and inter-colonial commerce, trade, and social intercourse, had greatly modified these peculiarities, and made the American colonists of Teutonic origin a homogeneous people a hundred years ago—a nation before there was a political union. Their general characteristics—their political, social, and religious life—had been molded by the English government, laws, literature and industrial pursuits. From the Penobscot on the East to the St. Mary’s on the South they were, in a general sense, a nation of Anglo-Saxons, with local interests at variance, but bound by
ties of blood and political affinities much stronger than these separating influences. They were precisely the materials for the constitution of a noble State according to the prescription of Alcæus of Myteline, who asked and answered:

"What constitutes a State?
Not high-raised battlements, or labor'd mound,
Thick walls or moated gate;
Not cities proud, with spires and turrets crown'd;
Not bays and broad-armed ports,
Where, laughing at the storms, rich navies ride;
Not starred and spangled courts,
Where low-browed baseness wafts perfume to pride.
No; Men, high-minded Men,
With powers as far above dull brutes endued,
In forest, brake or den,
As brutes excel cold rocks or brambles rude—
Men, who their duties know.
But know their rights, and knowing, dare maintain;
Prevent the long-aimed blow,
And crush the tyrant while they rend the chain—
These constitute a State."

Count Segur, of France, who was in this country at the close of our old war for independence, afterward wrote as follows, in the third person:

"Everywhere in that political Eldorado he saw public confidence, frank hospitality, and naive cordiality, simple virtues and pure morals. It may be said that America will not always keep these, but, if it only keeps them a century, it will be a century of happiness . . . The only danger which can menace this happy republic, is the excessive wealth which its commerce promises, and the corrupting luxury which that will bring with it."

A hundred years ago the American colonies occupied a selavage of the continent along the Atlantic Ocean almost a thousand miles in length, and back to the lofty ranges of the Alleghanies, an average distance of about thirty leagues, and covering an area of little more than 800,000 square miles of land and water. Now the domain of the Republic makes a broad belt across the continent, containing almost 3,500,000 square miles, or almost double that of the Roman empire in its palmiest days.

Agriculture was the chief pursuit of the inhabitants, for the home government, jealous of the growing prosperity of the colonies, had adopted an unwise policy of restriction, so that Commerce and Manufactures were so tightly bound, that they barely maintained a feeble existence. Here and there, towns by the sea-side enjoyed the advantages of a moderate coast trade, and fisheries soon rose into some importance; but the smoke of very few manufactories curled above the tops of the wide-spread forests.
As a general rule the people lived frugally. Their dress was simple and their ornaments were few, for untiring industry was a general condition of comfortable existence. There were many exceptions to the rule, especially in large towns, for as individual riches increased luxury more abounded. Yet it was not looked upon with favor. When Robert Murray, a rich Quaker merchant in New York, procured a coach from England—the third or fourth one then owned in the province—he respected public opinion of such extravagance sufficiently to call it “a leathern convenience,” for his residence was three or four miles from his place of business.

There were a few families, particularly in Virginia, who, from the beginning, had kept up the style of the wealthier class of commoners in England, in their dress, houses, furniture and travelling equipages, as far as the circumstances of the country and the distance from the sources of supply would permit. Then as now, the fashion of these things came from Europe, and nearly every article was manufactured there. We have never thrown off the vassalage to the fashion-tyrant enthroned in Paris, to which our great-grandfathers and great-grandmothers then bowed in meek submission. We are not yet independent.

The costume of the English gentry in 1776, was that of the wealthier class in America at the same time; and the dress of the rural population here was that of the English peasantry. The fashionable costume of that period has never been surpassed in good taste. It was simple and elegant in form, for both men and women. The coats of men were plain in shape. The skirts flowing at the bottom and thrown back like those of the old fashioned Friend a generation ago, extended almost to the knee, and were garnished with wide pocket-flaps and very large cuffs with big buttons from which protruded ruffled wristbands. From the small turned-over collar (or more frequently no collar), a row of large buttons made of wood, horn or metal, extended nearly to the bottom of the skirt. The waistcoat was open in front to display a ruffle of fine linen often trimmed with lace. This garment fell, with a graceful flaring bottom, to the hip or below. Pantaloons were then almost unknown here. They had been introduced into England by the “maccaronis.” Small clothes—breeches which terminated at the knee or a little below, were universally worn. Little boys wore such coats and breeches, and appeared like dwarfed men. These breeches were fastened at the knee with buttons or elegant buckles. Under the knee-bands were secured the tops of silk stockings worn in warm weather, and woolen ones in the colder seasons.

A hundred years ago, and for a half a century later, most of the stockings worn by a majority of the people of our country were made by the slow process of knitting by hand with steel needles. In every household these imple-
ments of labor were seen whenever the feminine portion sat down to rest, or for social enjoyment. It was the common employment of the prudent and industrious woman of those days, and it was regarded as very unbecoming to sit with the hands idle.

It is related that soon after the arrival of Mrs. Washington at the headquarters of her husband, at Morristown, in the winter of 1780, several of the leading ladies in the society of the village, made her a formal visit by appointment. They were dressed in silks and satins, and put on their finest ornaments to go into the presence of the distinguished woman. Mrs. Washington, dressed neatly in a worsted gown and petticoat of the same materials, and without ornament, received them very courteously, and entertained them in pleasant conversation for a long time, while her fingers were continually busy plying her needles in knitting a stocking for her husband. The women of the idle fingers were ill at ease in the presence of this industrious little woman, and they wished for their knitting work. Now most of our stockings and many other garments are knit by machinery, and the old-fashioned steel knitting-needle is seldom seen in the hands of our women.

The art of knitting—the making of a continuous texture from a single thread by a series of intricate loops, appears to have been understood in very remote ages. The net of the hunter and fisher, mentioned in the Bible, was of this texture; and among the Egyptian collection of the New York Historical Society may be seen head-nets, such as are now worn, made of linen threads that bound the hair of the belles of Thebes three or four thousand years ago.

In the Middle Ages, hose, a name now given to stockings only, was a garment that covered not only the feet and legs, but the thighs and lower part of the body. These garments were made of cloth, and so also were stockings proper in England, until late in the reign of Queen Elizabeth. Her father, Henry the Eighth, wore cloth stockings, excepting a single pair of silk ones that came from Spain.

So early as 1527, there was a stocking company in Paris, but none were made in England until 1564, when William Rider, a London apprentice, seeing a pair of worsted stockings in the house of an Italian merchant, made a pair like them, and presented them to the Earl of Pembroke. Knitting stockings soon afterward became a common domestic industry in England. At length, in 1589, the Rev. William Lee (who had been expelled from a college in Cambridge because he had married, and found himself so straitened that he was compelled to live on his wife's scanty earnings by knitting), invented and perfected a machine for doing that work. He found no encouragement for its use in England, and went to France, where he was patronized by the King. After his death in 1610, some of his workmen introduced the art of stocking-knitting by his machines into London. They made only a flat
web that was cut into required shape and sewed together. In course of time, the machine was improved, so as to knit a circular web and in the proper shape for the foot and leg, and the invention was applied to the manufacture of other articles of clothing. It is estimated that at the present time there are over 50,000 knitting machines in England, giving employment in Nottinghamshire alone to more than 40,000 persons.

The commercial policy of England was so severely restrictive toward its colonies, that down to the period of the Revolution, knitting machines were almost unknown in this country. Stockings formed a large item in the invoices of American importing merchants. To encourage the knitting industry among women, legislators offered premiums. So early as 1662, the Virginia Assembly voted a premium of ten pounds of tobacco (then the currency of that colony) for every dozen pairs of woolen or worsted stockings produced there; and when the non-importation leagues went into operation, a few years before the war for independence broke out, the Virginia legislature offered fifty pounds for every 500 pairs of men's and women's stockings produced, and worth from one to three shillings a pair, with the privilege of buying them at an advance of seventy-five per cent. upon these prices.

There was, at first, a penalty of £40 for exporting a stocking-frame from England. That penalty was so increased, that it was almost impossible for the colonists to obtain one. It is supposed the machine was introduced into this country by the German settlers in Pennsylvania. So early as 1722, stocking-weaving in that province is spoken of. In 1766 the Society of Arts (of which General Schuyler was a prominent member), established in New York, offered, through their Secretary, Benjamin Kissam, a prize of ten pounds for the first three stocking looms of iron set up that year; five pounds for the next three, and fifteen pounds for the first one manufactured in the province.

In 1776, the Committee of Safety of Maryland appropriated three hundred pounds to Mr. Coxenfender, of Frederick county, to establish a stocking manufactory. After the Revolution an Irish stocking-weaver set up a loom in East Greenwich, R. I., and at the same time there were machine stocking-knitters in Lancaster, Pennsylvania. So early as 1789, there were four stocking-loomos at Norwich, Connecticut. In the reports of the census of 1810, from ten different States, appear the manufacture of 481,400 pairs of stockings, valued at nearly $573,000. Of this amount, Virginia manufactured nearly one half, Pennsylvania a quarter, and Connecticut was the next largest producer.

The first application of other than hand power, in the propulsion of knitting machines, was by Timothy Bailey, of Albany, New York, in 1831. This had been tried in England and on the continent without success. This improvement, with the machine for knitting a circular web, (which was
introduced into this country, it is believed, by a Belgian in 1835,) greatly increased the facility in the manufacture of stockings, and the consequent cheapening of the price and great extension of the consumption. Numerous other improvements and inventions have since been made by Americans.

It is only about sixty years since stocking-making in our country has been changed from a domestic to a factory industry. This branch of employment, of which women had almost the entire monopoly, was taken from them, but it is likely to be returned to them, in a degree, by the knitting machine invented by the Rev. Isaac Lamb, a Baptist clergyman of Michigan. With that machine women can successfully compete with the factories without leaving their own homes.

Among the knitting mills of our country, the establishment of Thomas Dolan & Co., of Philadelphia, known as the Key-stone Mills, offers a perfect representative. The mills are situated between Oxford and Columbia Avenues, east of Second street. They were started in May, 1861, by Mr. Dolan, the senior member of the firm, for the manufacture of hosiery and fancy knit goods generally known as Germantown fancy woolens, and in a very short time they became the largest producers of this class of goods in this country.

In 1866, the mills were enlarged, and Messrs. Dolan & Co. were the first to introduce the manufacture of worsted shawls in the United States; and the new effects, rich coloring, and beautiful designs, secured for them an immense success. In 1872 they began the manufacture of worsted suitings for men's wear; and they are now among the largest, if not the very largest, manufacturers of these in our country.

The Key-stone Mills are well-appointed and thoroughly equipped with the best and latest improved machinery adapted to their various productions. They have a capacity equivalent to forty sets of cards; employ fifteen hundred persons, and produce goods annually valued at about two million dollars.

The shoes of our great-grandfathers were ornamented by large buckles of steel, silver, or gold, worn on the instep. They were polished with liquid blacking, the kind still generally used in England.

Blacking shoes is not a very ancient custom, not earlier, probably, than the reign of Louis XIV. of France, when black leather boots were worn by his cavalry, and a blacking was made for them composed of tallow, beeswax and lamp-black. It was called "black-ball" and was in vogue until about a hundred years ago. Then a composition that might receive a polish on leather, was made, and was in common use among the wealthier classes and in cities.

It is said that Washington's groom, while the patriot was President of the United States, and kept his splendid "four-in-hand" carriage horses in
Minor street, Philadelphia, was required to blacken and polish the hoofs of the steeds every morning. The more modern blacking then used, and which has come down to our time, was made of ivory-black or lamp-black, an acid and an oil, with sugar or molasses. It is now generally used in the form of a paste; and within the last thirty years, has been largely manufactured in this country. At the present time there are nearly forty establishments carrying on the business, employing almost six hundred persons and a capital of about $1,000,000. They manufacture about 15,000,000 boxes a year, having an aggregate value of $2,000,000. About 6,000,000 boxes are exported. Less than a dozen establishments monopolize the business.

A white cravat, or sometimes a black stock of silk or satin, completed the costume of a fashionably dressed gentleman, such as John Hancock at the time when he signed the Declaration of Independence. Many elderly gentlemen yet followed the late almost universal fashion of wearing wigs, while the younger men discarded them, wearing their own hair long and powdered. It was sometimes curled into "telescopes" on the sides of the head; and the back hair was generally tied into a queue with ribbons, and resting on the neck behind. It is related that in a skirmish near Cambridge, Massachusetts, on the day of the affair at Lexington and Concord, in the spring of 1775, Dr. Warren had a curl cut from his temple by a musket-ball that "carried away the curl-pin." The heads of the men were covered with plain cocked hats.

The feminine dresses in America at that time were modest copies of the then prevailing fashions in England. The immense hoop-petticoat and other immodest extravagances of the close of the reign of George the Second, were then rapidly disappearing, and in America the costume of women displayed remarkably good taste.

The dress of a fashionable woman consisted of a gown of some rich stuff, with a close bodice modestly low in the neck. The skirt was open in front, so as to display an elegant petticoat of costly materials, and often richly wrought by the quilter's skill. The skirt was looped or tucked up to the height of the hips (a "short-gown" in the more common form), or fell in graceful puffy folds to the garters behind. The sleeves were tight and terminated at the elbows, and the bare fore-arm was enriched at that point by falling lace ruffles, or partly concealed with broad and flowing lace or lawn sleeves. The hair was, in many cases, left loose in a profusion of curls, particularly among the young maidens. Others wore it in puffs, or plain and tied in a knot behind in the manner of the old Greeks. Hair-powder or its substitute (soap suds), was universally used among well-dressed people.

Strings of pearls, and sometimes a long gold pin or bodkin, the head of it sparkling with brilliants, were the common ornaments of the hair; and
small white caps of gauze or other thin stuff were tastefully made and worn on the back part of the head. The bonnets were usually small. Those of young women were often low-crowned with a very broad rim, of the kind now frequently worn, and were made of straw and gauze for summer. The high and narrow-heeled shoe had gone out of fashion, and elegant coverings for the feet were made of satin or calamanco, a kind of prunella.

The materials used for the dress of men and women in 1776, and their household furniture and other objects of domestic life, reveal to us in strong colors, the tone and taste and ideas of comfort of general society here at that time. The people throughout our country were generally more respectably clad, and better provided with food and lodging than were those of England in the ranks of life below the nobility.

The coats of well-dressed men were made of broadcloth, homespun and velvet, of various colors, black, brown, drab, blue, and claret. Their breeches for winter were made of homespun, broadcloth, worsted, stockinet, plush, leather, and buckskin; and for summer, cotton, linen, dimity, and nankeen. Overcoats were made of the skins of the bear and deer dressed with the hair on, homespun fabrics, broadcloth, a kind of serge called sagathy, and velvet; and they wore cloaks of camblet, kersey, and broadcloth, the latter sometimes of a bright scarlet color. Their vests were made of similar materials; their hats were of felted wool, beaver-fur, and velvet, and their gloves (used only in winter for comfort) were made of fur, leather, and woolen yarn. Their under-clothing consisted of fabrics of linen, cotton, and tow, and their stockings were of wool, flax, and cotton. Their shoes were made of cow and calf skins; and boots were seldom worn, except by military men. At the beginning of the present century, this antique costume began to disappear, but the older men still wore stocks, buckles, and knee-breeches, while the younger put on long boots with tassels, until the long pantaloons superseded the short clothes.

The fabrics worn by the women in 1776, were often very elegant, very costly, and the stores of clothing for both sexes in most families, were very abundant. Admiration of gay colors generally prevailed; and a group of ladies was often very picturesque. In certain articles of dress of minor importance, such as caps and aprons, there was a profuse supply in all well-to-do families; and even the humblest households were rich in these things, compared with their more sparing use now. The former were made of linen, taffeta, gauze, and muslin, and the latter of millinet, cotton check, and tow. Their dresses were made of an infinite variety of materials, running up from coarse checked and striped cotton fabrics, through worsted, calico, muslin, chintz, white and striped hollands, durant ("everlasting"), bombazine, and linsey-woolsey, to various colored moreens, poplins, velvets, and rich silks and satins
The common short gown and petticoat were universally worn when not in full dress, and was a general feminine costume for fifty years afterward. The full dress petticoats were made of various rich stuffs of bright colors, brocade being the favorite because it was the most elegant. They also had for common use, petticoats made of linsey-woolsey, flannel, tow, dimity, kersey, calamanco, and bombazine.

Shawls were made of cloth, cashmere, and taffeta; and of handkerchiefs, neckerchiefs, and underclothing, their supplies were almost inexhaustible. The kerchiefs were made of linen, muslin, cambric, gauze, taffeta, and thin silks. Gloves were much worn by the women, old and young, and were made of linen thread, knit-silk, and other stuff, and kid-leather. Their stockings were of linen and woolen, cotton and silk; and their shoes were made of prunella, calamanco, leather, cloth and satin.

On their heads they wore hats, bonnets, and hoods, made of beaver-fur, and bright colored satin, silk and velvet in winter, and gauze and straw in the summer. The jewelry for their ears, fingers, necks, and bosoms, consisted chiefly of gold and pearls; the more wealthy wore precious stones set in gold and enamel. Not long after the Revolution, gold beads came into fashion, and continued to be used by a few elderly women until about forty years ago.

I do not find Gingham, (a kind of striped and checkered cotton cloth now extensively used in our country,) mentioned among the fabrics a hundred years ago. Its manufacture was probably begun in England at a much later period, for it is only within less than forty years, that it has been manufactured to any considerable extent in this country.

Until a late period, the business was carried on in England, chiefly by manual labor, under a method known as the "domestic or non-factory system." The manufacturer needed only a dye-house, finishing-room, and small ware-house, for he bought his yarn of the cotton-spinners, colored it, and gave it to weavers in the neighborhood to make it into cloth. These weavers performed their work in the cellars or garrets of their dwellings, and were paid so much a yard for their labor. For every pound of yarn taken, they returned a given number of yards of cloth.

The introduction of machinery in the manufacture of gingham, has greatly reduced the manual labor, but it is still the costliest of cotton cloths, as may be seen by the following statement:—Plain cotton cloth costs 11 to 12 cents a pound; Calico, printed, 14 to 15 cents a pound; Muslins de laine, 16 to 17 cents a pound; Gingham, 19 to 20 cents a pound.

Probably few are aware to what extent the requirements of a gingham manufactory exceed those of a mill devoted to plain cloths. The following is a tabular view of the various processes in the two kinds of manufacture:
Among the earliest and now most extensive establishments in our country for the manufacture of gingham, are the Lancaster Mills, at Clinton (formerly Lancaster), in Worcester county, Massachusetts, a beautiful and healthful town containing about 7,000 inhabitants, who are chiefly employed in manufacturing or mechanical pursuits. It is situated in the midst of picturesque scenery, and has a fine town-hall; a well-selected free Public Library of about 6,000 volumes; excellent graded public schools, and churches of six denominations, namely, Baptist, Congregationalist, Methodist, Episcopalian, Unitarian and Roman Catholic.

The establishment we are considering was projected in 1844, by Erastus B. Bigelow, (now a resident of Boston) when a stock company was formed with a capital of $500,000. Mr. Bigelow is an ingenious American inventor. Before he was eighteen years of age (1832) he invented a hand-loom for weaving suspender-webbing; and in 1838 he obtained a patent for an automatic loom for weaving knotted counterpanes. The following year he constructed a power-loom for the Lowell Manufacturing Company for weaving two-ply ingrain carpets, which were then woven only by hand-loom, each producing eight yards a day. Mr. Bigelow's first loom produced ten or twelve yards a day. This was greatly improved. Other inventions of his followed, and in 1844 he became the founder of the flourishing town of Clinton, by the establishment of a mill there for manufacturing blue and white checked cotton cloth. It was built at the falls of the Nashua river. Before the edifice was completed it was decided to undertake the manufacture of the more difficult fabric of Gingham. The building was extended and the capital of the company increased to $900,000. This was a bold experiment, for it was determined to use machinery instead of manual labor, as far as possible. This enabled the company to compete successfully with the English manufacturers.

The mill at Lancaster was completed, and they began carding and spinning late in 1845—single carding with 96 cards. Early in 1846, all the other processes up to finishing, were begun; and at the close of that year they began to finish. The total product in 1846 was 33,472 yards. They began with ten looms, but so rapid was the increase in the business that within five years thereafter they had 550 looms in operation, making ging-

* Since 1851 most plain cloth mills use spoolers and quillers.
hams at the rate of 4,400,000 yards a year. The number of persons employed in 1846 was 148, of whom 108 were feminine operatives. In 1875 they were running 1,115 looms, which turned out 11,560,000 yards a year, and employed 1041 persons, of whom 481 were feminine. There were in use 224 cards, half breakers and half finishers, with 16,000 English mule spindles and 14,000 Sawyer's ring spindles.

The motive power at first used at this establishment was a water-wheel 26 feet in diameter. Two more were added. These were succeeded by two turbines of the Boyden pattern, of 300 horse power each. Since 1848 a pair of steam engines have been used in seasons of drouth, the present ones being of the Corliss pattern.

In 1864 the capital stock of the "Lancaster Mills" was reduced to $800,000, the $100,000 being paid back to the stockholders. The profits have been ample to enable the company to make great enlargements and improvements of the establishment, without assessing the stockholders, while the latter have seldom failed to receive a half-yearly dividend since 1850. The extent of the establishment may be imagined by considering the fact that it has five acres and a half of floor, distributed as follows:

- Cotton store-house, 7,500 square feet;
- Picking-house, 8,000;
- Carding department, 36,000;
- Spinning department, 40,000;
- Reeling, 5,000;
- Dyeing and Drying rooms, 12,000;
- Winding, 6,500;
- Quilling, 6,500;
- Warping and Dressing, 13,000;
- Weaving, (a single room covering about two acres,) 87,120;
- Yarn store-room, 4,800;
- Finishing room, including shearing, calendering, starching, tentering, measuring, pressing, folding, and packing, 8,000.

In 1875, they erected another mill 200 by 60 feet, three stories in height, for the purpose of adding 400 looms to the present number, making a total of 1515 looms. All of the buildings are constructed of brick. Connected with the manufacturing establishment are tenements occupied by two hundred families. Mr. Bigelow is also the founder of the Bigelow Carpet Company, (mentioned hereafter,) and the Clinton Wire-work Company, both doing business at Clinton.

Before the Revolution most of the textile fabrics were imported from Great Britain, and many of the garments were procured ready-made in London. A larger portion of other manufactured articles were also imported from Great Britain by the colonists. Men of wealth sent orders to England for articles for domestic use, every year, and sometimes more frequently. In 1762, Washington sent the following list of goods to be purchased by his correspondent in London, and sent over by a packet ship for Mrs. Washington and her little daughter. For the former he required:

"1 silver-colored Tabby velvet of the inclosed patterns, with satin flowers, to be made in a sack and coat; 1 Cap, Handkerchief, and Tucker [a piece of lace or linen pinned to the top of the stays], and ruffles to be made of
Brussels lace or Point, proper to be worn with the above negligee, to cost £20; one piece Bag Holland, at 6s. a yard; 2 fine flowered Lawn Aprons; 2 double Handkerchiefs; 2 prs. women's white silk hose; 6 pr. fine cotton do; 4 pr. of thread do., four threaded; 1 pr. blankets and 1 pr. white Sattin Gloves of the smallest fives; 4 pr. Calamanco do.; 1 fashionable Hat or Bonnet; 6 pr. Women's best Kid Gloves; 6 pr. ditto mitts; 1 ½ doz. Knots and Breast Knots; 1 doz. round Silk stay laces; 1 black Mask; 1 doz. most fashionable Cambric Pocket Handkerchiefs; 2 pr. neat small scissors; 1 lb. Sewing Silk, shaded; Real Minniken pins and hair-pins, and four pieces Binding tape; six pounds perfumed Powder (for the hair); 3 lbs. best Scotch Snuff; 3 lbs. best Violet Strasburg Snuff; 1 piece narrow white Sattin ribbon, pearl edge; a puckered petticoat of a fashionable color; a silver Tabby velvet petticoat; 2 handsome breast flowers.

"FOR MISS CUSTIS, 6 YEARS OF AGE.

A coat made of fashionable silk. A fashionable Cap or Fillet, with bib Apron, Ruffles and Tucker—to be laced; 4 fashionable dresses to be made of Long Lawn; 2 fine Cambric frocks. 4 Sattin Capuchin hats and neckates. A Persian quilted coat; 1 pr. pack thread stays; 4 pr. Calamanco shoes; 6 pr. leather do., and 2 pr. Sattin do. with flat ties; 6 pr. fine cotton stockings; 4 pr. white worsted do.; 12. pr. Mitts; 6 pr. Gloves, white Kids; 1 pr. silver shoe-buckles; 1 pr. neat Sleeve buttons; 6 handsome Egrets, different sorts [an ornament for the head, then much used by people of fashion, sometimes made of tufts of feathers, diamonds, etc., but more frequently of ribbons]; 6 yds Ribbon do.; 1 pr. little scissors; 3 M. [thousand] large pins; 3 M. short whites; 3 M. Minnikens; 1 fashionable dressed Doll to cost a guinea; 1 do., at 5s. A box of gingerbread. Toys and sugar images and Comfits. A neat small Bible, bound in Turkey, and Martha Parke Custis wrote on the inside in gilt letters. A small Prayer Book, neat and in the same manner; 12 yds. coarse green Calamanco; 1 very good Spinet, to be made by Mr. Plinius, Harpsichord Maker, in South Audley Street, Grosvenor Square. Send a good assortment of spare strings to it."

The Spinet (above mentioned) was an ancient keyed instrument resembling, and giving birth to, the Harpsichord which succeeded it in the sixteenth century. It was harp-shaped in structure, and was sometimes called a "couchèd harp." Its successor (the harpsichord) was constructed on a larger scale, and was, in form, much like the Grand Piano of our day. One of these, elegant when made, may be seen at Mount Vernon, to which it was taken by Washington at the close of his presidency of the Republic, as a present for Eleanor Parke Custis, Mrs. Washington's grand-daughter. It is in a mahogany box, about eight feet in length and three and a half feet in greatest width across the bank of keys.
The Harpsichord was succeeded in the latter half of the eighteenth century by the Piano-Forte, which now plays so important a part in musical education, domestic happiness, and the refinements of civilization. In the harpsichord, the strings were twanged by a quill or other substance, attached to a contrivance called a "Jack." The quality of the sound depended very much upon the material of which the "Jack" was made, and the scope of the instrument. "Is it not possible, by some device of percussion, to hit the string in a hundred ways?" asked inventive genius. It was answered by the invention of the piano-forte—the use of hammers instead of Jacks.

For half a century the invention of the piano-forte did not bear important fruit, and the harpsichord held its place in the musical world. But in 1760, Ztumpf, in London, made an instrument upon the new principle, that successfully contended for the palm of excellence with the ancient harpsichord. Improvements soon followed, and at near the close of the century the piano-forte, as we see it now, was perfected, but in an inferior manner, and the harpsichord was superseded. The piano-forte had not then reached a compass of more than five or five and a half octaves. The strings were made of brass, and the best skill of the performer could not overcome the inherent weakness of tone.

In the action of the original piano, the key had upon its inner end a lifter of stout wire, with a soft leather button, this striking and elevating the hammer; while beyond this rose a striker which at the same time lifted from the wire a damper above it—a lever having a bit of soft cloth at the end. On releasing the key this damper returned upon the string, checking its vibration. This arrangement formed the single action. But the tone was thin and wiry; and in playing very piano, the pressure on the key did not always cause the hammer to reach the string; while if the hammer rest was brought too near the string, the hammer did not quit the latter soon enough, and the effect of this was termed blocking.

These were serious defects, and to remedy them Longman and Company, of London, introduced the "grass-hopper"—commonly called the hopper— invented by John Gieb in 1786. The hopper took the place of the lifter. It was a pointed, upright piece which, when the key was pressed down, engaged in a notch under the hammer, and just before the instant of striking, slipped past the end of the hammer, allowing this, after the blow, suddenly to fall. With this was employed a second or under hammer, multiplying the velocity of the first, on the principle of the compound lever. This mechanism was the double action, still substantially in use by some makers of upright and square pianos. To this was afterward added the Irish damper, the invention of Southwell, about the year 1796, which was simply an upright rod, with a piece of soft cloth above, which the key, so long as it remained depressed, lifted off the string. This, too, had its serious defects.
Stops were early introduced into the instrument, but they were long ago abandoned, and were superseded by the pedal, of which only two are employed in England and this country: one for forte effects and the other for piano effect.

At the beginning of the present century great improvements were made. Steel strings took the place of brass ones, and the key-board was extended to seven and seven and one-third octaves. The delicate mechanism of percussion then reached its present perfection; and the delighted player found an instant and sympathetic response to his touch. Since then, the most important and conspicuous of the improvements are those which have increased the compass and power, enlarged the sonorousness, added strength and durability, and perfected the volubility and responsiveness of the instrument.
Chickering & Sons' Piano Forte Manufacture,
Boston, Mass.
CHAPTER IV.

It was at about the beginning of the present century, and at the time when improvements mentioned in the preceding chapter were made in the construction of piano-fortes, that their manufacture was begun in this country. Until that time the Americans were wholly dependent on Europe for these instruments, and for many years afterward this dependence continued.

It is supposed that Benjamin Crehore, of Milton, Massachusetts, was the first constructor of a piano-forte in this country. He was an ingenious mechanic who, as early as 1780, made bass-viol and guitars, and sent them to Boston for sale. He made his first piano-forte after an English one. In 1803, Adam and William Brent began the manufacture of these instruments, on a small scale, in Boston. In 1810, Lewis and Alpheus Babcock, natives of Milton, who had been apprentices with Crehore, established the business in the same city. Four years afterward, John Osborne began the manufacture in Boston; and at about the same time James Stewart, a Scotchman, made piano-fortes in New York. Jonas Chickering, the founder of the present house of Chickering and Sons, learned the trade of Osborne, and in 1823 commenced the business of piano-forte making in Boston. The same year he made a square piano, and in 1824, he made a Grand piano. Both are well-preserved by his descendants.

In the earlier piano-fortes the cases and frames were made entirely of wood. This material could only resist the strain of the strings up to a certain point, beyond which the power of tone by an increased tension, could not be enlarged. One of the first improvements made by Mr. Chickering was the substitution of iron for wood in the construction of the frame.

This invention was first put into operation in the year 1837. The improvement had been thought of before in this country and in Europe, but all experiments had failed, until Mr. Chickering constructed his frame upon true geometric and acoustic principles, and secured the dynamic effects of an instrument by a perpetual tension or draft upon the box or shell work, of twelve tons. This iron frame and Mr. Chickering's invention, made three years later, for casting it and the damper socket-rail all in one piece, form
the foundations upon which has been built up the magnificent American Piano-forte, the acknowledged superior to any in the world.

In 1841, Zimmerman, the director of the piano classes in the Conservatory at Paris, declared that America could produce nothing but steam-engines. Ten years afterward, he sat as a judge on the bench of criticism at the “World’s Fair” in the Crystal Palace in London, where Chickering’s piano-forte was first introduced to Europe. He was then satisfied that Americans could produce a better musical instrument of that kind than any other nation, and said so.

In 1867, there occurred at the Exposition Universelle at Paris, one of the severest contests for the prize of excellence in the production of a piano-forte, when the American instrument, manufactured by Chickering and Sons, won the victory. A gold medal and the Imperial Cross of the Legion of Honor (a special mark of distinction) were the awards given.

Many piano-forte manufactories have sprung up in the United States during the last forty years, some of them distinguished for the rare excellence of their productions; and many inventions for improvements have been made. In 1870 there were 156 establishments for the manufacture of these instruments in our country, employing over 4,000 persons, to whom was paid, in wages, the sum of more than $3,000,000. They employed a capital of $6,000,000; and their annual production was valued at $8,400,000. The increase in the business has been considerable since.

The establishment of Chickering and Sons, in Boston, employs over five hundred persons, and finishes over 60 pianos every week, on an average. Their establishment being the oldest and most extensive in the United States, I have chosen it as a representative one, by which the growth of the business in our country may be seen. It occupies an entire square in the city of Boston, bounded by Columbus Avenue and Tremont, Camden and Northampton streets. The buildings are of brick, fifty feet in depth, five stories in height on three streets, and three stories on the fourth. They have 224,370 superficial square feet of working room, and surround an open court containing over 100,000 square feet, where the lumber is seasoned by exposure to the elements at all times of the year. The buildings are all heated and the machinery driven by steam generated in eight boilers having a total capacity of 600 horse power. The main building and the wings are separated by fire-proof brick walls and double sets of iron doors, bolted and barred. No fires are allowed inside the factory, and the gas is lighted by electricity. The workmen are organized into a fire brigade, and hose are constantly attached to street hydrants.

The main entrance is on Tremont street, where, on each side of a large hall are the business offices, in one of which may be seen the electric tell-tale clock, an exquisite piece of machinery, which reports faithfully, every
morning, whether the night watchmen have done their duty, in going their rounds regularly. From this hall rises a great staircase, which leads to a suite of elegant show-rooms.

The basement contains the forge and certain departments of iron-working; also a veneer-room where the woods are formed for the case-maker. There are also placed some of the largest planers and other heavy machines which require very solid foundations. On the first floor, in the rear of one of the offices, is the stock-room, containing piano-forte hardware and everything used in making an instrument, excepting wood. On the same floor are the machine and mill-rooms, filled with over one hundred costly machines for the manufacture of every portion of a piano-forte, from the delicate screws and bridge pins, to the coarser bolts; also the sawing of every kind.

The show-rooms on the second floor are 50 feet square, with 18 feet ceilings. Between these is the designing-room, in which may be seen drawings which illustrate the progress of the instrument in outward form and inner construction, from the diminutive piano-forte of fifty years ago, to the magnificent Grand Piano of to-day. On this floor is also the skeleton-room, an immense apartment occupying the whole length of one of the wings, in which the various parts of an instrument are, for the first time, put into form, ready to be properly placed together by the case-maker, who occupies a room directly above it. That floor and the wings are used for case-making and varnishing, occupying the length of a room 826 feet. From that department the case descends, stopping first on the floor below to receive the sounding-board and iron frame; thence to the finishing-room below, where it receives the strings and key-board, and the action is adjusted; thence to the regulation-room, where the action and touch are regulated and the instrument tuned ready for the sales-room.

A hundred years ago, Music and Dancing were the chief amusements among the cultivated class of Americans, and the fashions of the day were displayed in full bloom at social gatherings, when the harpsichord or spinet, like the piano-forte now, was the chief musical instrument for the drawing-room.

Very soon after the beginning of the Revolution, great extravagances in dress, particularly of the head, appeared in England, and these were imitated in a more moderate degree in America, toward the close of that contest. A French traveller who was here in 1782, says in his journal: "The rage for dress among the women of America, in the height of the miseries of war, was beyond all bounds; nor was it confined to the great towns; it prevailed equally on the sea-coast and in the woods." As the people emerged from the distresses of the war, and prosperity returned with peace, luxury crept in; and there was a general following of European fashions by both sexes. Monstrous piles of hair, tow, flowers, and feathers, pomatum’d
and perfumed, appeared on the heads of women, and their skirts were again expanded by great hoops.

The advent of the British troops into Boston made changes in the costumes of the old families there, especially of the Tories. The sad-colored garments of the men, made with great plainness, gave place to velvet coats of various colors, with ruffles in the bosom and at the wrist. The wealthier men wore short swords, in full dress, according to the English court fashion, with a gold-headed cane. Their ball dresses consisted of white coats trimmed with silver basket buttons, and the collars and button-holes were garnished with silver lace. Sometimes they wore coats of blue or scarlet cloth, trimmed with gold lace; white satin waistcoat and breeches, with gold or silver knee-bands; white silk stockings and high-heeled morocco shoes adorned with gold or silver buckles.

When, after the French democrats had destroyed monarchy in France, and they assumed the titles, the airs, and the simplicity of the ancient Greeks, there was a sudden collapse in feminine costume, and it became, in fashionable circles, almost as scant as that of Sappho or Aspasia. For an example of an American woman in that scant costume, see the portrait of the Marchioness D'Yrugo, daughter of Chief-Justice McKean, of Pennsylvania, published in Griswold's "Republican Court."

From that time until now the costumes of men have not varied much. The pantaloon became general at the beginning of this century, and has maintained its place ever since. But the costumes of women have risen and fallen with almost the regularity of the tides, now as great in volume as those that were satirized by Foote, and caricatured by Hogarth, and then as diminished as those of the times of the French Directory. These fluctuations justified the satirist in writing—

"Now dress'd in a cap, now naked in none,
Now loose, in a mob, now close in a Joan;
Without handkerchief now, and now buried in ruff;
Now plain as a Quaker, now all of a puff;
Now a shape in neat stays, now a slattern in Jumps;
Now high in French heels, now low in your pumps;
Now monstrous in hoops, now trapish in walking,
With your petticoats clung to your heels like a maulkin;
Like the cock on the tower that shows you the weather,
You are hardly the same for two days together."

Very abundant were fabrics for household use a century ago. The matron took honest pride in the wealth of her sleeping apartments in solid comforts. The beds were made of soft feathers, and the coverings were profuse in quantity and variety. The sheets were of fine linen, muslin or flannel. Quilts (generally the products of social quilting parties which ended with
suppers and dances,) were made of calico, calamanco, durant, lutestring and persian. The blankets, often home spun and woven, were of wool, sometimes wrought of blue and white in set patterns; and the spreads were of dimity, calico, chintz and other light stuffs. The bedsteads had high posts which supported a canopy called a "tester" from which depended snow-white curtains of dimity, or warmer colored ones of damask, chintz, calico and diaper. Huckaback, diaper, and damask cloths and napkins graced the table.

The household furniture of well-to-do families and those of opulence, was made of rich woods. Mahogany was the most costly of all, and of this material were made bedsteads, tables, chests of drawers, bureaus, stands and sofas. The more ordinary furniture was made of pine, cedar, gum, chestnut, walnut and cherry. Their pails, tubs and other vessels were made of red cedar; so also were tables, stands, cupboards, clothes-presses, churns and bureau-bedsteads. Real China-ware was very rare excepting in the houses of the opulent. Delft or "Queen's ware" was much used. Plates, tankards, large platters, tea and coffee-pots were made of pewter polished with a lustre equal to the finest silver. Every thrifty housewife had a three-cornered cupboard in which the pewter articles were displayed. There was then very little glass-ware used, and when vessels were made of it, they were regarded as unusually elegant. The more opulent families had many vessels for the table made of silver. Some of them were richly wrought, and emblazoned with the family arms; and some were very massive, such as salvers, tureens, coffee urns, et cetera. The houses of the wealthy were embellished with vases, clocks and mirrors. Silver tea-spoons were rare among the people of moderate means, and only the wealthy had table-spoons and soup-ladles of silver. Horn, pewter and wooden spoons, as well as wooden dishes, were in common use. Carpets were seldom seen excepting in the mansions of the opulent; but tidiness in appearance and reality was secured by covering the floors with beach-sand and frequent washings.

To Asia we must look for the origin of carpets. The people there sat on the floors instead of chairs, and mattings, such as were manufactured by the North American Indians in the region of the Gulf of Mexico, of cane or bamboo, were used for comfort. At length textile fabrics of flax and wool appeared among the luxuries of the Orient. These were used for floor coverings and for doors and partitions. This kind of fabric, for hangings, is spoken of as among the furnishings of the Hebrew Tabernacle, in the wilderness—"curtains of fine twined linen of blue and purple and scarlet, with cherubims of cunning work." This is the earliest record we have of tapestry—a period full three thousand years ago.

Among the ancient Egyptians, Babylonians and Assyrians, carpets and hangings were common. They were of "divers colors"; and the art was carried to great perfection. No doubt the Israelites learned their cunning
in making tapestries, in looms on the banks of the Nile. The stories in the Arabian Nights are full of descriptions of exploits with magic carpets on which favored persons were transported in an instant from place to place by supernatural power.

In Persia the manufacture of carpets arrived at great perfection many centuries ago, and the looms of that empire, for hundreds of years, supplied the world with its richest and costliest carpets. These exhibited the most pleasing combinations of colors. As the carpet was intended as a substitute for the soft green-sward, so the Persian weavers introduced into their patterns, flowers and leaves, in imitation of the works of nature in a meadow.

Homer mentions carpets in use among the Greeks. No doubt the never-finished web of Penelope—the funeral pall for the aged Laertes—was a needle-work tapestry. From Greece the art was carried to Rome, where the couches at feasts were covered with carpeting made of silk or the finest cashmere wool and camel's hair, richly wrought in patterns with gay colors and silver, gold, and precious stones.

At about the beginning of the seventeenth century, carpet-weaving was introduced into France and England from Persia. Earlier than this, a kind of coarse woolen cloth had been laid upon floors in England, but even the palaces of royalty had nothing better on their floors than loose or woven rushes and straw, before the reign of Queen Elizabeth.

A successful carpet-factory was established in England in 1609, in which King James took so much interest, that he contributed nearly £15,000 toward its establishment. The business was very languid for a century and a half, when, in 1757, the Society of Arts awarded a prize to their Secretary, Mr. Moore, for the best imitation of Turkey carpets. He had employed some Huguenots from France, to manufacture them. Now England produces carpets for all the world.

The manufacture of carpets was not introduced into this country until some time after the Revolution, except the common rag-carpeting. The first regular establishment of the kind appears to have been that of William P. Sprague, in Philadelphia, founded in 1791. In his famous report on the finances, in 1790, Alexander Hamilton, the Secretary of the Treasury, recommended the imposition of a duty of seven per cent. on all imported carpets; but the census of 1810—twenty years afterward—reported only about 10,000 yards of carpets as the entire product of the United States that year. Of this amount, 7,500 yards were made in Philadelphia. In 1870, there were no less than 689 carpet manufactories in the United States, employing 13,000 persons, to whom wages to the amount of $4,700,000 were paid that year. These establishments employed in the aggregate, about $13,000,000 capital, and produced goods that year of the value of $22,000,000.
Down to about thirty-five years ago, all the carpets made in the world were woven by hand. Jacquard, a Frenchman, invented an apparatus, about three-fourths of a century ago, for weaving devices on silk by which the slow, tedious, and unhealthful labor of many persons was performed by a single machine in the same space of time. The use of this invention was extended to the manufacture of carpets, but all the processes of Jacquard's weaving were done by hand, until 1838, when Mr. Erastus B. Bigelow (whose career as an inventor has been briefly noticed in the preceding chapter,) obtained letters-patent for a power-loom for the same purposes, invented by him the previous year. It embodied the main features of the Brussels carpet loom afterwards patented by him. It was used for the weaving of coach-lace, in elegant patterns.

In 1845, Mr. Bigelow applied this invention to the manufacture of Jacquard Brussels carpets, at Lowell, Massachusetts. This was the first automatic power-loom for the purpose, ever invented. He obtained a patent for it in England in the spring of 1846, and soon afterward in our country.

The work performed by this loom was acknowledged, at once, to be superior to any done by hand. The inventor exhibited some of its products at the "World's Fair" in London, in 1851, after the prizes were awarded, but the jury stated in a supplementary report that "The specimens of Brussels carpeting exhibited by Mr. Bigelow, woven by a power-loom, invented and patented by him, are better and more perfectly woven than any hand-loom goods that have come under the notice of the jury. This, however, is a very small part of their merit, or rather that of Mr. Bigelow, who has completely triumphed over the numerous obstacles that presented themselves, and succeeded in substituting steam power for manual labor in the manufacture of five-frame Brussels carpets. Several patents have been taken out by different inventors in this country [Great Britain] for effecting the same object; but as yet none of them have been brought into successful or extensive operation, and the honor of this achievement, one of great practical difficulty as well as of great commercial value, must be awarded to a native of the United States." A full description of this invention may be found in Appleton's Dictionary of Mechanics, Engine Work, and Engineering.

The carpets most largely used in this country are of three classes: (1) Two-ply and Three-ply Ingrain carpets; (2) Tapestry Brussels, and Tapestry Velvet carpets; and (3) Jacquard Brussels and Wilton carpets. The last two mentioned classes have also the generic name of Piled or Terry-fabric. Their faces are substantially alike, consisting of loops of worsted formed over pile or terry wires, as they are called, the loops of the Brussels-faced fabric being left whole, and to form a velvet face, are cut open. Their structures, however, are essentially different. In the tapestry carpet, whether of the Brussels or velvet kind, there is but one set of worsted warps, the figure
being printed thereon before it is woven, the printed figure being elongated in proportion to the length of worsted required to form the loops, so that in the woven cloth, the figure assumes the intended dimensions; whereas in the Jacquard wrought cloth, whether of the Brussels or of the Wilton description, there are five or more sets of worsted warp, each thread of which is dyed in the skein, the various colored threads, during the operation of weaving, being raised in the order requisite to form the figure by Jacquard mechanism. Hence it will be seen that in one case the figures are printed, and that in the other they are wrought into the fabric during the operation of weaving.

The figure of an ingrain carpet is largely formed by the filling, and requires twenty-two shuttles, each carrying a different color of filling to make a complete ingrain carpet loom. In the manufacture of piled or terry fabrics, only one shuttle is required to carry the filling which binds the fabric together. The loom, however, has delicate and complex mechanism to perform its work. Mr. Bigelow is the original inventor of the three kinds of power-looms just mentioned, which have greatly reduced the labor and cost of production of the best carpets. The daily product of the hand-loom, as compared with that of the power-loom at the present day, is as follows:

<table>
<thead>
<tr>
<th>Hand Loom.</th>
<th>Power Loom.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superfine 2-ply ingrain carpets</td>
<td>10 yds.</td>
</tr>
<tr>
<td>Tapestry Brussels carpets</td>
<td>6 yds.</td>
</tr>
<tr>
<td>Jacquard Brussels carpets</td>
<td>5 yds.</td>
</tr>
</tbody>
</table>

Able-bodied men are required to operate the hand-looms; one girl can manage one of the power-looms.

In the preceding chapter it has been mentioned that Mr. Bigelow was the founder of the flourishing town of Clinton, Worcester county, Massachusetts. There has been the grand theatre of his practical achievements as an inventor and manufacturer. There, with his brother Horatio N. Bigelow, he set up the first power-loom factory ever established for weaving coach-lace, Brussels and Wilton carpets, wire cloth, counterpanes and gingham, the latter (already described) combining all the processes required to take the cotton from the bale, and transforming it into finished goods. Mr. Bigelow’s patented inventions (numbering 36 in 1860), are the foundations upon which these various manufactories have been established at Clinton. They have all been constructed (except that for making wire-cloth) under the agency of Mr. Horatio N. Bigelow.

In 1848, Mr. Bigelow and his brother began the manufacture of Brussels and Wilton carpets at Clinton. In 1850, Mr Henry P. Fairbanks became a partner, and in 1854 the Bigelow Carpet Company was formed, with a capital of $200,000.
Bugelow Carpet Company
Weaving Mills.
In the earlier years of their history the Company bought their worsted yarn of other parties, who made worsted spinning a specialty, and confined their business to dyeing and weaving, a division of labor still practiced by some of the largest carpet manufacturers in England. It was found that a constant supply of worsted yarn, of uniform quality, could not be obtained in this country, and in 1858, the Company established a spinning mill to supply its wants. In the several additions to the works which have since been made, the two departments have been enlarged, proportionally, the largest addition having been recently made, and equipped with Mr. Bigelow's latest improved looms.

This establishment is now the largest in the world for the manufacture of Jacquard Brussels and Wilton carpets, in which the several processes of worsted spinning, dyeing, and weaving are united in one concern. One of the accompanying engravings gives a view of the spinning-mills; and the other of the weaving-mills. The buildings for storing, assorting, and washing the wool are situated in the rear of the spinning-mills; and the dye-house and needed out-buildings are hidden by the weaving-mills.

The aggregate floor area of the establishment devoted to the spinning department, is 133,795 square feet. That of the weaving department is 128,403 square feet, making a total of floor area of over six acres.

The machinery in these mills is of the most approved kinds, and is propelled by four Corliss engines, having in the aggregate 900 horse power. The annual consumption of coal for all purposes is 4,000 tons. The capital of the Company, increased from time to time, is now $1,000,000. When in full operation the establishment gives employment to over 1,000 persons, about one-half of whom are feminine operatives; and they manufacture annually 1,200,000 yards of Jacquard Brussels and Wilton carpets.

Axminster carpets (so named from the town of Axminster, in Devonshire, England, where the fabric was first made, woven in one piece like the Turkish carpets) are manufactured at Yonkers, New York, by the Alexander Smith & Sons Carpet Company. These carpets are woven on power-loom, the invention of Alexander Smith and Halcyon Skinner, and patented in 1856. On account of the Civil War, and the total destruction of their establishment by fire, the invention was not put into considerable use before 1867, when the factory was rebuilt and the machinery set to work. There are now about 150 persons employed in the establishment, and the product, when in full operation, is about 200,000 yards of carpeting a year. That amount, it is believed, equals the entire annual production of the same kind of goods in France, and more than equals all that is now made in Great Britain. One of these power-loom, attended by one competent woman, will produce in a day an amount equal to the product of ten English or French hand-loom attended by as many men. The consequence is that the establishment at
Yonkers, on the Hudson (which is the only one of the kind in this country) can successfully compete with all foreign producers.

In many a household a hundred years ago, as a consequence of non-importation agreements, were to be found implements of domestic manufacture—the wool and flax-wheels; the reel; the quill-wheel and the loom. Stoves were not in general use then; and wood and peat were then the only kinds of fuel used. Thirty years before the Revolution, Benjamin Franklin invented an iron portable fireplace, for the saving of fuel and better warming of rooms, known as the "Franklin stove." These were quite extensively used in 1776, and they continued to be popular in the rural regions until a generation ago. The immense fireplaces used at that time consumed prodigious quantities of fuel, especially those of the kitchen. In these were large iron cranes with hooks on which to hang pots and kettles over the fire. The fowling-piece with its powder-horn and shot-bag, was always seen, in the country, over the great kitchen fireplace or the almost equally large one in the family sitting-room.

The great productiveness of the soil and the general industry of the inhabitants who tilled it, made food very abundant. The poorest laboring man was able to cover his table with better and a greater variety of food, than that which furnished a banquet for an English nobleman in the reign of Queen Elizabeth. Beef, pork, mutton, fowls of all kinds, wild and domestic, venison, fish, oysters, clams; flour made of wheat, rye, buckwheat and Indian corn, potatoes, and many sorts of vegetables and fruits, were very abundant throughout the settlements.

The common beverages, besides pure water, were tea, coffee, chocolate, cider and metheglin; and rum, cordials and other strong drinks were easily procured. At the houses of the wealthy or the thrifty, especially in large towns, guests were entertained sumptuously. John Adams, who was in Philadelphia, a delegate to the First Continental Congress, in 1774, wrote in his diary on the 7th of September: "Dined with Miers Fisher, a young Quaker and a lawyer. We saw his library, which is clever. But this plain Friend and his plain though pretty wife, with her thees and thous, had provided us the most costly entertainment; ducks, hams, chickens, beef, pig, tarts, creams, custards, jellies, fools [a compound of gooseberries scalded and crushed with cream], trifles [made of alternate layers of cake and sweetmeats, with syllabub], floating islands, beer, porter, punch, wine, and a long etc."

On the 22d Mr. Adams dined at Chief Justice Chew's, at Germantown. "We were shown into a grand entry and staircase," he wrote, "and into an elegant and most magnificent chamber, until dinner. About four o'clock we were called down to dinner. The furniture was all rich. Turtle and every other thing, flummery [a sort of jelly made of flour or meal], sweetmeats of
twenty sorts, jellies, trifles, whipt-syllabubs, floating islands, etc., and then a
dessert of fruit, raisins, almonds, pears, peaches. I drank Madeira at a great
rate, and found no inconvenience in it." Mr. Adams seemed to enjoy these
banquets, though he called them "sinful feasts."

In the custom at funerals, there has been a considerable change. In
"the olden time," refreshments were provided for the attendants in rural
districts, when persons came, sometimes, great distances over rough roads.
This was a custom that prevailed especially in Dutch communities. A
table was set in the principal room in cold weather, and under the trees in
warm weather, upon which were set food and mulled wine. After the
repast, pipes and tobacco were furnished, and smoking was indulged in until
the funeral services were begun.

Men and women rode much on horseback in those days; and side-
saddles and riding-habits were owned by almost every thrifty family.
Besides the heavy farm wagons and sleds, they had four-wheeled chaises,
and two-wheeled riding-chairs and gigs, the bodies of which rested on
wooden springs or stout leather straps. Inventories of "losses by the
enemy" during the Revolution that were presented to the government on
making claims for remuneration, give fair indications of the ordinary posses-
sions of the people. From a book of these inventories recorded in New
Jersey, Mr. C. A. Deshler made a selection for Harper's Magazine, and
gave some specimens of very odd collections found in the inventories. For example:

"Two white shirts and a pepper mill"; "fifteen pounds of butter and
pot, and six shifts"; "twenty-four pounds of cheese and one pair of
gloves"; "one large bag, and one good tea-kettle"; "one pair of striped
trousers and one pewter tea-pot"; "6 pounds of Tobacco and 6 pounds
of sassages"; "1 stout Negro man 30 years of age £100, 1 large Looking-
glass 3 by 2 feet, broke."

The "libraries" mentioned as having been carried off, were generally
small affairs. They almost invariably included a Bible and Psalm Book,
and sometimes nothing more. The most extensive of those enumerated
was one containing "The whole volumes of the Spectator; Barker on the
New Testament," and "1 case of books worth £60."

The amusements of the Americans a hundred years ago, were compara-
tively few. Public amusements were almost unknown, excepting an occa-
sional theatrical performance in the larger cities, exhibited by a single
dramatic company led by Mr. Hallam, who gave their first performance in
America at Williamsburg, in Virginia, in 1752. There was a "play-house"
in New York as early as 1733, but no account exists of any performances in
it; but in 1750, or two years before the arrival of Hallam, a company under
the joint management of Thomas Kean and Mr. Murray, went to New York
from Philadelphia, where they performed in a building hired for the purpose, in Nassau street.

Between 1752 and the breaking out of the war of the Revolution, plays were exhibited at Annapolis, Philadelphia, and New York. In 1774, the Continental Congress agreed by resolution, to discontinue "gaming, cock-fighting, exhibitions of shows, plays, and other expensive diversions and entertainments." During the war that ensued, the British officers had amateur theatrical performances in cities held in winter by the enemy, to which the public were invited, and Tory sympathizers flocked. After the war, the theatre became a prominent source of amusement for the Americans.

Hunting was much engaged in, as a sport, especially in Virginia. The "gentry" there kept fine packs of deer and fox-hounds. Washington had a superb kennel before the Revolution. The dogs all bore names. Among these were Vulcan, Ringwood, Singer, True-love, Music, Sweet-lips, Forrester, Rockwood, etc. He was frequently engaged in hunting-parties, which always ended in a dinner at Mount Vernon, Belvoir (the seat of the Fairfaxes), or elsewhere, where the guests usually spent the night with the host. Entries similar to the following may be found in Washington’s Diaries, sometimes two or three times in a week:

"Went a hunting with Jacky Custis, and caught a fox after three hours' chase. Found it in the creek"; or "Mr. Bryan Fairfax, Mr. Grayson, and Phil. Alexander came home by sunrise. Hunted and caught a fox with these, Lord Fairfax, his brother and Colonel Fairfax—all of whom, with Mr. Fairfax and Mr. Wilson of England, dined here." Afterward, two days in succession: "Hunted again with the same company."

Before the Revolution, Mount Vernon was a gay place, where princely hospitality was dispensed. Washington had company at dinner almost every day. In his diary in 1768, he wrote: "Would any one believe that with a hundred and one cows actually reported at the late enumeration of the cattle, I should still be obliged to buy butter for my family?"

Music, dancing assemblies, cards and sometimes chess, were the leading in-door amusements of the more refined, while horse-racing, cock-fighting and bear-baiting were among the coarser attractions for the people. In the rural regions in the autumn, corn-huskings, apple-cuts, quilting-parties and prinktums, and more social gatherings in which "kissing-plays" were indulged in, at evening, furnished much pleasure for the young people of both sexes. In the winter, skating, sleighing-parties and balls in the Northern and Eastern States were among the more exciting sports. Afterwards musical concerts, oratorios and operas succeeded each other as entertainments—as refined pleasures—and so continue to be. The theatre, less objectionable in its character and accessories than formerly, maintains its claim to popular regard, and might become one of the highest and best kind
of amusements; and card-parties prevail in the fashionable world. Base-ball playing (learned from the North American Indians), cricket, rowing, target-shooting, horse-trotting, yachting, rifle-shooting, skating, hunting and fishing, compose the principal out-of-door sports of the American people.

Just now rifle-shooting and rowing-matches occupy more of the public attention than any other species of open-air sport. The students of American colleges have, for a few years past, paid much attention to rowing as a healthful physical exercise. They have contested in rowing matches called regattas, when thousands of citizens would gather to see the sport. The first of these college boat-races, in this country, was rowed on the 3d of August, 1852, at Centre Harbor, New Hampshire, on Lake Winnepiseoge. The race was two miles straight to windward in eight-oared barges, by the students of Harvard University and Yale College, one Harvard barge beating the Yale barges. Crews from the same colleges rowed another race in July, 1855, on the Connecticut River, at Springfield, Massachusetts. Again there was a contest of strength and skill between the students of these institutions, on Lake Quinsigamund, at Worcester, Massachusetts, in July, 1859, when a crew from Brown University joined in the contest. In May, 1858, oarsmen of Harvard, Yale, Brown and Trinity Colleges, had met in convention at New Haven, Connecticut, and formed the "College Regatta Association." After the eleventh regatta in 1870, the National Association of American Colleges, for rowing, was organized, and the first contest of this Society occurred on the Connecticut River at Ingleside, in Massachusetts, in July, 1871. In 1874 Saratoga lake was chosen for the race-course. The fifth and last contest of the Association, before our record closes, was on the same sheet of water, on the 14th of July, 1875, when the victory was won by the crew of Cornell University. The question whether this sport is as healthful for body, mind and morals, as some others, is yet an open one.

Many of the sports and some of the social customs which the Puritans condemned as sinful, or at least "inconvenient," and forbade indulgence in them, such as drinking of healths in public or private, wearing funeral badges, celebrating the Church festivals of Christmas and Easter, attending theatrical shows, et cetera, were freely indulged in by the Americans in 1776, and have been ever since. Sumptuary laws had then gone out of existence; and those which regulated apparel; forbade "women to cut their hair like men;" forbade any other gait on Sunday than "walking reverently to and from church" by man and beast; or compelled the people in towns (as in Hartford) to "rise in the morning when the watchman rang his bell," were then laughed at as ridiculous, and ever since fashion has reigned supreme.

At the present time—the close of the first century of the Republic—the sway of fashion is an oppressive tyranny. Extravagance in dress has become more marked since the Civil War than at any time in the history of
our country. It is not so much extravagance in taste as extravagance in cost. A fashionable woman now expects four or five new bonnets each year, costing $25 to $50 each; and some, on which rich and rare laces are used, may cost $200. Forty to one hundred and fifty dollars are now charged, sometimes, for the making and trimming of a single dress, in addition to the cost of the body material. A writer at Saratoga, in the early autumn of 1875, tells us of one woman there who brought with her "fifty elegant and costly dresses," and of another who, during the full season, was "never seen twice with the same dress." The writer adds: "O ye gods! is all this outward show all there is of womankind; or is this temple of dry-goods a fit one in which man should worship?"

Only by the use of the wonderful Sewing Machine (to be noticed hereafter), that does the work of scores of nimble fingers in the same time, could the needle-work on the dresses of women now, even the plainest that are in fashion, be performed. That machine is one of the grandest triumphs of the inventive genius of the Americans.
CHAPTER V.

In 1767 John Dickenson, of Pennsylvania, wrote: "We are all tillers of the earth from Nova Scotia to West Florida." This was almost literally true when the old war for independence began. Agriculture was then the chief pursuit of the American people. It was imposed upon the greater portion of the inhabitants, first, by the necessity of producing food for man and beast, and afterward because commerce and manufactures were restrained by unjust and oppressive laws. But now, so diversified have our industries become under the influence of freedom from restraint, that not more than one-seventh of our population are engaged in agriculture, machinery largely taking the place of human muscle.

For a long time agriculture in this country consisted largely of a series of experiments. Everything in America was new to Europeans; and as the English settlements took root along the Atlantic seaboard, from the more rigorous climate of Nova Scotia to the softer one of Florida, in the winter, the tillers of the land had to learn, by experience, what crops were best adapted to the various soils and climates. The experiments had ceased a hundred years ago, for the question had been settled by actual demonstration. Since 1776 not a change has been made in the geographical or climatic position of the domestic animals of our country; nor has there been a single new cereal or plant, profitable for food for man and beast, introduced into the United States, excepting sorghum, a native of India.

Agriculture is the primary source of wealth, for it increases the means for the subsistence of men and beasts, rendering their existence less precarious than when all food was of spontaneous growth. Daniel Webster wrote: "Agriculture feeds; to a great extent it clothes us; without it we should not have manufactures; we should not have commerce. They all stand together like pillars in a cluster, the largest in the centre, and that largest Agriculture."

Agriculture is both an art and a science. The most skillful and scientific cultivator of the soil is the best husbandman, for he is the most prolific and excellent of producers. In 1776 agriculture was almost wholly an art only. The teachings of chemistry within a hundred years have elevated it to a science. To that teaching mechanical inventions have been added which
have vastly increased the production and lessened the labor of men and beasts.

Farmers do not now, as then, work in ignorance of the general principles of vegetable production, doing so and so because their fathers did, without being able to give a reason for their faith that a harvest will surely follow a seed-time. The majority of the tillers of the soil then did not have intercourse with distant neighbors, seldom going beyond the boundaries of their respective townships. That social attrition which gives expansion to the mind and awakens new ideas, was very little known, and, too frequently, that little was confined to the teachings of the demoralizing school at the country taverns, where the conversation was often low in its tendency, and the influence degrading rather than elevating.

Town-meetings and election days seldom failed to bring together the people living considerable distances apart, and these, with the gatherings at the meeting-houses on the Sabbath, afforded the chief social intercourse between great masses of the rural population. Their social and intellectual culture were of the same narrow pattern. Their diet was homely but abundant. Salted meat was the staple, yet they occasionally indulged in fresh beef, mutton, and poultry of their own raising. Their clothing and that of their families very seldom consisted of "store-goods." They were from home-raised materials and were home spun and woven. From the crackling and swingling of the flax and the shearing of the sheep, to the completion of garments for use, required the lapse of several months, for everything was done "by hand," no machinery being used but the simple flax and wool-wheel and the ponderous loom. Weddings were consequently delayed full two years after the wooing and betrothal to allow the expectant bride to prepare ample garments for herself, and sheets, flannels, and quilts for good housekeeping.

It is a singular fact, which we cannot fully understand, that improvements in farming then, were generally opposed by a blind public opinion. Great ignorance, the mother of prejudice and bigotry, then generally prevailed in the rural districts. The schools were few and scattered, and newspapers and books were almost never seen, excepting, perhaps, the Bible, in most of farmers' families. Trained in the narrow routine of farm-life as it then existed, the lad had very little opportunity for any other than muscular development; and when one, with irrepressible energy and genius, attempted to make improvements in the methods of cultivation, or the construction of farm implements, he was ridiculed by all his neighbors, as a foolish dreamer. If one did not plant "in the old of the moon," like his neighbors; if he did not plow, sow, and reap at the same time of the year and month, and with the same implements that his grandfather used; if he ventured to wear other than the same kind of dress worn by his father; if
he would clear his barn-yards of manure, and put it on his fields, and kept his cattle warm in winter under comfortable sheds or in warm stalls, he was regarded with dislike, as an innovator—a "stuck up" man who thought he knew more than his neighbors.

The strangest views sometimes took possession of ignorant minds. It was a prevailing opinion in some parts of the country, that housing and milking of cows in the winter would kill them. In some places farmers would not remove stones from their land, because they supposed they would assist in keeping the soil warm; and the prognostications concerning the weather, made at random by the almanac-maker, were implicitly relied upon by many. Under these adverse circumstances, the labors of the agriculturists of our country were manifold less productive than now, and that great interest—the foundation of national and individual wealth—was intrusted chiefly to ignorant men, after the type of Dryden's farmer, who

—"trudged along, unknowing what he sought,
And whistled as he went, for want of thought."

In 1785, Washington wrote to Arthur Young, an eminent British writer on agriculture, saying: "The system of agriculture, if it deserves the epithet of system, which is in use in this part of the United States, is as unproductive to the practitioners, as it is ruinous to the land-owners. Yet it is pertinaciously adhered to. To forsake it; to pursue a course of husbandry, which is altogether different, and new to the gazing multitude, ever averse to novelty in matters of this sort, and much attached to the customs of their forefathers, requires resolution, and, without a good practical guide, may be dangerous."

In many of the States, a century ago, particularly in those south of Pennsylvania, a greater portion of the manual labor, especially in agriculture, was performed by slaves of African descent, many of them not much more intelligent than the mules with which they were associated in the field. Some of them had been brought directly from Africa (for the slave-trade was then in active operation), and were mere machines in the hands of their masters and overseers.

The Africans had been introduced into America by the Spaniards and Portuguese, and into the English American colonies by a Dutch trader, who sold a few negroes of both sexes to Virginia planters on the borders of the James river, in 1619. Soon after that an English Attorney-general gave it as his official opinion that negroes, being pagans, might justly be held in slavery, even in England. This was substantially the opinion of the British courts until, in 1772, Chief-Justice Mansfield decided that, by the laws of England, no man could be held in slavery in the British realm. An English poet, reëchoing this sentiment, wrote:
"Slaves cannot breathe in England, that moment they are free
They touch our country, and their shackles fall."

All the English-American colonies cherished the slave-labor system, when the war for independence broke out, but when the great Declaration asserted that "all men," without distinction of color or race, were possessed of the "inalienable right" to personal freedom, many of the leaders of that movement found it difficult to harmonize that system with their own demands for justice. Henry Laurens, of South Carolina, saw clearly the inconsistency, and wrote to his son in August, 1776: "I am not one of those who dare trust in Providence for defence and security of their own liberty, while they enslave, and wish to continue in slavery, thousands who are as well entitled to freedom as themselves." But the people of his State, and of several others, then engaged in the profitable business of slave-trading, cherished the slave-labor system; and the New Englanders, who sent vessels to the African coast, and were considerable carriers of slaves to others, were not averse to continuing it. And it was continued under the Confederacy that followed the great war-league of the Colonies, and also under the National government formed in 1789.

Efforts were made, from time to time, to get rid of the slave-labor system, for the double reason that it was not economical and was a moral wrong. Public sentiment was against it. Wise men saw that a free man was worth twice as much to a country as a man in bondage; and so early as in 1775, an anti-slavery society was formed in Pennsylvania, with Dr. Franklin as its President, and Dr. Benjamin Rush as Secretary. It labored hard to secure the object of its organization, and had the warm approval of Washington, Jefferson, Madison, Jay, Hamilton, and other founders of our Republic. And after the organization of our National government under the Constitution, that Society, with Franklin still at its head, asked, in a memorial to Congress (1790), that body to "devise means for removing the inconsistency of slavery from the American people," for it was generally regarded as a great evil.

In 1785 the New York Manumission Society was formed, with John Jay as President. Hamilton was his successor. Similar associations were formed in Rhode Island, Connecticut, Delaware, Maryland and Virginia, and their efforts were crowned by the abolition of slavery in several of the Northern States. It was practically abolished by the State constitution adopted by Massachusetts, in 1780. Others provided for its gradual extinction; and yet the institution lingered almost until our time, in States north of and including Pennsylvania. It was not finally abolished in New York until 1827; and so late as 1823, a negro woman was sold in Fayette county, Pennsylvania, to satisfy a money claim on her owner. There were still living, in New Jersey, in 1850, over two hundred of the former slaves in that State who, in 1790,
numbered more than eleven thousand. New York had twenty thousand at the close of the last century.

At about the time when the National Constitution was formed, the slave-system was so unprofitable in all parts of the Union excepting in the extreme Southern States, where the cultivation of the cotton-plant had just begun, as a source of profit, that the people, generally, were willing it should cease to exist. When, in 1787, an ordinance was adopted by the unanimous vote of the Congress, for the government of a large territory northward of the Ohio river, formed of lands ceded by different States to the United States, there was in it the following clause:

"There shall be neither Slavery, nor involuntary servitude in the said Territory, otherwise than in punishment of crime, whereof the parties shall be duly convicted."

And in the convention that framed the National constitution, the same year, the subject assumed great importance. The majority of the delegates were in favor of not recognizing the institution, in that instrument, and would have prohibited American citizens from engaging in the slave-trade, from the moment of its adoption, but the delegates from South Carolina and Georgia threatened to secede from the Union if such action should be taken. They said, "No slave-trade, no Union." A compromise was effected by giving the Congress permission to interdict the slave-trade at the end of twenty years after the adoption of the constitution.

Our National Government had just started on its grand career, with a prospect of having all its citizens soon free indeed, when the cultivation of a fibre-producing plant and the invention of a machine for preparing it for market by a New Englander, made the slave-labor system so suddenly profitable that it became not only a fixed but a powerfully controlling institution in our country. The plant became King, and for many years sat upon a throne built by a Yankee pedagogue, to whose class Halleck alluded when he wrote of the apostates of Connecticut:

"Or wandering through the southern countries teaching
   The A B C from Webster's spelling-book,
   Gallant and godly, making love and preaching,
   And gaining by what they call 'hook and crook,'
   And what the moralist calls overreaching,
   A decent living. The Virginians look
   Upon them with as favorable eyes
   As Gabriel on the devil in paradise,
   But these are but the outcasts," etc.

The agricultural product alluded to is the Cotton Plant. It was found in South Carolina by Europeans, in the seventeenth century; and early in the last century it was cultivated in gardens from Georgia to Cape May, in
New Jersey. It continued to be a garden plant, chiefly, until about the beginning of the war for independence, at which time thirty acres of green-seed cotton were under cultivation near Savannah.

From 1748 until that time, only about ten bales of cotton or a little more than 4,000 pounds had found their way to England as an article of commerce from America. So little was American cotton known in Europe, that eight bales, shipped to Liverpool in 1784, were seized by the government authorities under then existing navigation laws, on the ground that so much cotton could not be produced in the United States. At about that time some seeds were brought from the Bahama islands, where the cotton culture was successful, and were planted on some of the islands clustered along the coasts of South Carolina and Georgia. Great care was taken in the cultivation; and in time the fine wool known as Sea Island cotton was naturalized there, and brought to the perfection of texture and lustre, and fineness and length of fibre, that made it so much sought after by the manufacturers of the finest cotton fabrics.

At that time the inventions of John Hargreaves, and of Richard Arkwright, a barber of Bolton, England, had so increased the consumption of cotton in that country, that the demand was greater than the supply, and high prices prevailed. The Americans were satisfied that their Southern lands were well adapted to the growth of the prolific shrub, but on account of difficulties in preparing the wool for market, it could not be abundantly or very profitably cultivated by them.

The common variety of cotton then (as now) cultivated in the interior, was the native Mexican, of which the Aztecs made fabrics at the time of the invasion, by Cortez. To the seeds of this variety, the wool adhered so firmly, that it could not be separated by a machine used in the Bahamas, known as the Roller-gin. The separation had to be done by hand; and so slow and tedious was the process, that the cultivation of the plant was very limited. The labor was performed chiefly by feminine slaves; and the separation of one pound of clear staple cotton from the seeds, was considered a good day's work for one person. So limited was the cultivation even under the stimulus of ready cash sales at high prices, that the entire export of cotton from the United States in 1791, was only about 2,000,000 pounds.

The following year a young man named Eli Whitney, a native of Massachusetts, and educated at Yale College, accepted an invitation to become the teacher of the children of a planter in Georgia. Before his arrival there the planter had hired another tutor. Young Whitney was a stranger in a strange land, when the widow of General Nathaniel Greene, living on a plantation near Savannah, became his friend and benefactor. He displayed remarkable inventive genius, which Mrs. Greene observed and appreciated. One day, several gentlemen at her table expressed a regret that there was
no machine wherewith to separate the wool of their cotton from the seed. “Apply to my young friend here,” Mrs. Greene said; “he can make any thing.”

Whitney had then never seen a cotton seed; but his mind began to plan. He was furnished with some seed with the wool adhering. With the rude tools of the plantation he made a machine. Into it he placed some uncleaned cotton procured in Savannah, and it performed the desired work. This was the original of the famous Saw-gin, which, with some improvements to perfect its workings, is still used. It was constructed as follows: On a cylinder were placed horizontal rows of bent wire like those of a common wool hand-card. The cotton was separated from this cylinder, by a frame of parallel wires at right angles with the rows of wire teeth. As the cylinder revolved, the teeth extending through the wire frame caught the cotton and drew it through the grating, while the seeds, being too large to pass through, were separated from the wool, and fell to the ground. It was soon found that the bent wire teeth were too weak to pull the cotton from the seed without being bent or broken, and a series of circular saws were substituted for them, having large and strong teeth shaped like the beak of a hawk. Behind or under the cylinder and the saws was an apparatus with brushes to remove the cotton from the teeth. There was also a revolving fan for producing a current of air that throws the cleaned wool to a convenient distance from the saws and brushes. With this machine, one man could do the work of a thousand pairs of women’s hands, and the labor of months was performed in a day.

Some of Mrs. Greene’s neighbors were called in to see the working of the machine. They were astonished and delighted, for the desire of their hearts—the key to wealth—was before them. Phinehas Miller, a college-mate of Whitney, had come to Georgia, and soon became the second husband of Mrs. Greene. Having some money, he formed a copartnership with Whitney for the manufacture of gins, and the machine was locked from public view until a patent should be secured. That was done in the spring of 1793. Planters came from all parts of South Carolina and Georgia to see the workings of the wondrous machine. Weak human nature was sorely tempted. Cupidity overbore honor. Some men broke into the workshop of Whitney and Miller and carried off the model, and by the aid of common mechanics they constructed imperfect machines, which injured the fibre and defamed the character of the gin for a while.

The inventor and his partner prosecuted the violators of the patent-right, but packed juries gave such sweeping verdicts against them that they despaired of receiving justice. Even State legislatures broke their bargains with them; and when, in 1812, Whitney asked Congress for an extension of his patent, the members from the cotton-growing States, whose constituents
had been wonderfully enriched by the cotton-gin, made such vehement opposition that the prayer of the petitioner was denied. Thenceforth those who had wronged the inventor in defiance of law and justice were permitted to wrong him under the protection of law.

The value of Whitney's invention to the nation may be estimated by the fact that in the year when he went to Georgia, the whole cotton crop of the United States amounted to about 2,000,000 pounds, of which amount 190,000 pounds were exported. In 1795, or two years after Whitney's invention was patented, the product was over 6,000,000 pounds. Six years later the crop was 48,000,000 pounds, and the exports 20,000,000 pounds. In the year when Congress denied the prayer for a renewal of his patent, the crop was 100,000,000 pounds.

Grateful England rewarded Arkwright for his invention (spinning machine) which provided one man with means to do the work of one hundred and thirty men, with the honors of knighthood, and enabled him to leave to his heirs a fortune of $2,500,000. Ungrateful America robbed Whitney of his invention whereby one person might do the work of a thousand men, and which added hundreds of millions of dollars to the wealth of the Southern States, and prevented his leaving to his heirs more than the priceless value of a name associated with those of the greatest benefactors of the human race.

The immediate influence of Whitney's invention, upon the dying institution of slavery, was most remarkable. The increased production of cotton caused an enormous demand for labor in the preparation of the soil for the crop, the gathering of the harvest, and the preparation of it for market. Its effects upon the industrial pursuits of nearly half the nation, and on the moral, intellectual, social and political conditions of that portion of the people engaged in cotton-raising, were equally marvellous.

In the cotton-growing regions bordering on the Gulf of Mexico and extending back to the vanishing spurs of the Appalachian mountains, raising cotton speedily became almost the sole business of the people. It finally absorbed nearly the entire capital and labor in a greater portion of ten States of the Republic. The planter raised corn and bacon sufficient only to supply his own table and that of his rapidly increasing family of slaves. With this exception, nearly all the labor and capital were given to cotton. The planter's yearly profits were used in the purchase of more lands and negroes; and whatever might be the profession or pursuit of an immigrant from a more northern State, he finally became a cotton planter when, by industry or marriage, he had acquired sufficient capital in land and labor. The increase of population, labor and capital, and the profits of every kind of business, were devoted to the cultivation of cotton, because it gave the most generous returns.
A natural consequence of this state of things was a vast increase in the demand for and value of slaves, in the cotton-growing districts of the Republic. The closing of the foreign slave-trade in 1808, in accordance with the spirit of the constitutional provision for such an act, cut off that source of supply, and made the inter-state slave-trade very brisk and profitable. The traffic increased rapidly; and Virginia, a tobacco-growing State, became, in time, so extensively engaged in the business of slave-breeding, that for several years before the late Civil War, the income of its great landholders from that trade alone, was from $12,000,000 to $20,000,000 annually. Many farms in Virginia, worn-out by unwise cultivation, were abandoned, and the owners and their numerous slaves went to the cotton-growing States, and there engaged in raising that shrub.

Slavery and the Cotton plant grew together in bulk, value and importance; and when the late Civil War broke out, at the beginning of 1861, the number of slaves within the domain of the republic, was more than 4,000,000, having an estimated money value of $1,000,000,000. The product of the Cotton plant at that time (1859-60) in a surface of little less than 11,000 square miles, was over 5,300,000 bales, or almost 1,220,000,000 pounds that year—the largest crop ever raised in the United States. The value of the cotton crop in 1791-2 was about $30,000; in 1859-60, it was over $220,000,000.

It has been admitted for many years, that the United States exceed all other countries in the production of cotton, both as to quantity and quality; and for years the looms of Europe and of our Northern and Eastern States have been chiefly dependent upon our cotton-growing region for their regular and never-failing supply of raw material. Of the 2,300,000,000 pounds of cotton produced from the whole earth, employing a fixed capital of $600,000,000, and paying annually $160,000,000 in wages to 1,200,000 operatives directly, more than one-half is cultivated in the United States.

Because of these facts, the impression had taken deep root in this country, that cotton was monarch of the world's commerce, and the cotton producers, when they resolved to break up the Union, and establish an empire whose corner-stone should be slavery, boldly and with some reason proclaimed, "Cotton is King!" and confidently relied upon that monarch for success. Twenty-five or thirty years ago, one of the most popular of our Northern poets wrote:

"Old Cotton will pleasantly reign,
When other Kings painfully fall,
And ever and ever remain
The mightiest monarch of all."

And a member of the United States Senate, in his place in the hall of
legislation, at the middle of December, 1860, said when that civil war was kindling: "I say that Cotton is King, and that he waves his sceptre, not only over these thirty-three States, but over the island of Great Britain and over Continental Europe; and that there is no crowned head upon that island, or upon the Continent, that does not bend the knee in fealty, and acknowledge allegiance to that monarch. There are five millions of people in Great Britain who live upon cotton. You may make a short crop of grain, and it will never affect them; but you may cram their granaries to bursting; you may cram them to bursting until the corn actually is lifting the shingles from the roofs of their barns, and exhaust the supply of cotton for one week, and all England is starving."

The senator, after alluding to the absolute security of the slave system because of the overshadowing power of King Cotton, and looking to the passage of an ordinance of secession by South Carolina, which it had been understood should take place seven days later, he gave the following outline of her intended policy—the policy which all other States of the same mind expected to pursue: "Before this day next week, I hazard the assertion that South Carolina, in convention assembled, will have revoked the ratification of the treaty which makes her one of these United States. Having revoked that ratification, she will adopt an amendment to her constitution, by which she will have vested in the government of South Carolina all those powers which she, conjointly with the other States, had previously exercised through the foreign department; and in the government of South Carolina will be vested the right to declare war, to conclude peace, to make treaties, to enter into alliances, and to do all other matters and things which sovereign States may of right do. When that is done, a minister plenipotentiary and envoy extraordinary will be sent to present his credentials, and when they are denied, or refused to be recognized by this Government, I say to you, that the sovereignty of her soil will be asserted, and it will be maintained at the point of the bayonet."

All this assumption was based upon the supposed puissance of Cotton as the absolute monarch of commerce. Eli Whitney built his throne upon an apparently immovable foundation, and the slave-labor system appeared to be an essential element of the monarch’s power. That is now an exploded fallacy.

We have seen how early some of the founders of our Republic labored for the abolition of Slavery from their country. Their speedy success seemed certain, when the Cotton plant came forward to oppose them. The people of the South became reconciled to slavery, and cherished the institution. The people of the North, regarding it as morally wrong, and discreditable to a nation proud of its free institutions, were opposed to it. Out of this feeling grew the warm debates in the Congress preceding the adoption of the Missouri Compromise, already mentioned. This agitation
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was followed by a period of profound repose in regard to that subject. It was revived when, in 1831, William Lloyd Garrison began the publication of "The Liberator," in Boston, and vehemently advocated the immediate emancipation of the slaves as the duty of every master and the right of every bondman; and denounced slave-holding as a "Sin against God and a crime against humanity."

Upon that principle Arnold Buffum, a Quaker, and eleven others, in Boston, formed an Anti-slavery Society in 1832. This was followed in 1833, by the formation of the American Anti-Slavery Society, in Philadelphia, by Arthur Tappan and others. That Society claimed that Congress had no power to abolish slavery in States where it existed, at the same time they declared that laws admitting the right of slavery, to be "before God utterly null and void." By lectures, tracts and newspapers these doctrines were promulgated all over the land, and produced intense excitement. The friends and opponents of slavery threatened the dissolution of the Union. Churches were dismembered and political parties were formed with the great question of slavery as the central point of action. In 1840 the "Liberty party" was organized; and in 1848, it was absorbed by the "Free-Soil party." This, in time, was absorbed by the "Republican party" which still exists, and which carried on the war against the institution of slavery, until it was utterly exterminated.

In 1850 a law compelling the people of the free-labor States to return fugitive slaves to their masters, "fired the Northern heart." Opposition to this law by State legislatures and individuals, "fired the Southern heart." Violent and virulent contests ensued. It was determined, by one party, to make slavery a national institution. It was as strongly determined by the other party to restrict it to its then boundaries, and keep it out of the Territories.

That labor system was rapidly exhausting the soil of the older States. It must be allowed to expand into more territory, or it would die of suffocation. Its friends saw no other way for such expansion than by a political revolution which would sever the slave-labor States from the rest, and, by the establishment of an independent government, allow that expansion indefinitely. They kindled a civil war to accomplish that end. In the intense heat of that war, the institution of slavery was utterly consumed. But the cotton culture upon which the foundations of the institution were broadly laid, and in the production of which staple slave-labor seemed to be essential, has, since the war, assumed its vast proportions in our agricultural and commercial statistics, that it held at the beginning of the fearful conflict.

The cotton product in 1870–71 was nearly 4,400,000 bales. The increase in the home consumption had been rapid, and is still going on. In 1830, the amount of cotton consumed by the mills in the United States, was 126,512
bales, or 44,000,000 pounds; in 1870, the amount was nearly 400,000,000 pounds.

We perceive by the foregoing narration, how a hoary institution, intimately connected with the agriculture of our country, and thoroughly incorporated with the social life of the nation, suddenly rose into a controlling power in the land within the last one hundred years, and more suddenly disappeared forever—a social and political phenomenon of startling significance. We have seen, too, how an agricultural industry, increasing in importance with the increase of power of that social institution, was begun and has flourished within that century, until it assumed, with a degree of propriety, the title of a monarch, and has not only withstood the shock that killed its coadjutor, but is to-day, a prince powerful as ever in sustaining our commercial prosperity.
CHAPTER VI.

We have observed that mechanical inventions have greatly increased the productiveness of our soil and lessened the labor of the tiller. Improvements in agricultural implements during the century just closed have been many, some of them wonderful, and all of them beneficent. As manual labor became dear because it was inadequate to meet the increasing demands, improvements in implements were called for, and “necessity, the mother of invention,” led men to ponder and to invent substitutes for human muscle.

The few rude and imperfect tools used on a farm a hundred years ago, were generally the product of the plantation, or of a neighboring blacksmith, and were often the result of one man's work. Division of labor was thus almost wholly unknown in this country. A millwright made the whole of the machinery, and very often the building in which it was to be used. Now machinery has largely taken the place of human fingers, and works like fairy hands. Had sewing machines been made then, one man would have done the whole work, and they would have been rude and scarce; now almost a hundred costly and various machines, and as many men, are employed in making one sewing machine; but millions of them exist in our land, and Hood's "Song of the Shirt" is scarcely intelligible to our young people.

The rough and imperfect farm-implements, then, required far more labor of man and beast to use them, than those employed for the same duty now. It is estimated that improvements in plows alone, within the past fifty years, save to our country annually, in work and teams, more than $12,000,000. The improvements made in other agricultural implements within the same period, (and they have been chiefly the product of American inventors), have enabled the farmers of the United States to accomplish at least double the amount of labor with the same number of teams and men.

The tools in use on a farm a century ago, consisted of the axe, plow, harrow, spade, hoe, shovel, hand-rake, scythe, sickle, wooden pitch-fork, flail, willow fan for winnowing grain, and a crackle for breaking flax. All of these being rude in construction, were costly in labor. Now the farmer has cutting-machines in various forms for many uses; and hoes, rakes, cultivators, seed-sowers, mowing and reaping machines, threshers and pressing-
machines, all worked by horses, and winnowing mills that perform the labor of a dozen fans in the same time.

The axe, that has come down to us from pre-historic ages, and been the theme of poetry, is the pioneer of Agriculture (especially in a country like ours, over large portions of which vast forests yet brood), felling the trees for the introduction of the plow; and it is, in various shapes, the fast friend and useful help-mate of the farmer and every worker in wood. It is the prototype of a great number of edge-tools of the same family, in the manufacture and quality of which, very important improvements have been made in this country. The business of edge-tool making, which did not exist in our land as a separate industry until forty or fifty years ago, is now very extensive, and the American axe, in various forms—the broad-axe, adze, hatchet, machete, cleaver, chisel, et cetera—have an almost world-wide fame, being extensively used in Europe, South America, and the British colonies.

Probably the first American establishment for the exclusive manufacture of edge-tools was founded by Samuel W. Collins, at Collinsville, on the Farmington river, in Connecticut, which is now one of the largest manufactories of the kind in the world. It was begun about fifty years ago, on a small scale, the product of a day's labor in the establishment being the forging and tempering of eight broad-axes. Now there are one hundred edge-tool manufactories in the United States, employing about four thousand persons who receive in wages full $2,000,000 a year. A capital of about $5,000,000 is invested in this industry, and the annual product is valued at full $6,000,000.

Earlier than Collins, Oliver Hunt, a blacksmith, at what is now East Douglass, a pleasant village on Mumford river, a branch of the Blackstone river, in the south part of Worcester county, Massachusetts, began the business of axe-making. That was a little more than sixty years ago, when that branch of industry was wholly unknown in this country. He occupied a little shop in that hamlet, and when not doing work for the neighboring farmers, he manufactured axes for sale. He took his first lot to Providence, R. I., where he found a ready market for them. The next lot he took to Boston, where he formed the acquaintance of Mr. Eustis, a hardware merchant, who engaged to take all the axes the skillful blacksmith might manufacture.

This success induced Mr. Hunt to take his son, Warren, into partnership with him. The young man was more enterprising, venturesome and persevering than his father, and induced the latter to build another shop and employ more hands. At length Warren proposed to buy an idle factory there, for sale for about $4,000. His father would not consent to risk so much, for he was disposed to let well-doing, in a small way, alone. The younger Hunt then withdrew from the partnership, purchased the factory, established axe-making in it, and was so successful that, in 1834, some gentlemen joined him in forming a joint stock association under the title of The Douglass Axe
THE DOUGLASS AXE COMPANY.

Company, with a capital of $30,000. The works, consisting of suitable buildings and the best machinery for the purpose then known, were placed in charge of Mr. Hunt, who held the position of general agent and manager until 1865, when he was succeeded by Edwin Moore, the present incumbent. The President of the Company is S. W. Swett, and the Treasurer is D. D. Dana. Their office is in the city of Boston.

The company have been eminently successful in the production of superior axes. Their tools are known in almost every part of the world. Their works, situated on the line of the New York and New England railway, cover a large area. Owing to the peculiar situation of the water-power, they include five clusters of buildings located at different points on the stream, and are designated by the several titles of "New Shops," the Upper Works," the "Lovett Works," the "Howe Factory," and the "Gilboa Works." Each of these consists of several buildings devoted to different branches of the axe manufacture.

The New Shops comprise two buildings, one 240 by 65 feet in size, and the other 240 by 30 feet. The Upper Works consist of a stone building 95 by 45 feet; a tempering-shop 100 by 20 feet; two forging-shops, one 125 by 20 feet, and the other 85 by 30 feet, and several other buildings used for inspecting-shops, grinding-shops, etc. The Lovett Works, part of which are of stone, include a building 80 by 15 feet, three stories and basement; two grinding-shops, one 100 by 25 feet and the other 70 by 25 feet; a polishing-shop 45 by 30 feet; a forging-shop 30 by 30 feet, and a store-house 120 by 25 feet. The Howe Factory consists of a stone building 140 by 50 feet; four stories in height, with a basement; a grinding-shop 145 by 30 feet; a tempering-shop 130 by 30 feet, and handle-shop 70 by 25 feet. The Gilboa Works include several buildings of like character, devoted to the same purposes as mentioned above. Attached to the establishment are a number of substantial dwelling-houses for the use of the workmen.

In carrying on the business of the Douglass Axe Company, there are annually consumed 1,200 tons of iron, 250 tons of high grade English steel, 1,200 tons of grind-stones, 2,400 tons of anthracite coal, 400,000 feet of lumber for packing purposes, and $30,000 worth of handles, which are made exclusively for the company, in Baltimore. The machinery used is of the most improved kind. The works contain 34 trip-hammers, and 65 forges. The running of the grinding-shop is the most expensive part of the establishment, the wear and tear of the stones alone, costing about $100 a day. The works furnish employment to about 320 persons, and the pay roll is over $200,000 annually. The capital is $400,000, and the annual product is more than $800,000. The present capacity of the works enable the company to turn out daily 2,500 chopping axes, and 1,000 smaller edge-tools which they manufacture.
The iron used in axe-making at these works, is brought to them in bars, of convenient shape as to width and thickness. A powerful machine cuts the bars into proper lengths, when the pieces are put into a furnace, heated, and passed between rollers where they are prepared for welding, and by an ingenious contrivance the socket is formed for the handle of the axe. The pieces being properly heated again, are put under a welding hammer, when they begin to assume the shape of axes. Again heated, the forming axe is taken to an anvil, where an opening is made in the thinner end by a sort of hatchet into which the steel that is to give a keen cutting edge to the implement, is inserted, when blows from a hammer in the hands of a workman draw out the steel, and firmly unite it in its proper place. Then being again heated, the axe is placed under a swage-hammer, which gives it proper shape. From this hammering it is taken first to a shop to have the head properly fashioned; then to the grinding-shop, and then to the tempering-shop. In the latter place only the most careful experts are employed. The axe is heated to a cherry-red, and then plunged into a tank of very salt water to harden it. It is then submitted to fire heat, and carefully watched until the steel assumes the desired color—a pigeon blue. Then the axe is taken to the polishing-shop and placed on emery wheels of four different grades of fineness, which give it the brightness seen in a new axe. A searching examination for defects then follows in the inspection-shop, where, after passing the strict scrutiny of an expert inspector (who holds each workman responsible for the work he has done), the axe accepted, is painted, labeled, and packed for market.

The plow in 1776 was a rude affair. In the Southern States the "shovel-plow" was in general use until near the close of the last century. It was generally made by a plantation mechanic (a slave), and not unlike the old Roman plow before the Christian era. It was made of a rough-hewn stick for a beam, with another stick framed in, upon the end of which a piece of iron somewhat shovel-shaped, and sharp pointed was fastened. Two rough handles were pinned with wooden pegs or nailed to the sides of the beam, having a wooden prop. At the forward end of the beam was a draft-iron, or a piece of bark in a raw-hide loop.

With this plow the land-owners scratched to a considerable depth. It was superseded by the "hog plow," so called because of its aptness in rooting into and out of the ground. This was followed by the "bull plow," with an immense clump of iron like the half of an enormous lance-head for a share, and having a rough mold-board for turning the furrows in one direction. This was a great improvement, but the share and the mold-board were attached in such a manner, that the wedge was so blunt the friction was excessive. It broke and crumbled the furrow slices, and they were very irregular. Deep plowing was almost impossible; the draught was very heavy, and it
was so easily thrown out of the ground, that when much depth of furrow was required, one or two men rode upon the beam to keep it down. The mold-board was sometimes shod with pieces of short iron, or old scraps of tin to make it more durable, but these frequently increased the resistance to its progress through the soil.

The shares were wrought iron, sometimes pointed with steel. These were sharpened by a country blacksmith, a mechanic often far away in sparsely settled districts.

An ancestor of the writer, living in a county bordering on the Hudson river, was compelled to go to Kingston, forty miles distant, to have his plowshare sharpened in the spring. He carried it on horseback along a bridle-path or Indian trail through the woods. On one occasion when he had traveled half the distance back, his share, fastened to his saddle with a rope, slipped out and fell to the ground. It struck a rock, and the point of the share was broken off. He was compelled to go back to the blacksmith to have the damage repaired.

Improvements in the construction of plows were made in England long before they attracted much attention in our country. Early in the last century, (1720) an excellent plow (by comparison) was patented by Joseph Foljambe, of Rotherham, England, known as the Rotherham plow. It was afterwards improved. Colters were introduced for cutting the sod before the share; but little more was done in the way of real improvement until James Small, a Scotchman, began the manufacture of plows with cast-iron mold-boards, in Berwickshire, in 1740. He continually improved the implement until his death, at near the close of the century, when he had produced the celebrated “East Lothian Plow,” which was so excellent that it is still used and highly prized in many parts of Great Britain.

In 1785, Robert Ransom, of Ipswich, England, obtained a patent for making plowshares of cast-iron, and in 1803, he greatly improved them by a mode of chilling or case-hardening them. Meanwhile the subject had begun to attract attention in this country, among the better class of farmers. Thomas Jefferson seems to have been the first American who made experiments to solve the problem of the true form of a mold-board constructed upon mathematical principles, to do the required work of a lifting and upsetting wedge. He communicated his theory to the French Institute, and in 1793 he put it in practice on his own farm in Virginia. He was satisfied by experiments that his theory was correct. His mold-board turned the surface of a furrow in a flat and unbroken mass. It was about the same shape as the most approved mold-board of the present time.

In 1797, Charles Newbold, of Burlington, New Jersey, obtained a patent for a cast-iron plow, and spent large sums of money in perfecting and trying to introduce it. The share, mold-board and land-side were all cast together.
Strange as it may appear, it is nevertheless true, that the absurd idea became so prevalent that the cast-iron plow "poisoned the soil and ruined the crops," that the inventor was compelled to abandon the manufacture of them. Two years afterward, David Peacock, of New Jersey, another inventor, paid Mr. Newbold $500 for the privilege of copying a part of his plow. Several other inventions were patented between the years 1800 and 1820, the most useful and popular of which was that of Jethro Wood, of Scipio, New York, patented in 1814 and again in 1819. His plow was light and strong, and it soon drove out of the market, the clumsy and inefficient ones. Other improvements have since been made, chiefly in the materials used in the construction of the implement, such as the substitution of steel for cast-iron in the shares and mold-board, and cast-iron for beams. One of the most useful of the late improvements, is the "subsoil plow," without share or mold-board, but having a strong, flat standard of sufficient height, with a steel or iron point. This plow follows in the furrow of an ordinary one, and will penetrate the earth to the depth of eighteen inches, merely to break the soil, not to turn it up.

Plows moved by steam power have been introduced with some success on the great prairies of our Western States and Territories, and promise to perform wonders in the development of the agricultural resources of those regions. Heathcoate, in England, obtained a patent for one in 1832, by which plows were moved over the fields by a stationary engine working endless chains. In 1833, E. C. Bellinger, of South Carolina, obtained a patent for one, which was improved and patented in England, by Fowler, in 1834. Since then several Americans have produced steam plows—Obed Hussey in 1853; T. H. Burridge, with a traction engine, in 1858; the next year J. W. Fawkes and James Waters; A. Hale in 1863, and P. H. Standish in 1868. The great want yet unsatisfied is a traction engine or locomotive, strong, of light weight and moderate in price, and a following of a gang of plows working with precision and good effect. Doubtless the time is not far distant when the inventive genius of some American will supply the want, and then the resources of the Great West will be developed with a plenitude hitherto undreamed of.

The business of manufacturing plows has wonderfully increased in our country, within the last half century. It is only within that period that factories, devoted exclusively to that business, have been established. These, on a small scale, became quite numerous, at first, but gradually the business was concentrated into fewer hands, and greatly increased in productiveness. For instance, in 1845, there were seventy plow manufactories in Massachusetts, which made, in that year, 61,334 plows and other agricultural implements. Eleven years afterward there were only twenty-two of these establishments in the State, which made 152,686 plows. Since that time, the
business has greatly increased throughout the whole country, especially in the West. In 1870, the number of plows manufactured in the United States was about 865,000, of which number, 237,000 were made in Illinois, and 147,000 in Kentucky. There are over 2,000 establishments in our country devoted to the manufacture of agricultural implements of every kind, from the hand-rake to the reaper, employing more than 25,000 persons, who receive annually over $12,000,000 in wages, and produce wares valued at about $53,000,000.

Next to plowing, the complete pulverization of the soil is the most important business of the farmer. The harrow made for that purpose has, therefore, been the constant companion of the plow, from the earliest ages. The kinds used in this country, in 1776, were no more efficient than those of ancient Egypt. They were clumsy, rude, ill-shaped and made wholly of wood by the farmer himself, generally. The first real improvement in harrows was the substitution of iron or steel for wooden teeth. This effected a great change in the efficiency of the implement, but that change was very slowly wrought. Our farmers generally cultivated with the kind of harrows used by their ancestors, until about twenty-five or thirty years ago, when metal teeth and better forms began to come into use. At a later period, the harrow made more flexible by hinges, was introduced; and still later the rotary and smoothing harrow has become popular among careful cultivators.

Wonderful progress has been made in our country, within the present century, in the improvement of old forms of lighter agricultural implements, and the invention of new ones for saving muscular labor, such as the hoe, shovel, spade, and fork. What a contrast there is between the clumsy wooden pitch-fork of fifty years ago, and the delicate steel one of to-day. These articles are now all manufactured by machinery, and far lighter, stronger, and more effective than any made by Europeans; and the low prices at which they are sold, shows the triumph of mechanism over handi-craft as an economical laborer.

The manufacture of some of these articles, as a vocation, was begun in this country, soon after the old war for independence. The iron-plated wooden shovels made at Bridgewater, in Massachusetts, as early as 1788, were superior to any imported at that time, in workmanship and form. At about the beginning of this century, a shovel manufactory was established at Easton, Massachusetts, which is still in existence with its fame as a superior producer of shovels undiminished. A similar manufactory was established in Pittsburgh, Pennsylvania, at about the same time. Cast steel shovels were first patented in 1828, but cast steel hoes were made in Philadelphia as early as 1823. Ten years afterward they were sold at half the former price of the iron hoe.
Scarcey a single agricultural implement remains in its old form or structure, having been improved so as to economize material, time, or power; and by these changes the processes of tillage have been greatly modified. A single laborer with these improved tools, can till twice, thrice, and in some instances, five times the acreage that he could with the implements used in the last century. The aggregate advantage to the business of husbandry, is incalculable. And animals now perform much of what was formerly done by human muscle.

Drills, which now take such an important part in the raising of cereals, were known in England before the Revolution, but it is only a few years since they have been brought into general use in this country. The Rev. Jared Eliot, of Connecticut, in an essay on "Field Husbandry," published in 1754, wrote:

"Mr. Tull's Wheat Drill is a wonderful invention, but it being the first invented of that kind, no wonder if it be intricate, as indeed it is, and consists of more wheels and other parts than there is really any need of. This I was very sensible of all along, but knew not how to mend it. Therefore I applied myself to the Rev. Mr. Clap, President of Yale College, and desired him for the regard he had for the public and to me, that he would apply his mathematical learning and mechanical genius in that affair; which he did to so good a purpose that his new-modeled drill can be made for the fourth part of what Mr. Tull's will cost." Jethro Tull was an eminent writer on agriculture, and discoverer of new methods.

Washington, in a letter to Theodoric Bland late in 1786, spoke of a "drill-plough," which he said his friend would find equal to his "most sanguine expectations," (when the ground was tolerably free from stumps, stones, or large clods) for planting "Indian corn, wheat, barley, pease, or any other tolerably round grain." Washington had sowed oats with it successfully. The drill was simply a barrel attached to the plow, with holes in the bottom the proper size and distance apart for any grain to be planted.

 Implements for harvesting grass and cereals in the best and most economical manner, are next in importance to those used for seed-planting. These a hundred years ago, were very simple. The scythe for cutting grass, and the sickle for cutting grain, both known and employed by the people of antiquity, were the only implements for those purposes then generally known. The scythe in its modern form may be seen on antique sculptures made many centuries ago; and the sickle is the same in shape as those used by the young men and maidens in the wheat and barley fields of Boaz, the rich Bethlehemite, who told them to let fall "handfuls of purpose" for Ruth the gleaner, a charming young widow who became the wife of this good farmer more than three thousand years ago.

The cradle—a scythe with several bent wooden teeth or fingers for laying
the cut grain smoothly in swaths, superseded the use of the sickle in this country early in the present century, and is still extensively used, excepting on large grain-growing farms. This has been superseded by the well known reaping-machine, invented within the last forty years; an American production which has satisfied the aspirations of farmers during many centuries. The elder Pliny, writing at about the middle of the first hundred years after the birth of Christ, tells us of a reaping-machine in use in Gaul, consisting of a van on two wheels, with projecting teeth on its edge, that was driven by oxen through standing grain, and tore off the ears which dropped into the van. A similar machine used in the same country, was described full three hundred years afterward. The driver, by regulating the elevation of the vans, could, passing a few times over the field, gather the whole crop of grain in a few hours.

Arthur Young, an eminent English writer on agriculture, with whom Washington corresponded, gives us an account of a reaping-machine in England, invented by William Pitt, of Pendleford, before 1785. It was composed of iron combs attached to a rotary cylinder, which hatched off the heads of the grain and dropped them into a box behind. This apparatus was suspended in front of a two-wheeled car, and motion communicated by a band and pulley, connected with these wheels, operating upon a pinion and cog-wheel.

The first patent for a reaping-machine in England, was issued to Joseph Boyce, in the summer of 1799. Several others obtained patents afterward, but they were so complicated and inefficient that none of them seemed to succeed excepting one for which Henry Ogle, a schoolmaster of Remington, obtained a patent in 1822. It was very simple; and it was estimated that it would cut fourteen acres of grain a day. The exasperated hand-reapers, regarding it as an enemy of labor, threatened to kill the manufacturer, and the machine dropped into oblivion.

Four years afterward, Rev. Patrick Bell, of Scotland, invented a reaping-machine, so excellent in its operations, that it was in use in some parts of Great Britain until a few years ago. At a trial in 1828, before fifty farmers, they signed a declaration that it reaped one acre of oats in an hour. One of these was imported into this country in 1834, by John B. Yates, but it seems to have been soon lost sight of. It was composed of a series of blades, operating like tailors' shears.

So early as 1803, a patent was granted to Messrs. French and Hawkins, of New Jersey, for a reaping-machine, but it did not get into any extended use. The reaper was supported on wheels, one wheel extending into the grain. The horses drew at one side, opposite the cutters, which were a series of scythe-knives revolving on a vertical spindle—a rotary reaper. Beneath the cutters were long wooden fingers extending some distance into
the grain, and supporting it to the action of the cutters. Directly behind the cutters were fingers that passed between the cradle-fingers, and removed the cut grain, which fell to the ground ready for the binder.

In 1833, Mr. Hussey, of Cincinnati, obtained a patent for a reaper which was successful from the first. It was publicly tried for the first time, at the Hamilton County Agricultural Fair, in July of that year, and received the highest commendation. It was soon afterward introduced into other States, and in 1838, Mr. Hussey removed his manufactory to Baltimore.

In 1834, Mr. McCormick, of Virginia, obtained a patent for a machine which he had put in use, in an imperfect state, as early as 1831. Others invented improvements: and in 1845, Mr. McCormick took out another patent when there were no less than fifteen patented rivals in the field, including one invented by Ketchum in 1844, and which, with his mower, gained a wide reputation. At the "World's Fair" in London, in 1851, the American reaper was first introduced to Europe, and attracted great attention; but it was much inferior to the perfected machine now in use.

At the International Exhibition at Paris, in 1855, American reapers were brought to trial in competition with the world. The contest was on a field of oats about forty miles from Paris. Three machines were entered, one American, one English, and one from Algiers, a French province in Northern Africa. Each machine was allowed an acre to cut, and do the raking at the same time. The American reaper did its work in twenty-two minutes, the English in sixty-six minutes, and the Algerian in seventy-two minutes. "The successful competitor on this occasion," said a French journal, "did its work in the most exquisite manner, not leaving a single stalk ungathered, and it discharged the grain in the most perfect shape, as if placed by hand, for the binders. It finished its piece most gloriously."

Then followed a contest between three different American machines. Two of these were afterward converted from reapers into mowers, one making the change in one minute, the other in twenty. "Both performed their task to the astonishment and satisfaction of a large concourse of spectators," says Mr. Flint, "and the judges could hardly restrain their enthusiasm, but cried out, 'Good, good! Well done!' while the excitable people who looked on, hurrahed for the American reaper, crying out, 'That's the machine! That's the machine!' The report of the trial in a French agricultural journal said: 'All the laurels, we are free to confess, have been gloriously won by Americans, and this achievement can not be looked upon with indifference, as it plainly foreshadows the ultimate destiny of the New World.'"

Nothing more excited the astonishment of Europeans, especially those in commercial marts, than the fact that Americans could continue to export vast quantities of breadstuffs during our late Civil War, while more than a million men were under arms, a large proportion of them drawn from the
fields of productive labor to become wasteful consumers. The secret lay in the general use of machinery in farming, in the free-labor States. It is estimated that the number of two-horse reapers, alone, in operation in this country, in the harvest of 1861—the year when the Civil War broke out—did an amount of work equal to the labor of a million men.

Still more astonishing to the English mercantile community, and humiliating to the just Englishmen who deprecated the course of their government during that war, was the fact, that, in 1863, while the contest was raging most fiercely, the people of the free-labor States sent, from the port of New York, a ship laden with provisions valued at $200,000 for the relief of the starving English operatives in Lancashire, under the convoy of an American ship-of-war, to protect the precious cargo from the torch of Confederate cruisers built, manned, armed, and provisioned in England! The London "Punch" seems to have been justified in lampooning the boasted anti-slavery sentiment of the British, in this wise:

"Though with the North we sympathize,
It must not be forgotten
That with the South we've stronger ties,
Which are composed of cotton,
Whereof our imports 'mount unto
A sum of many figures;
And where would be our calico
Without the toil of niggers?"

"The South enslaves its fellow men,
Whom we love all so dearly;
The North keeps commerce bound again,
Which touches us more nearly,
Thus a divided duty we
Perceive in this hard matter—
Free trade, or sable brothers free?
O, will we choose the latter?"

The mowing machine, whose invention in our country is coeval with that of the reaper, is saving a vast amount of manual labor, and like its coadjutor, is adding millions of dollars to the annual product of our farms, by enabling the husbandmen to gather their crops quickly and in excellent order. In these machines very great improvements have been made since the Manning mower, patented in 1831, made its appearance. That and the Ketchum (1844) held the place of superior excellence, until within the last twenty-five years. Other inventors have made improvements. In 1850, less than five thousand mowing machines had been made in our country, and very few of them gave satisfaction. Now, almost every farmer, espe-
cially in the old free-labor States, is the possessor of one as an indispensable implement.

In 1857, the United States Agricultural Society instituted a national trial of mowers and reapers at Syracuse, New York, where no less than forty different machines entered upon the contest. Very great improvements were noticed in the lightness of their draft and general efficiency. Yet the side draft (then universally used) was heavy in many of them; and of the nineteen mowers engaged in the trial, only three could start in fine grass without backing to get up speed. The Buckeye, patented the year before, won its first triumph there.

Wilbur's "Eureka Mower," (John D. Wilbur, Duchess county, N. Y.) patented in February, 1863, was the first invented machine with a direct draft. The inventor claims (1) that by a direct draft there is a saving of twenty-five per cent. of team-power over any side-draft mower; (2) that his machine does better work than any other; (3) that it cuts a five or six feet swath, instead of four feet; (4) that it leaves the cut grass nearly standing for quicker and more perfect curing, and dispenses with the use of a tedder, and (5) that it gives perfect safety to the driver. In 1872 the machine was awarded the grand gold medal of the Vermont State Agricultural Society— the only medal given in the United States; and it has since taken first premium at many other agricultural exhibitions in New York and other States. In 1875, it was awarded a gold medal at Binghamton, New York, where ten different mowing machines contended in a trial.

The Wood Mower was invented in 1859, by Walter A. Wood, and soon gained a high reputation. Almost every year since, there have been some improvements made on old mowing machines or new ones have been introduced, by which lightness, power and greater perfection in construction have been obtained.

The manufactory of the Walter A. Wood Mowing and Reaping Machine Company, is at Hoosick Falls, New York, where iron mowers, self-rake reapers, self-rake reapers and mowers combined, and harvesters and self-binders combined are made, is a leading one in our country. Their machines have won scores of first prizes at exhibitions; and they received the Grand Diploma of Honor at Vienna, in 1873. That establishment has sold 234,120 harvesting machines from 1852 to 1876.
CHAPTER VII.

So early as 1864 there were 187 establishments in the United States devoted to the manufacture of Reapers and Mowers, which gave to the market a hundred thousand machines, whose aggregate value was $15,000,000. The number of these establishments is not much greater at this time, but their products have increased. They now produce annually about 40,000 mowers, over 60,000 reapers, and full 60,000 reapers and mowers combined, making a total of 160,000, having an aggregate value of $24,000,000. Of these machines, New York is, by far, the largest producer, manufacturing about 20,000 mowers, and full 13,000 reapers, while Ohio produces nearly 25,000 reapers and mowers combined. Almost a million scythes are annually manufactured in the United States, of which Connecticut produces almost 342,000.

The gathering of the hay-harvest in good condition, is of essential importance in giving value to the crop. In implements for this purpose, vast improvements have been made in the methods of “curing” and in the gathering up of the dry grass. The tedder, an invention of quite recent date, is an essential co-worker with the swift mower and fast gathering horse-rake. It was first patented and used in England, but the English tedder was too cumbersome for American farmers, and the ingenuity of our own inventors soon produced the light and efficient implement now employed by horsepower, for stirring up the swaths and exposing them to the sun and air so freely, that grass cut in the morning may be housed in the barn as excellent hay toward evening.

The horse-rake is a great improvement as a labor-saving implement, upon the simple hand-rake of our ancestors. It was invented less than eighty years ago. In its crude state it was estimated that it did the work of six men. It has passed through many improvements, until it has reached the form of a wheel-rake of our time, on which a man or boy may ride as in a “sulky,” and gather up easily with its long curved fingers, managed by a lever, the hay in swaths or teddered. With one of these rakes, a son of the writer not twelve years of age, gathered into wind-rows on our farm in Duchess county, New York, almost a hundred tons of hay in the summer of 1874. It was a healthful amusement for the boy, and saved the time of a
man. But the tedder and wheel-rake, like many other prosaic inventions in our day, have made sad havoc with the romance of the hay-field, where rollicking boys and girls were seen together in the "olden time," with wooden forks and simple hand-rakes. Of these rustic scenes the old English poets loved to write; and a more modern bard has sung:

"The hay-field is a pleasant sight
For happy groups assemble there,
And laughter makes their labor light,
Ringing along the balmy air;
And many a glance and joke oft passes
Between the country lads and lasses."

Although more than 80,000 horse-rakes of various kinds are now manufactured annually, in the United States, and assist in gathering from the farms of our country a hay-crop of about 28,000,000 tons each year, they have not entirely superseded the hand-rake, an indispensable implement in many ways. Two million and a half of hand-rakes are made yearly in our country; and of these, about one-fourth are manufactured in the State of Michigan.

Such is a brief account of the improved implements for harvesting the hay and grain crops of our country. We may sum up the matter by saying that previous to the year 1850, the scythe, the sickle, and the cradle for cutting, and the fork and hand-rake for curing and gathering, were the implements in universal use; and the common employment of the modern reaper and mower dates back less than twenty-five years.

After the harvest comes the preparation of the crop for home consumption or for a market. In facilities for this business, there have been as marked improvements as in other implements of farm labor—more wonderful for the cultivation of the cotton crop, as we have already observed. The threshing-machine is the most conspicuous of these improvements, after Whitney's cotton-gin. It was practically unknown in our country before the present century; but was somewhat used in England, in crude form, in the last decade of that century. It seems not to have been introduced into this country until a much later period. Washington, who took great interest in agricultural affairs, and was ever ready to adopt new methods that promised well, wrote to Colonel Henry Lee, in October, 1793, concerning a stationary threshing-machine set up by a fellow-Virginian, saying:

"I have always, from the accounts given it, entertained a high opinion of Colonel Taliaferro's threshing-machine, but knew at the same time I had no stream that could supply water for one, on any of my farms. The model brought over by the English farmers may also be a good one, but the utility of it among careless negroes and ignorant overseers, will depend absolutely
upon the simplicity of the construction; for, if there is any thing complex in the machinery, it will be no longer in use than a mushroom in its existence. I have seen so much of the beginning and ending of new inventions, that I have almost resolved to go in the old way of treading [the most ancient of methods] until I get settled again at home, [he was then President of the United States, and was making a short visit to Mount Vernon] and can attend, myself, to the management of one. As a proof in point, of the almost impossibility of putting the overseers of this county out of the track they have been accustomed to walk in, I have one of the most convenient barns in this, or perhaps any other country, where thirty hands may, with great ease, be employed in threshing. Half of the wheat of the farm was actually stowed in this barn, on the straw, by my order, for threshing; notwithstanding, when I came home about the middle of September, I found a treading-yard not thirty feet from the barn-door, the wheat again brought out of the barn, and horses treading it out in an open exposure, liable to the vicissitudes of weather."

These remarks about the ignorance and aversion to change, of overseers in Virginia, are equally applicable to the great body of farmers of our country, at that time. In the slave-labor States, especially, the land-holders knew and cared little about the art of farming. They seemed to leave everything to the overseer; many of the overseers left the management to the negroes, and the latter left the whole to Providence, who only helps those who help themselves.

Between the years 1810 and 1820, threshing-machines appear to have been extensively used in Great Britain; but the ancient, simple and unerring implement of which Cowper wrote—

"Thump after thump resounds the constant flail,
That seems to swing uncertain, and yet falls,
Full on the destined ear,"

held its position in almost universal use until a very recent period. In larger processes the wasteful method in vogue in the patriarchal ages of the Hebrews, of treading out the grain (alluded to by Washington) by horses or oxen, was largely followed. The threshing of ten or twelve bushels of wheat with a flail, was considered a good day's work for one man, and twenty-five to thirty bushels a day with three horses, a man and a boy, was a common result.

The comparative value of the flail and the modern threshing-machine as an economical implement of labor, was displayed at the Paris Exposition, in 1855. Six men were set to work with flails, and in one hour threshed 36 liters of wheat. A liter is about 2½ pints wine-measure. In the same time Pitt's American machine threshed 740 liters; Clayton's English machine
Duvoir's French 250, and Pinet's French 150. A Paris journal, speaking of this trial, said: "This American machine literally devoured the sheaves of wheat. The eye cannot follow the work which is effected between the entrance of the sheaves and the end of the operation. It is one of the greatest results which it is possible to attain."

Threshing-machines were very rare in this country fifty years ago, but before 1835 their use had spread rapidly. Great improvements were made by American inventors. First nothing was accomplished but simple threshing. Then came an invention for separating, and this was followed by an apparatus for cleaning. Now the grain is threshed and prepared for the market by one operation, in the most perfect machines of our day.

Horses were universally employed in driving these machines until recently, when steam was introduced as a motive power, and is used in the greater grain-growing regions, like some portions of our Western States and in California. By means of one of these machines, moved by horse-power, 1,500 bushels of wheat a day have been threshed and cleaned, ready for market; and for a steam machine 2,000 bushels a day is average work. To show the progress made in this item of labor, it may be mentioned that, on a farm fifty years ago, 1,300 bushels of grain were threshed, winnowed, and the straw removed to a neighboring field in twelve weeks by two men and five horses, by the old processes. This was considered notable work. A hundred years ago, not more than seven bushels of grain could be so prepared for market, in a day, by one man's hard labor. The hand-fan, made of willow, in the general form of a clam-shell, was then used for winnowing the grain in the wind. But fanning-mills, such as are in very general use in the United States, especially among moderate grain-growers, took their place long before the threshing-machines were used in this country. The cleaners of the threshing-machines have reduced the production of fanning-mills. About 20,000 are annually manufactured in this country. Of threshers, about 23,000 are made each year.

Many labor-saving machines for farm work, of a smaller kind, have been invented within the last thirty or forty years, such as the corn-sheller, the hay-cutter, and the root and vegetable-cutter, by which a vast amount of muscular exertion has been decreased. These have been mostly invented by Americans. Some of our older farmers will remember when a pan-handle was his most efficient aid in shelling corn; now the corn-sheller will strip the grain from the cobs of a bushel of ears in the same time that it formerly took to shell half a dozen ears. These, and hay and straw-cutters, are now extensively used, about 13,000 of the former and more than 30,000 of the latter being made annually in the United States.

To these must be added the hay-press for putting the loose crop into bales; also a great variety of churns, stone-lifters, stump-pullers and many
other implements that were entirely unknown a hundred years ago. According to the census of 1870, the value of farming implements and machinery then employed in our country, was at least $337,000,000. In 1850 their value was only $152,000,000; a gain of $185,000,000 in twenty years. In the year 1872 more than a thousand patents were issued for original or improved agricultural implements.

Having now considered many of the great improvements in, and the extended uses of, farming implements in our country, during the last one hundred years, let us take a view of the progress of agricultural productions during that period.

We have observed that agricultural implements were few and rough in 1776. The cattle were poor and unprofitable, and the products of the soil were limited in number. Wheat was cultivated to some extent, but the people subsisted largely upon Indian corn and potatoes, both of which the English settlers found here. Rye and barley were also cultivated, the flour of the former being mixed with the meal of Indian corn, in making bread. In Maryland, Virginia, and some parts of North Carolina, tobacco, which, at one time was the currency in the former colony, was extensively cultivated; and South Carolina produced a considerable quantity of rice. Very little attention was given to the cultivation of grasses, most of which grew spontaneously. The meadows were fostered, not cultivated. Of the three hundred varieties of grasses which were indigenous to our country, very few seemed to be susceptible of improvement by culture. It is estimated that nine-tenths of the forage grasses now cultivated in the United States had a foreign origin.

Fruit-culture was almost unknown here in the last century. Only apples, of inferior kinds, were generally raised for the manufacture of cider; and choice varieties of that fruit, pears, peaches, and cherries, were known only to a very few, who cultivated them with the care of garden products. It is said that until within fifty years, there was not a nursery for the sale of fruit-trees, in all New England, and even gardens were generally neglected, and yielded small varieties of inferior vegetables. It was only in 1829, when the first horticultural society was formed in this country. More attention to fruit-culture was given in New York and New Jersey, than in any other States. Even the Seneca Indians, whom Sullivan severely chastised in 1779, for their depredations in the Wyoming Valley and other places, by utterly devastating their cultivated lands, and their villages, had thrifty apple-orchards in the neighborhood of the Genesee Valley. Now the raising of fruit in the United States, is rapidly becoming one of its important industries. The products of our orchards annually amount, in value, to about $50,000,000.

There were no associated efforts for improvement in farming, until after
our old war for independence. There were no societies organized for the purpose. Lord Kames, in his "Gentleman Farmer," published before our revolution, had urged the utility of a Board of Agriculture, in England, but it was left to the untiring energy of Sir John Sinclair to call into existence such a board, in 1793.

Meanwhile the planters of South Carolina, when they emerged from the scathing furnace of the war, had been impressed with the importance of developing the agricultural resources of their State. They met in consultation in Charleston, and in 1784, formed the South Carolina Agricultural Society—the first in this country, and which is yet in existence. The example was followed, the next year, by Pennsylvanians, who formed the Philadelphia Society for Promoting Agriculture. In 1791, citizens of New York organized a similar Society, and the following year the Massachusetts Society for Promoting Agriculture, was formed.

These societies were not generally composed of practical farmers—they were city institutions which dealt with facts and theories. The mass of the husbandmen then did not hear or did not heed their appeals for countenance and support. Their theories were above the comprehension of the plodding farmers of that day. Those who did hear were jealous of the city-folk who had never held a plow, and yet presumed to teach the farmer how to hold it! They wanted no new-fangled notions to perplex their souls. Theories would disturb their ease and peace of mind. They could imitate, but would not experiment. What was known was quite sufficient for them.

At length, when enlightenment came to the average farmer, through education, he began to see that there was something useful beyond the narrow limits of his vision, and he wished to know it. This wish was a long stride toward obtaining knowledge. The feeling grew in the public mind; and the deliberation of a convention of practical farmers and others, held at Georgetown, in the District of Columbia, late in 1809, resulted in the formation of the Columbian Agricultural Society for the promotion of Rural and Domestic Economy. They offered premiums for the encouragement of sheep-raising, and other things; and their exhibition or Fair, held in May, 1810, was, it is believed, the first of its kind in this country.

At that time Elkanah Watson, one of the most earnest of the early promoters of the industrial pursuits of our country, was cultivating a farm near Pittsfield, in Berkshire county, Massachusetts, to which he had retired in 1807, at the age of fifty years. He saw around him antiquated and profitless ways of farming, and he determined to introduce reforms in methods. In the autumn of that year he procured from Colonel David Humphreys' flock of sheep, which he had imported from Spain, a pair of Merinos, the first, it is believed, that were introduced into Massachusetts, and he gave notice that he should make a public exhibition of them under a great elm tree on the
public square at Pittsfield. Many farmers, and their wives and daughters, were attracted to this novel show. Mr. Watson concluded that if two sheep could cause a gathering of people, a more extended show ought to attract a great crowd, and agricultural improvement would be the happy consequence.

The idea of Agricultural Fairs and Cattle Shows took possession of Mr. Watson's mind, and he pursued the matter with his accustomed zeal and intelligence. Cloth manufacture had then begun in our country, and he conceived that by breeding good sheep it might be made a rival of the manufactures of England. With this patriotic idea he had the fleeces of his two Merinoes made into blue cloth by the best workmen. It was finer than any yet made in America. Samples of it were exhibited in many cities, and attracted great attention.

The following year Mr. Watson obtained from Duchess county, New York, a pair of small-boned, small-legged pigs, known as the "grass-fed" breed, and the farmers in his vicinity profited by his generous dissemination of the breed. The same year he bought a blooded English bull with a view of improving the breed of cattle. Mr. Watson advocated these improvements steadily and almost alone, and he became the target for many shafts of ridicule.

In 1810 Mr. Watson issued an appeal to the farmers of Berkshire county, in favor of a Cattle Show. It was signed by twenty-six persons, and the first of the ensuing October was appointed as the time for the exhibition. It was successful, and the Berkshire County Agricultural Society was formed. A charter for it was procured, and arrangements were made for a grand Show in September, 1811, of cattle, farm products and domestic manufactures. It was a great success. The day was a very beautiful one, and at an early hour the village of Pittsfield was thronged by thousands of interested spectators. Of this event Mr. Watson wrote as follows:

"Fine domestic animals were seen approaching the place of exhibition from every direction. The procession was splendid, novel and imposing beyond anything of the kind ever exhibited in America. It cost me an infinity of trouble, and some cash; but it resulted in exciting a general attention in the Northern States, and placing our Society on elevated ground. In this procession were sixty-nine oxen, connected by chains, drawing a plow held by the oldest man in the county;—a band of music;—the Society bearing appropriate ensigns and each member decorated with a badge of wheat in his hat. The members bore two heads of wheat, tied with a pack-thread, and the officers three heads, secured by a green ribbon. A platform upon wheels followed, drawn by oxen, having a broadcloth loom and spinning jenny, both in operation, by English artists, as the stage moved along. Mechanics with flags—and another platform filled with American manufacturers. The pens were handsomely occupied by some excellent animals."
Mr. Watson, as President of the Society, delivered an address to the people who crowded a church, and then announced the premiums, which amounted to only seventy dollars, for the most meritorious animals. The following year the premiums amounted to two hundred and eight dollars. On that occasion Mr. Watson exhibited a piece of superfine broadcloth made from wool of his flock. That piece formed a new era in American manufactures, and excited a strong interest throughout the country. The President of the United States (Mr. Madison) and several other public men were clothed in it.

There was much prejudice yet to be overcome. It was with difficulty that Mr. Watson procured the services of a clergyman to open the proceedings in the church with prayers, for they all seemed to regard the excitement as a bubble that would soon burst, and were afraid of making themselves ridiculous. Mr. Watson conceived it to be of the first importance to the Society and the community at large to interest the women in the movement, and with that object in view, a separate day was appointed for them, and several valuable premiums of silver plate were exclusively devoted to them to be awarded on domestic industry. "The day arrived," wrote Mr. Watson; "a large room was prepared, many superior articles of domestic manufactures, especially woolens and linens, were exhibited; but no female appeared to claim the premiums. This was the crisis, and I was extremely agitated lest the experiment should fail. Native timidity and the fear of ridicule restrained them. No one dared to be the first to support a new project. To break down this feeling, we resorted to a manœuvre, which in an hour accomplished our wishes. I left the hall, and with no small difficulty prevailed on my good wife to accompany me to the house of exhibition. I then dispatched messengers to the ladies of the village, announcing that she waited for them at the Cloth Show. They poured out: the farmers' wives and daughters who were secretly watching the movement of the waters also issued forth, and the hall was speedily filled with female spectators and candidates for premiums. This was one of the most grateful moments of my life. I immediately rose in the rear of the table on which the glittering premiums were displayed, and delivered a formal address."

With a prophetic glance at the future—a prophecy wonderfully fulfilled in our day, Mr. Watson remarked: "The vast effects which will grow out of this system, when these societies shall become general, are beyond the reach of figures, by arresting our Colonial degradation and dependence on foreign countries, especially for articles of clothing. Perhaps the net gain to the nation may equal the benefit which agriculture will derive from these institutions."

The fair at Pittsfield was the first of the county fairs held in this country. In 1816 the Massachusetts Society held its first exhibition at Brighton, when
a list of premiums was offered, and a plowing match was instituted. Who can tell how much these institutions, now so numerous and attractive, have stimulated the American mind to the improvement and invention of agricultural implements?

From that time until now, there has been, at first a gradual, but lately a very rapid increase in the number of agricultural and cognate associations, known respectively as Agricultural, Horticultural, and Pomological Societies, Farmers' Clubs, etc. They exist in every State and Territory of the Republic. According to the report of the National Commissioner of Agriculture, in 1872, there were almost two thousand of these societies, distributed as follows:

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There are also, an United States Agricultural Society; American Pomological Society; National Agricultural College; National Wool-growers' Association; Cotton States Mechanical and Fair Association, and New England Agricultural Society.

Since 1872, the number of these associations have materially increased, and is now, probably, full 2,100. To these must be added the vast confederation known as *The Grange; or, the Patrons of Husbandry*. The story of its origin and growth, is one of the most marvellous of the age. It is a secret society, suggested by the Masonic Order, very simple in its ritual, and designed purely for the promotion of the interests of the cultivators of the soil, in a business and social point of view.
The founder of the system of Granges is William Saunders, a native of Scotland, who was employed by our government as Superintendent of the gardens and conservatories of the Department of Agriculture, in Washington city. He was in a position to hear a vast number of complaints from farmers in various parts of the country, of the unprofitableness of their pursuit, their social disabilities, and their hard and unsatisfactory labor. His cultivated and logical mind conceived the idea of an immense guild that should, in degree, supply the great want of the farmers of our country. His general plan was approved by others; and in 1867, Mr. Saunders, with Messrs. O. H. Kelley, J. R. Thompson, and William M. Ireland, who were members of the Masonic order; Rev. A. B. Grosh, a veteran member of the order of Odd Fellows, and Rev. John Trimble, Jr., perfected a plan for an organization, with a ritual, constitution and by-laws. On the evening of the 4th of December, 1867, less than ten persons assembled at the office of Mr. Saunders, organized a National Grange, by the appointment of a Master, Lecturer, Overseer, Steward, Assistant Steward, Chaplain, Treasurer, Secretary, and Gate-keeper. Provision having been made in the constitution for feminine officers, at a subsequent meeting, four women were elected to fill the respective offices of Ceres, Pomona, Flora, and Lady Assistant Steward. Very soon afterward a subordinate Grange was organized in Washington, which numbered about sixty members. This was the Pioneer Grange.

Mr. Saunders, as Master of the National Grange, issued an explanatory circular on the first of January, 1868. Copies were sent broadcast over agricultural districts. It fully explained the objects and the advantages of the organization, and prepared the way for fuller development. No responses came back; and in the early spring, Mr. Kelley went out as a missionary to preach and teach the faith of the new guild. He went westward from the National capital, and when he reached Minnesota, his place of residence, he had organized only four subordinate granges. On his farm there, he waited in faith for more than two years, for the leaven to work. The farmers were distrustful, for they had been often deceived by impostors, and for more than three years the progress of the order was slow and attracted very little attention. Editors of agricultural papers hesitated to speak favorably of the movement. But the idea finally took root and began to grow in the minds of intelligent men. A State Grange was formed in Iowa, in 1870, of which Dudley W. Adams became Master in 1871, and by his earnestness in labor, eloquence, and personal influence, soon gave a wonderful impetus to the movement.

At that time there were less than ninety subordinate Granges in the whole country. The order then began to expand rapidly. In 1872, there were 1,162 new Granges organized; in 1873, 8,600 more, and in May, 1874,
The Grange, or Patrons of Husbandry.

According to a report, there were almost 18,000 Granges in existence, with over 1,500,000 members. The estimated number at the beginning of 1876, was 19,600 Granges.

The professed objects of the Grange are to effect the elevation of the agricultural classes, and increase the volume and value of the agricultural productions of our country. It proposes to afford its members an opportunity for social, intellectual, and moral improvement by associations composed of persons of both sexes interested in husbandry. The members of a Grange meet two or three times a month, generally in the afternoon, at some chosen place, where they gather a library, be it ever so small, have some instrument to accompany vocal music, and cooking apparatus, for the members take their own food, picnic fashion, and very soon a bountiful repast is spread before them. The time is usually spent in social pleasures, or in the discussion of topics in which all are interested.

This occasional breaking away from the drudgery of the farm and the home by the husbandman and his family, must be of incalculable benefit to all in every aspect of the case. Another grand object of the Grange is to make better farmers by meeting and comparing notes of results arising from various methods of cultivation. The Grange also teaches industry and economy, and consequently thriftiness. It aims to bring the producer and consumer nearer together for their mutual benefit, by dispensing with the services of middle-men; and it proposes to work harmoniously with companies engaged in transportation.

Political and theological discussions at public-meetings of the Granges are eschewed. It is proposed to build up an immense guild, with fraternal features most conspicuous, and with virtuous and patriotic aims, whose labors shall secure for the organization a greater elevation of its membership, and for our country a larger productiveness of its soil by hands and machinery directed by enlightened minds. It proposes to effect a great moral and social good by the intermingling of men and women interested in agricultural affairs—to elevate woman without taking her from her appropriate field of action, by giving her the enjoyment of the Grange-room with its books, its piano or melodeon, its sweet songs and social intercourse, and its interesting discussions, by which she may become a more useful and delightful companion for father, husband, brother, or son, and be no longer a mere household drudge and slave.

The importance of this feature in the scheme of the Grange can not be over-estimated. It may be calculated in a degree, by considering the vast amount of physical and mental labor now performed directly or indirectly by women in the food production of this country, as in all others. Of the 600,000,000 pounds of butter, valued at $180,000,000, or the 240,000,000 pounds of cheese, valued at $36,000,000, probably made in the year 1875, and
the 24,000,000 gallons of milk sold, how much comes from the labor of the physically weaker sex in milking, churning, and preparing butter and cheese for use? The eggs and poultry; the honey gathered; the products of the garden and the fruit-orchard, and the vast number of berry-plants and shrubs of many millions value are largely the fruit of the labor and care of feminine hands. To these occupations must be added the assistance of women in planting, weeding, cultivating, haying, harvesting, and even the care of live stock, particularly in the Western States and Territories. Computed at the true value, it will be found that woman's labor in farming holds a conspicuous place in the census of agricultural operations and the production of our national wealth. There is, therefore, essential need for her thorough education, encouragement, elevation, and fostering love by every citizen interested in the welfare of his country, for she is truly a "help meet for man."

What shall that education be? Common sense answers, practical as a solid foundation, and ornamental and esthetic as a refinement and spiritualization of the practical. A recent writer says, concerning the education of girls and boys in our country: "Delving in classic mines through weary years, till the atmosphere of the present is moldy with the emanations of the dead past, will not suffice for the activities and practicalities of this living age. The theory and philosophy of language must take a high place in American education; but science, in its myriad applications to art and invention, offers a field inviting, alluring, and boundless, which promises more of good and glory than any other path of learning. It is a new path. Alas! how little do the masters of special branches of science at present know of the treasures of which they have caught but glimpses, and how powerless are they to apply this knowledge to human arts or the wants of man."
CHAPTER VIII.

OUR ancestors, one hundred years ago, were necessarily ignorant of much now known, because of a lack of facilities for acquiring knowledge by other means than occasional social intercourse. The farmers of that day were particularly isolated from knowledge of their pursuit acquired from books and newspapers, and the revelations of science which are now made through them. With the exception of four short "Essays on Field Husbandry," by the Rev. Jared Eliot, of Connecticut, published some years before the Revolution, I know of no work on agriculture printed in this country, until long after the close of that struggle. In 1784, Arthur Young, an eminent English writer, to whom the world is, perhaps, more indebted for the spread of agricultural knowledge, than to any other man, began the publication of his great work, the Annals of Agriculture, which was continued through forty-five volumes, and to which King George the Third was an occasional contributor under the name of "Ralph Robinson." A few copies of this work found their way to this country, and stimulated a thirst for such knowledge; but it was late in the first quarter of the present century, before any publication devoted exclusively to agriculture was published in the United States, excepting the reports of the four or five agricultural societies then in existence here.

It is believed that The American Farmer, established in Baltimore in 1818, by John S. Skinner, was the first newspaper issued in this country, devoted to the interests of agriculture. Solomon Southwick started The Plough Boy, in Albany, in 1821, and the next year Thomas G. Fessenden began the publication of The New England Farmer. Mr. Fessenden, while he was a student at Dartmouth College, in 1798, had written for The Farmer's Weekly Museum, a literary and political paper published in the farming region of Walpole, New Hampshire. The Farmer was printed in quarto form.

In 1828, John D. Legarde began the publication of The Southern Agriculturist, in Charleston, South Carolina; and two years afterward, Luther Tucker issued the Genesee Farmer, at Rochester, New York. In the same year Samuel Fleet published The New York Farmer and Horticultural Repository, and in 1833, Edmund Ruffin, the white-haired Virginian, who fired the first shot at Fort Sumter in 1861, started an agricultural paper at
Shellbanks, in Virginia. The Maine Farmer also first appeared that year; and in 1834, Jesse Buel established The Cultivator, at Albany. From that time publications devoted to agriculture and kindred pursuits, have rapidly multiplied until now about one hundred are in the field, and all seem to be well sustained by the public. Their aggregate circulation is probably more than half a million at each issue, conveying knowledge to more than 4,000,000 minds. The American Agriculturist, started in New York city in 1842, and yet published there, claims to have a circulation of 160,000 copies every month. Besides these publications devoted exclusively to the promotion of good husbandry, every rural newspaper in the land has a column or more on that subject.

The influence of this agricultural literature, which has chiefly grown up to permanency within the last thirty years, has been very great in making farming a favorite pursuit, and, by furnishing farmers' sons with agreeable and profitable reading, has kept them at home on the lands of their fathers. It has created an intense thirst for more knowledge on the subject of tillage and tools for husbandry, and by bringing to the eyes of farmers, weekly or monthly, information concerning new implements and methods, has assisted in securing an immense increase in our agricultural productions. Art, science and taste are now working together to enrich and beautify our country, while Industrial and Agricultural Colleges, the creations of to-day, as it were, are scattering their blessings broadcast over our land.

In 1857, J. S. Morill, a member of Congress from Vermont, and chairman of the Committee on Agriculture of the House of Representatives, introduced into that body a bill appropriating to the several States a portion of the public lands for the purpose of encouraging institutions for the advancement of agriculture and the mechanic arts. After much opposition the bill passed by a small majority. It was not reached by the Senate until the winter of 1859. It finally passed that body by a majority of only two, and was vetoed by President Buchanan.

In 1862, while the Civil War was raging, Senator Wade of Ohio introduced the same bill into the Senate, and it was passed on the 10th of June by a vote of 32 to 7. On the 17th it passed the House of Representatives by a vote of 90 to 25, and on the 3d of July it became a law by the approval of President Lincoln. The originator of the bill stated the purpose of it as follows:

"To establish at least one college in every State, upon a secure and perpetual foundation, acceptable to all, but especially to the sons of toil, where all the needful sciences for the practical avocations of life shall be taught; where neither the higher graces of classical studies, nor that military drill our country now so highly appreciates, will be ignored, and where agriculture the foundation of all present and future prosperity, may look for troops of
earnest friends, studying its familiar and recondite economies, and at last elevating it to that higher level where it may fearlessly invoke comparison with the most advanced standards of the world.” The bill fixed the leading objects, but left to the States much latitude in carrying out the practical details.

This act provided first, that each State should receive a quantity of land equal in value to $30,000 for each of its Senators and Representatives in Congress under the census of 1860.

2. That no State should be permitted to locate its scrip within the limits of another State, although its assignees may do so, Provided, that not more than 1,000,000 acres should be located by such assignee in any one of the States.

3. All expenses of location, management, taxation, etc., must be paid from the State treasuries, that the entire proceeds of the sales of the land may forever remain undiminished.

4. That the proceeds were to be invested in State stocks, yielding not less than five per cent. a year, and the interest be appropriated by each State which may claim the benefit of the act, to the endowment, support, and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such a manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life. The grant was made on the following conditions substantially:

1. That each State should guarantee the entire capital of the fund received by it; and one-tenth of the capital might be devoted to the purchase of land for an experimental farm.

2. That no part of the fund or the interest should be used for the purchase, erection, or repairs of buildings.

3. That every State receiving the grant must provide an institution within five years from the date of filing its acceptance of the grant with the Commissioner of the General Land Office.

4. That an annual report should be made and distributed.

5. That if lands improved by railroads should be selected, the number of acres should be diminished.

6. That no State in a condition of rebellion against the National Government, should be entitled to the benefits of the act.

7. That no State might receive the grant unless its legislature formally accepted it within two years of its approval by the President. The last clause was afterwards modified so as to allow the States then in a condition of anarchy, to enjoy the benefits of the act after the reorganization of their respective governments.
Every State in the Union but Nebraska has established one or more Industrial colleges, but the whole of the 9,510,000 acres granted by Congress, have not been sold. All of the industrial colleges show signs of prosperity, and most of them have the character of a high seminary of learning, and equal to our best colleges in the amount of useful knowledge taught.

Persons of both sexes may enjoy the benefits of the State Industrial Colleges, and each student is paid a stipulated sum of money for every hour of labor given to the institution. By this means students are materially aided in defraying the expenses of their education. As a fair representative of these State schools, I here give some facts concerning the Iowa State Agricultural College, at Ames, one of the earlier of these seminaries, which was opened in the spring of 1869.

There were during the first year, one hundred and ninety-two table attendants representing fifty-five counties of the State. Of the one hundred and seventy-three students admitted to the preparatory department, fifty-nine were young men, and twenty-one were young women, and to the Freshmen class, seventy-seven young men, and sixteen young women. The following was the course of study:

**First Year**—First term—Algebra, rhetoric, and book-keeping. Second term—Geometry, physiology, and hygiene, and English language and literature.

**Second Year**—First term—Trigonometry, mensuration, and surveying, general chemistry, botany, and vegetable physiology. Second term—Mechanics, analytical chemistry, analytical geometry, zoology, practical agriculture, descriptive geometry.

**Third Year**—First term—Analysis of soil, entomology, practical agriculture, botany, horticulture, forestry, mechanics of engineering, shades, shadows, and perspective, differential and integral calculus. Second term—Chemical physics, geology, and mineralogy, comparative anatomy, and physiology, practical agriculture, mechanics of engineering, and machine drawing.

**Fourth Year**—First term—Agricultural chemistry, landscape gardening, rural architecture, history and principles of architecture, architectural drawing, carpentry and masonry, political economy and logic. Second term—Mental philosophy, constitutional law, veterinary science and art, and civil engineering.

The course of study the first year is the same for both sexes; after that the course for young women consists of studies adapted to meet their special wants. They may, however, pursue any course of study taught in the college. All the members of the college spend two or three hours every afternoon, according to the season, the weather, and the wants of the farm and workshops, in manual labor, for which they receive payment at the rate of from three cents to ten cents an hour, according to the value of their service.
The young women engage by rotation in all the different processes of the art of housekeeping.

The expenses of students are reduced to the lowest figures possible—board furnished and washing done at actual cost. The students make a small deposit once a month for board, and settle all accounts at the end of each term. Incidental expenses are limited to injuries actually done to the furniture and rooms. Books are supplied by the college at wholesale prices. Each representative district may send one student for every representative elected in such district to the popular branch of the legislatures. Applications for admission are made to the superintendent of schools in the county in which the representative resides, who examines all candidates and selects them by lot. The French and German languages are taught. Besides the regular working force of the college, composed of seventeen professors, when full, men eminent in science and art are appointed to lecture before the students. This college has an experimental farm of 838 acres. In 1874, there were two hundred and ninety-five students in the college, of whom ninety-six were feminine.

Cornell University, situated at Ithaca, New York, is the most prominent, extensive and generously endowed of the institutions which have accepted the National bounty for the advance of agriculture and the mechanic arts. It was founded by Ezra Cornell, about ten years ago—a citizen who, by energy and industry, had risen from poverty to opulence. He gave $500,000 for the purpose, and the institution received from the State of New York the land scrip representing 989,000 acres given by the United States. Mr. Cornell afterward added more than $100,000 to his gifts.

The University buildings, eight in number, composed chiefly of dark blue stone, stand upon ground east of Ithaca, about 400 feet above Cayuga Lake. These, with over 200 acres of land, compose most of the real estate of the University at Ithaca. These buildings are known respectively as the McGraw (presented by John McGraw, of Ithaca), North and South University, and Sibley buildings, the latter the gift of Hiram Sibley, of Rochester, New York. The other buildings are the Laboratory (a temporary wooden structure); Cascadilla Place, a dormitory for feminine students, and a chapel. The last two buildings have been erected at the expense of Henry W. Sage, of Brooklyn, New York, and presented to the institution. The President of the University, Andrew D. White, built a President's house, at an expense of $40,000, and deeded it to the institution.

The McGraw building consists of a main edifice and two wings, with a tower 120 feet in height, in which swings the great bell of the University and a sweet chime of smaller bells. From that tower may be obtained a view of the whole surface of Cayuga lake, forty miles in length, and of the vast and romantic region of the surrounding country. The building contains the
library of about 40,000 well-selected volumes, a large proportion of which were purchased in groups at the sale of private libraries, or supplied by the generous gifts of friends of the institution. It contains the classical library of the late Charles Anthon; the philological library of Franz Bopp, of the University of Berlin; and the historical library of the late Dr. Sparks, of Cambridge, Massachusetts, purchased for the University. Also about 4,000 volumes of the private library of the President; the library of Professor Goldwin Smith, consisting of about 5,000 volumes, chiefly on history, presented by that gentleman; a collection of 1,000 volumes on architecture, presented by President White; a mathematical library of 1,800 volumes given by the late William Kelly, of Rhinebeck, New York, and an agricultural library donated by the founder, Mr. Cornell. The McGraw building also contains the museums of the University, a reading-room and several lecture-rooms.

The Sibley building is occupied by the mechanic arts with appropriate tools and machinery. The Cascadilla building contains apartments for the Professors and students, a large reception-room and several University offices.

The peculiarities which distinguish Cornell University from other colleges are: 1. non-resident professors; 2. a wide liberty in the choice of studies; 3. the prominence given to studies which shall be practically useful; 4. the absence of a daily marking system; 5. the unsectarian character of the institution. Simple religious services are held daily in the University chapel, but attendance is not compulsory.

There are thirty-two resident professors. The non-resident professors, seven in number, are chosen from among scholars of acknowledged eminence in particular departments of learning, each of whom delivers a series of lectures every year. Dean Sage, of Albany, has given $30,000, the income from which is to be devoted to lectures on general theology by divines of different denominations. The plan of instruction embraces three general courses—in arts, in literature and in science; and the studies in relation to agriculture and the industrial arts are similar in kind to those found in the Iowa State Agricultural College, above described. Particular attention is paid to instruction in languages, ancient and modern, in the exact sciences and the fine arts. The labor on the farm, in the workshops and in domestic industry, is also remunerated; and some students support themselves by the proceeds of their work.

Every department of Cornell University is already rarely furnished with implements of education, which are continually increasing in importance and value. Geology and Natural History are fully represented by original specimens and models. The arts and sciences are well illustrated by models, maps, charts and photographs. Provision has been made for the education of the gentler sex, the University having accepted, in 1872, the munificent
sum of $250,000 from Henry W. Sage, of Brooklyn, for the establishment, in connection with the University, of an institution for the education of women, to be called the "Sage College of Cornell University."

The institution was first opened for pupils in October, 1868, with Andrew D. White as President, and who still occupies that position. It was to his efforts as a State Senator that the procurement of the charter is mainly due. Gifts to the amount of more than $300,000 have already been bestowed upon the University. Its purpose is, according to the language of the founder, to afford a place where "any person can find instruction in any study." This is a broad foundation, but the expenditure promises to be worthy of it. In 1875-76, there were 532 students—43 feminine.

The endowment of the University, in 1872, was $1,102,000. Additions made to that fund since by the sale of some of its lands, makes its present annual income about $140,000. It has yet about 420,000 acres of land unsold; and it holds real and personal property—the college farm, buildings, furniture, library, apparatus and scientific collections—valued at nearly $555,000.

In a less pretentious way, the school district library has been, for many years, the teacher of a large class of the rural population of our country. This institution was first organized in the State of New York, in 1837, when an appropriation of $200,000 a year for three years, was made, and subsequent appropriations were afterwards made. Other States have followed the example. Many States also distribute every year a large number of volumes—perhaps 200,000—on agriculture, some of them of great literary and scientific merit. These are scattered among the farmers, and are productive seeds of grand results. Add to this as many more volumes on husbandry sent out among farmers, from Washington city, by the Department of Agriculture, and some idea may be formed of the immense educational advantages possessed by the farmer of our time over his ancestors a hundred years ago. What a contrast with the farmer in 1776!

I can not refrain from referring here to the vast influence of the Pennsylvania Agricultural College, established in 1854, in the promotion of scientific culture among the husbandmen of our country, especially under the management of the late Evan Pugh, Ph. D., one of the most devoted students of chemical science in its relations to agriculture. Dr. Pugh was called to the Presidency of that institution, and remained in the office until his sudden death in 1864, at the age of thirty-six years. He had succeeded in establishing a thoroughly scientific institution upon a broad and enduring basis. Its obvious usefulness undoubtedly suggested the movement in Congress for the establishment of Industrial Colleges, and it has been the model of most of them. It was the first institution of the kind established in this country.
Science, as we have observed, has come to the aid of the art of agriculture, and produced wonderful results. Our fathers knew nothing about agricultural chemistry, for the science had its birth late in the last century. The fresh dung-hill was their only laboratory; they knew nothing of the hidden secrets of the compost heap.

The advantages derived from manuring were known in ancient times, but the reason why is a modern discovery. Arthur Young made some chemical experiments concerning the growth of plants, but it was left for Sir Humphrey Davy to reveal a knowledge of Agricultural Chemistry as we know it, at the end of the first decade of this century. He published a work on the subject in 1813, which was translated into several European languages. Many experimenters followed him during the next thirty years; and finally Liebig, arranging the many facts evolved by these experimenters, separated them from theories, and placed Agricultural Chemistry upon its present foundation.

Manures known before have become manifold more efficacious by scientific application to various soils, and new ones, in more concentrated forms, have been introduced, such as superphosphate of lime and guano, by which, and a system of rotation of crops, soils, exhausted by cultivation have been restored and others have been made vastly more productive.

The preparation of phosphates and other fertilizers has become, within the last thirty years, an important item in the records of our national industries. Our Southern States are more dependent upon these than those of the North, because of the want of making and economizing farm-yard manures, which the system of stall-feeding implies. The planters of Georgia alone, it is estimated, pay over $10,000,000 a year for fertilizers. It is now generally conceded that these fertilizers, artificially compounded, are most important adjuncts to farm-yard manures, and the manufacture and sale has become enormous. Chicago, alone, manufactures and sends out an average of 6,000 tons a year, valued at $7,000,000. There are many single townships in New England that use every year, from $25,000 to $35,000 worth of fertilizers. In New England, New York, New Jersey, and Virginia, there are several fish-guano establishments.

A little more than thirty years ago, Professor F. S. Holmes, a young planter between the Cooper and Ashley rivers, in South Carolina, discovered nodules of phosphate of lime while searching for marl. He found among them the bones of animals; but very little attention was given to the matter until after the late Civil War, when the same gentleman found an immense bed of this natural fertilizer, far more valuable than marl, in the same locality. He brought the subject to the notice of scientific men and capitalists, and in 1867, the first Phosphate Mining Company was formed. These enterprising men have been rewarded by abundant success. The products of
these mines and of others since opened in that region, have become a staple article of commerce. Foreign vessels leave the port of Charleston almost daily, laden with the rough phosphate rock or the material prepared for use. Already nearly $75,000,000, furnished chiefly by Northern capitalists, are invested in the mines on the Ashley and Cooper.

These deposits are near the surface, and are mined by means of long trenches, like the ancient copper-mining near Lake Superior. Machinery is used for crushing the rock and preparing it for market, which, in that shape, is worth $60 a ton. Already sales have been made to the amount of about $5,000,000. The mining operations are extending far up the peninsula. It is evident that in the bosom of the old Palmetto State there is an immense treasure, deposited there in the post-pliocene—the pre-historic age of man—the times of the mastodon and the giant saurians—and just revealed when such a treasure is needed for the enrichment of our soils. Among these deposits have been found the bones of man; the teeth of sharks that must have been a hundred feet in length; the bones of alligator-like animals, and remains of lizards almost twenty feet long.

Guano, another natural fertilizer, has become an article of great importance in our commercial statistics connected with agriculture. It is the excrement of sea fowls mingled with the remains of their egg-shells and bodies. It is found chiefly upon the islands off the west coast of South America. It was used as a fertilizer by the Incas of Peru. In a book published in that country in Spanish, in 1640, occurs the following sentence: "Out of the islands of the South seas, not far from the city of Arica, they fetch earth called guano," which, it is stated, they used for manure, and thereby their fields were "put in heart for a hundred years."

Sir Humphrey Davy experimented with guano so early as 1805, but not until Liebig recommended it as a fertilizer, about forty years ago, did it become an article of commerce. A few casks taken to England in 1840, were used in experiments. The result was so satisfactory, that two thousand tons were imported into that country the following year. It was not used in this country until a somewhat later period. Up to 1850, the aggregate amount imported into the United States, was less than 30,000 tons. But it has now become an important item in the history of our traffic and agriculture. Commercial arrangements have been made with the government of Peru for the guano of the islands of that republic, which is the chief source of supply; but that supply will fail in time, the aggregate deposits there being estimated at less than 3,000,000 tons. At the present time hundreds of vessels and millions of dollars are employed in the transportation of guano from those islands. Our own sea islands produce guano in small quantities.

Gypsum was almost unknown among our farmers as a fertilizer, a hundred years ago. It was then extensively used in France, and Dr. Franklin,
after his return from his diplomatic mission from that kingdom, brought it to the notice of his countrymen. It was found to be particularly valuable in the cultivation of clover, and its use rapidly spread from about the year 1810 to 1830. Other fertilizers have taken the place, to some extent, of this simple mineral, which is indigenous and most abundant in New York and Michigan. There are about 320 plaster mills in our country, producing ground gypsum to the value of $2,500,000 annually.

Drainage and irrigation (the latter practiced by the ancient Egyptians) have been mechanical processes in agriculture introduced into the country within the last fifty or sixty years. In 1818, Noah Webster, in an address on agriculture, spoke of the art of drainage being in its infancy in this country. It was then almost in that state in Great Britain. The first to introduce the use of tiles in our country, was John Johnston, yet living, I believe, near Geneva, New York. That was in 1835. Earlier under-drains were made of stone. John Delafield, a neighbor of Mr. Johnston, who had what he called a model farm then, imported a machine for making tiles in 1848, the first one ever seen in this country. The practice of drainage, the usefulness of which has been demonstrated by agricultural chemistry, is now in common use in our country.

Having now briefly considered the progress in the production of implements of agriculture during the last one hundred years; the creation of agencies for the intellectual and moral improvement of the rural population of our country during that time, and the helps of invention, discovery and science given to our farmers, it remains for us to note the great results in the productions of our soil now manifest, as compared with those of the last century. Then the acreage of improved land—land leased for grazing, grass or tillage—was smaller in proportion to the population than now.

According to the census of 1870, when our population was nearly 39,000,000, the total acreage of farm land within our republic was 408,000,000, and that of improved land, exclusive of irreclaimable swamps, and considerable bodies of water, was 189,000,000 acres. In 1850, when the population was little more than 23,000,000, the total acreage was less than 294,000,000, and that of improved land was about 113,000,000; showing an increase of the former in twenty years, of 114,000,000 acres, and of the latter 76,000,000 acres.

The raising of domestic animals and the production of food for their use and that of man, is the chief business of agriculture. In this department, vast progress has been made in our country, since 1776.

The earlier settlers on our domain, as well as successive colonists, introduced various domestic animals from Europe, but they soon deteriorated in size and quality, for the cultivated grasses which had been brought to great perfection on the continent beyond the sea, in their nutritious qualities, were
NEGLECT OF DOMESTIC ANIMALS.

unknown here. The land was covered with forests, and the pastures in their shadows were sparse in every way.

The best natural meadows were salt-marshes, near the coasts. In the winter the poor animals subsisted on straw, the stalks of Indian corn, marsh hay, and the browse of the woods; and when the spring opened, they were all emaciated and weak, and reduced in number by death from starvation. It is said that “too often the farmers’ first work of the spring morning, was to assist the weakened creatures to rise to their feet, and several native plants had reputation for strengthening cattle, so that they could get up alone when weakened by the winter’s starvation.” And this system, or want of system, prevailed in a greater portion of the States down to the period of the Revolution.

The farmers, especially in the States south of Pennsylvania, made very little manure for their grain-fields. Travellers of the time tell us that when one piece of ground had been exhausted by continual cropping, in Virginia, they cleared and cultivated another piece of fresh land, and when this was exhausted, they proceeded to a third. This exhausting process was carried on in many places, down to the period of our late Civil War. In Alabama were “old fields” where fifty years before was virgin forest. I have seen thousands of acres of “old fields” in Virginia—exhausted land on which a coarse kind of sedge which they called “poverty grass” had come up—which had been abandoned. These “old fields,” after lying idle a few years, would produce a crop of pine trees. One day in 1848, I passed through a pine forest between Charles City Court-house and the Chickahominy river, seven miles without a clearing, many of the trees being large enough for timber, where, as I was informed by ex-President Tyler, at whose house I had spent the morning, were cultivated farms fifty years before.

All the manures the farmers gathered previous to the Revolution, were collected in cow-pens for the gardens and tobacco lots. These cow-pens were filled with miserable cattle, such as modern breeders would hardly recognize as belonging to the bovine species. “In those days,” wrote a Virginia statesman in 1842, “they were so utterly neglected, that it was quite common for the multitudes starved to death every winter to supply hides enough for shoering the negroes on every farm. This was a matter so generally and constantly anticipated, that my own grandfather, as I have heard from unquestionable authority, was once very near turning off a good overseer because cattle enough had not died on the farm of which he had the supervision, to furnish leather for the above-named purpose. When any cattle were fattened for beef, almost the only process was to turn them into the corn-fields to feed themselves. Sheep and hogs were equally neglected.”

Down to the period of our Revolution, very little attention was paid to the cultivation of forage grasses, even in England, and the first time grass-
seed was ever sown in Scotland, was in 1792. It was a rare practice in our country down to about that period. With such cattle and such pasturage, we need not wonder at the statement of Washington that with a hundred such cows on his farm, he was compelled to buy butter for his family.

The science of breeding was very little understood here in 1776. For about twenty years Robert Bakewell, stimulated by the writings of Lord Kames and Jethro Tull, had been carrying on his successful experiments in Leicestershire, England, in the improvement of the breeds of domestic animals, especially of cows and sheep. His aim was to produce a breed of animals that would fatten on the smallest amount of food, and give the greatest product in return. The grand results obtained by Bakewell and others were not fully appreciated before the period of the breaking out of the Revolution.

It was not until the close of the war that any improved cattle came to this country. In 1783 some were imported into Maryland and passed into the hands of Mathew Patton, of Virginia, who took great pains in raising pure stock from them. With a considerable herd of them he went to Kentucky in 1794. In the year 1800, his son took some of them to Ohio, and both father and son became extensively known as breeders of fine cattle. That Patton stock made a very sensible impression upon the public mind and did much to teach the people the possibility of improvements.

During the closing decade of the last century there were other importations of a few improved cattle from England; among them some short-horns that went into Westchester county, New York, in 1792 and 1796. These were probably the first cattle imported with a design of improving the American stock. Some Jerseys and other good cows had been brought over by ship-masters, from time to time, which were kept here for the same purpose, but their influence was not greatly felt on the common breeds of cattle in this country. In 1817, Henry Clay introduced the Herefords into Kentucky. While he was in England, in 1814, as American commissioner to negotiate, at Ghent, in Belgium, a treaty of peace, he had observed the excellent qualities of this herd. Others introduced some short-horns into Kentucky at about the same time; but it was not until after the year 1820 that such importations became frequent. Many American breeders have visited the English Channel Islands during the last quarter of a century. Among the earliest to visit Jersey, was John A. Tainter, of Hartford, Connecticut, to select cows for himself; and a recent visitor to that island says his name is spoken with great respect there.

The short-horns—Herefords, Devons, Durhams, Ayrshires, Jerseys and Alderneys—were introduced on trial and crossed with our native stocks. The latter has been so improved by these crossings that, in certain Agricultural Societies, where premiums have been offered for the best "natives," not a pure one could be found, for all that were offered were, in fact,
IMPROVED BREEDS OF CATTLE.

"grades," having had an infusion of the better blood within a few generations. Yet it is only within the last twenty years that the farmers of our country, particularly the smaller ones of the East, seemed anxious to avail themselves of opportunities to improve their cattle; but in the West greater interest was early felt.

In 1834, an association was formed in Ohio for importing English cattle, and gave a great impetus to the spirit and business of good cattle-breeding. From that time the excellent work has gone on with ever-increasing interest, from year to year, especially within the last twenty years, until now all of the more distinguished varieties of English cattle are successfully and extensively bred here. Early maturity, proneness to fatten quickly, and the yield of milk by cows, have been the great aims in view.

Now much attention is given to pedigrees, by both the breeder and the purchaser. The first volume of the English Short-Horn Herd-Book appeared in 1822. In it only twenty animals are recorded that flourished in 1780 and earlier. In the present pedigrees, all of the thousands of short-horn thorough-breds date back, theoretically, to that time.

When the short-horns were first brought to this country, is not precisely known. It does not appear certain that any of the Patton stock were of that kind. After 1800, they were imported, and that business has gone on ever since; and when pedigrees began to be looked after in this country, an American Short-Horn Herd-Book was prepared, the first volume appearing in 1846. The work is still continued, and contains the record of over 33,000 pedigrees. Certain of this breed have become very famous in the United States and Canada, and bring enormous prices. On the 10th of September, 1873, there was a sale of over one hundred head of these cattle, at New York Mills, Oneida county, New York, the most extraordinary on record. One hundred and nine head were sold for the aggregate sum of $382,000, or an average of over $3,500 a head. One cow brought $40,000 and several sold for over $20,000. A calf five months old was sold for $27,000.

The effects of these importations and crossings, have been a very great increase in the production and value of horned cattle in this country. Even the Spanish and California cattle, and those of Texas, which are seen in immense herds, have been changed, in many instances, by crossing with these improved kinds. Of the extent of these herds of half wild cattle, the general reader can have no adequate idea.

Cattle breeding and trading is not only a profitable business, but it is the grand pastime of hundreds of Texans. Mr. King, in his admirable work The Great South, says: "They like the grandiloquent sound of a purchase of 60,000 head. There is something at once princely and patriarchal about it. They enjoy the adventurous life on the great grazing plains, the freedom of the ranch, the possibility of an Indian incursion, the swift coursing on
horseback on the great stretches, the romance of the road. Nearly all the immense region from the Colorado to the Rio Grande, is given up to stock-raising. The mesquite grass carpets the plains from end to end, and the horses, cattle, and sheep luxuriate on it; while the giant pecan throws down stores of oily nuts every year for the wandering hogs to revel over. The mountainous regions around San Antonio offer superb facilities for sheep husbandry; and the valleys along the streams are fertile enough for the most exacting farmer. There are millions of cattle now (1874) scattered over the plains between San Antonio and the Rio Grande, and the number is steadily increasing. It is not uncommon for a single individual to own 200,000 head."

While great improvements in the quality and intrinsic value of neat cattle—bulls, cows, and oxen—have been going on in our country, their increase has been very rapid, especially within the last thirty years. In 1840, their aggregate number was about 15,000,000 head; according to the census in 1870, they had then increased to about 24,000,000, or 11,000,000 in thirty years. The whole number now is probably about 30,000,000. Of these, there were 1,320,000 working oxen, and about 9,000,000 milch cows. The number of cows is now, probably, about 11,000,000. The total value of the live stock of the country at this time is estimated at more than $1,500,000,000, of which amount $300,000,000 were invested in cows.

Four States of the Union each contained over half a million milch cows, namely, New York, Pennsylvania, Ohio, and Illinois. The States of Wisconsin Indiana, Illinois, Missouri, and Texas, each contained more than 300,000 cows. New York had the greatest number—1,350,000—whose annual dairy products are now full 150,000,000 pounds of butter, and almost 100,000,000 pounds of cheese, with at least 140,000,000 gallons of milk, of which amount over 136,000,000 gallons are sold to the inhabitants of large cities and villages. The aggregate dairy product of the Union at this time, is estimated at more than 600,000,000 pounds of butter, over 200,000,000 pounds of cheese, and full 250,000,000 gallons of milk, of which 240,000,000 were sold.

The greater portion of the cheese now manufactured in the United States, is produced by cheese factories, an American invention, and first put in operation in 1851 by Jesse Williams, of Oneida county, New York. Only twenty-one factories were established during the next nine years, but since 1860 their number has increased so rapidly, that at this time there are probably 1,800 of them in our country.
CHAPTER IX.

The general history of the horse in the United States, is very much like that of horned cattle: first a deterioration, and then improvement. Their deterioration was not so great as that of cattle, and at the period of the Revolution there was a very substantial, though not elegant, race of horses in this country, well-adapted for the labor they had to perform. And these continued to make up the great bulk of horses used here, for the remainder of the century, mostly for the road. They were draught-horses for the transportation of the inland commerce of the country. The products exchanged were carried in heavy wagons, over generally very rough roads. Lighter vehicles would soon have broken in pieces. Even pleasure carriages were made very heavy. Such as we have now could not have endured the wear and tear of the roads in those days; and the speed now obtained on our roads, would then have been extremely perilous. The speed of post-horses for riders, and for vehicles that carried the mails after 1790, was calculated at not exceeding an average of five miles an hour. A few of the racer and hunter breeds of Europe were sometimes imported by men of wealth, before the year 1800; but the great bulk of the horses in this country remained, until the close of the century, about the same as those used during the old war for independence. The farm work was chiefly done with mules and asses.

The race of trotters now so numerous and so increasing here, was then unknown. It is peculiarly American in its origin and uses, for here it has been developed into a most attractive family whose members may be frequently met on good highways in pleasant weather, and are conspicuous on the carriage roads of our public parks. They have taken the place of racers in the contests of speed; and "trotting matches" form an attractive feature at the fairs of agricultural societies. The race has been created very largely by the use of the elegant carriages made by the Americans—marvels of lightness, strength and beauty, and the admiration of Europeans. These matchless vehicles are the product of the last fifty years of progress in carriage-making in our country, which has become a considerable item in the list of our manufactures.

Before the light carriages were brought into use, fast trotting gave no
special money value to a horse; now that quality seems to be so essential to the comfort and convenience of all classes in our country, that the money value of fast trotters is very great, amounting sometimes to thousands of dollars on a single animal. By careful breeding and training, with attention to form, temper, constitution, endurance, style, and action, a really new race of horses, in character, has been made within about thirty years. It is now a common thing for one of these horses to trot a mile in two minutes and forty seconds, and a few have acquired greater speed. In his History of Domestic Animals, Professor Law, of Scotland, remarks of the Americans: "They prefer the trot to the pacer, more admired in the old continent, and having directed the attention to the conformation which consists with this character, the fastest trotting horses in the world are to be found in the United States."

No doubt these improvements are largely due to the infusion of thoroughbred blood into our equine stock, especially at the South and South-west; and in the New England, and largely in the Middle and Western States, they are due in a large degree to the influence of two great classes of horses known as the Morgans and Blackhaws, both celebrated roadsters, the former descendants of "Justin Morgan," foaled in 1793. The Morgans are remarkable for their compactness of form, strength, and docility; and for general usefulness are unsurpassed, while the Blackhaws are distinguished as excellent roadsters, of a high and nervous style of action, a step of wonderful elasticity, and muscular and symmetrical form. It has been remarked that these two families of horses have added many millions of dollars to the value of the stock of this country.

The whole number of horses of all kinds in the United States now is estimated at about 11,000,000, of which about 8,000,000 are on farms; the remainder are in cities and large towns. This gives one horse to every four persons of our population. To this animal force for the use of man must be added about 1,200,000 mules and asses. Our great dependence on these animals was manifested during the wide-spread prevalence of the epizootic, that afflicted our horses a few years ago, and reappeared, in a mild form, in 1875. It brought much of the social, manufacturing and commercial transactions of our country to a stand-still. I saw oxen performing the duties of dray-horses in the city of New York, and drawing milk-wagons from door to door in a rural city on the Hudson river.

Sheep husbandry in our country has undergone many vicissitudes, but, on the whole, it has been profitable. Sheep were imported by the early colonists, but in some regions the increase was very slow, owing to the ravages of wolves. The Dutch introduced them into New Netherland (New York) as early as 1625, but almost twenty years later there were only sixteen in the whole colony.
Our country has no indigenous domestic sheep, and has depended entirely upon importations. In the later years of our colonial times, there were such rigid commercial restrictions, that it was about impossible to import any. Eliot wrote in 1747: "A better breed of sheep is what we want. The English breed of Cotswold sheep cannot be obtained, or at least without great difficulty; for wool and live sheep are contraband goods, which all strangers are prohibited from carrying out on pain of having the right hand cut off."

The so-called "native" sheep were quite numerous here at the period of the Revolution, but they were distinguished more for their coarse wool and flesh and long legs, than for any of the finer qualities now known. There was no demand for the wool of large flocks, and sheep-breeding was confined to the farmers who kept enough to furnish wool for the homespun clothing of their families. No attempts were made to improve the breed of sheep here until about the beginning of the present century. In 1793, William Foster, of Boston, brought from Europe three Spanish Merinos. These were fine-wooled, but their real commercial value was not appreciated. Mr. Foster gave them to a rural friend, who ate them up instead of breeding from them. A few years afterward he was buying the same class of sheep for $1,000 a head. For a long time this class of sheep had been shut up in Spain. In 1765, the Elector of Saxony introduced them into his dominions, and from these have come the very fine-wooled merinos called the Saxony. At about the same time Frederick the Great introduced them into Prussia, and the Empress Maria Theresa domesticated them in Hungary in 1775. Louis the Sixteenth caused them to be brought into France in the year 1776, and they were imported into England in 1785, by George the Third.

On his return home from Spain, in 1802, David Humphreys, American Ambassador at Madrid, brought with him two Spanish Merino sheep, and these were the ancestors of their class in this country, the finest specimens of which may now be seen among the hills of Vermont. That importation attracted the attention of enterprising Americans to the importance of raising fine wool and establishing domestic manufactures. Among them was George Washington Parke Custis, the adopted son of Washington, who had just built his fine mansion, Arlington house, beyond the Potomac, and overlooking the then little hamlet of Washington city. There, for the promotion of sheep-husbandry and domestic manufacture, he inaugurated an annual convention known as "The Arlington Sheep-shearing." At a large fountain of pure water that bubbled up from the roots of an oak on Mr. Custis's estate, these conventions were held for several years, on the 30th of April, when shearing, in the presence of a large number of people would be performed at "Arlington Spring." On these occasions a feast would be spread and prizes given to those who presented the finest specimens of wool or domestic man-
ufacture, at the sole expense of Mr. Custis. On these occasions toasts were drunk, speeches were made, and the guests and the host had a delightful day together.

The fine-wooled Saxony Merinos (whose fleeces form the best of German broadcloths) were introduced here in 1824, when some of them were sold as high as $300 a head. The fine-wooled sheep are not, on the whole, as profitable, especially for mutton and lambs, as the larger and coarser woolled ones; and the favorites now, especially in New York and New England, are the Cotswold and South Down varieties. New England and portions of the Middle States are particularly adapted to sheep-husbandry, but since the great facilities of transportation have been established, and are increasing, they cannot compete with the Western States, Texas, and California in wool and mutton raising. The last named State is rapidly becoming the greatest wool-producing region of the Union, and vast quantities of this product cross the continent by railway or find markets by ocean vessels. California produced about 30,000,000 pounds of wool in 1875.

There are now about 30,000,000 sheep in the United States. Of these Ohio has about one-sixth, and California almost as many. These produce more than 100,000,000 pounds of wool annually. The largest fleece ever sheared was from the merino ram "Dictator," belonging to Sheldon and Son, Moscow, New York, which weighed 26\frac{3}{4} pounds. Our woolen mills, of which there were 2,891 in 1870, employing more than 80,000 persons, and $100,000,000 capital, use more than 70 per cent. of domestic wool, which is now regarded among the best in the world. At the "World's Fair" in London twenty-five years ago, the fleece that commanded the highest premium for the fineness and beauty of staple, in a competition with those of Spain, Saxony, Silesia, and other parts of Germany, was grown among the hills of Tennessee. At the International Exhibition at Hamburg, in 1863, the highest price was given for Vermont merino fleeces.

Our swine, in 1776, have been described as resembling "the profile of a hog cut out of a thick plank with four bent sticks nailed on to it for legs, and ears like the ragged brims of slouched hats." Similar hogs might have been seen in the Southern pine-woods, and on our Western prairies, before the late Civil War, with very long snouts, and tails hanging in half-straightened ringlets. When we consider that few animals are so susceptible of change and improvement as the hog in the hands of a skillful breeder, it seems strange that so long a time should have elapsed before this capacity was discovered or appreciated, for no effort appears to have been made in this country before near the close of the last century, to improve the breed.

The first swine seen on our shores were landed in Florida, in 1538, by De Soto, when he attempted to conquer that country. They were brought from Cuba, where Columbus had left some on his second voyage. The
Portuguese navigators introduced swine into Newfoundland and Nova Scotia as early as 1553, where, left to themselves, they rapidly multiplied. It has been estimated that the product of a single sow, with only six young, would amount in ten generations, to over 6,000,000. The English settlers took some to Virginia in 1609, and in a few years they overran the colony, and the Indians ate the flesh of wild ones running in the wood. Governor Winslow imported some into Plymouth, and the next year the Dutch West India Company sent some to New Netherland, now New York.

The hogs were all inferior varieties, the tamed products of the wild ones of the European forests, and were finally improved by crosses with Asiatic varieties, especially with the small-boned short-legged and small-eared Chinese hog. Such were the pair of pigs—a cross between a Chinese and a large English hog, which the Duke of Bedford sent from Woburn as a present to Washington. The dishonest Englishman who had charge of their delivery, sold them on his arrival in America, and pocketed the proceeds. The breed that came from these pigs, became numerous in Delaware, Maryland, and Virginia, and gave the first impulse in this country toward improvement in the breed of swine. The pure ones were white, with ash-colored spots; large in size, with deep round bodies, short legs and thin hair, maturing early, and easily fattened. A pair of these were sent from Virginia to Timothy Pickering, in Massachusetts, who raised and disseminated their products widely. This race, called Woburns, and sometimes Bedfords, is now extinct.

Early in the present century some efforts were made to improve the breed of swine by importations and crossings with our slab-sided, long-legged and flab-eared native hog. Soon after his return from Europe, Chancellor Livingston imported some and bred from them. He tried to disseminate them widely, but met with opposition from the farmers, who were averse to innovations. It was at about the time when the Merino sheep were introduced, animals which the Chancellor cherished, and in derision his swine were called “Merino hogs.” A wag wrote,

“Let Humphreys rear his Spanish sheep,
In spite of Yankee dogs;
Our worthy Chancellor will keep
Flocks of Merino hogs.
Our tall and stately big-eared swine
That served our fathers well,
Must bow before the superfine
Small hogs of Clermont dell.”

The excellent qualities of the “Merino hogs” soon overcame prejudice, and better varieties of swine were reared.
Gorham Parsons, of Byefield, Massachusetts, raised an excellent variety known as the "Byefield," from a cross between a Chinese and a common American hog, and these were in high repute for a long time, and are still popular in some parts of Ohio. The Middlesex was a favorite in England and this country. It was a mixture of the small Chinese and a large hog, some of them weighing, when eighteen months old, 800 or 900 pounds. The Suffolk, Berkshire, and Essex are favorite breeds. In the West, where pork-making is an extensive business, the larger varieties are more in repute.

In the East hogs are mostly kept in pens; in the West, they are allowed to roam until about three months before the time of killing them, feeding upon grass, corn, and mast, such as acorns and beech-nuts. They are raised in great numbers there and in Texas. According to the census of 1870, the whole number of swine in the Union was about 25,000,000, of which the nine States of Illinois, Indiana, Iowa, Kentucky, Missouri, Ohio, North Carolina, Tennessee and Texas contained about 6,000,000. The largest number in any one of these States was in Missouri, which contained a little more than 2,700,000.

In many of these States the slaughtering of hogs and packing of pork forms an extensive and important industry. A larger portion of these are killed and packed between the first of November and the first of March. Very recently it has been discovered that packing in the summer is profitable, and now large numbers are so disposed of during the hot season. This business is carried on chiefly in Chicago and Cincinnati, the former having, within a short time, outstripped the latter in this particular industry.

According to official statements, the number of hogs slaughtered and packed in the Western States and Texas between November, 1873, and March, 1874, was about 5,400,000, of which a little more than 1,500,000 were packed in Chicago, and nearly 600,000 in Cincinnati. The total value of the pork packed in the Western and Southern States during that period was a little more than $63,370,000. The average gross weight of the hogs slaughtered was 268.27 pounds. The total product of lard was a little more than 191,000,000 pounds. During the year ending on the 30th of June, 1875, there were exported to foreign countries, 56,152,000 pounds of pork, valued at over $5,672,000, and 250,281,000 pounds of hams and bacon, valued at $26,612,000.

The hogs are slaughtered and dressed very rapidly. About twenty are driven into an apartment, where a man with a heavy, long-handled hammer knocks each hog senseless by a blow between the eyes, when they are dragged forward to the bleeding-platform where they are cut in the throat with a sharp-pointed knife. After bleeding sufficiently, they are thrust into a vat of water heated by steam, out of which they are lifted by levers, and scraped. Then they are passed on and hung up on a wheel with hooks,
revolving horizontally, and there dressed. These processes are performed by a specified number of men, dividing the labor in such a way that each man, in effect, kills and dresses a hog every ten minutes, or forty in a day of working time. This is followed by cutting up and preparing the slain animals for market, in the form of barreled pork, hams, bacon, and lard. In the smoke-houses from 175,000 to 500,000 pounds may be cured at one time. Of 500,000 hogs cut up, the products will be about 180,000 barrels of pork, 25,000,000 pounds of bacon or hams, and 16,500,000 pounds of lard.

When we consider the immense extent of other industries dependent upon swine-raising, the importance of that product of our farms will appear amazing. In Cincinnati alone, fifteen years ago, one establishment (when the number of hogs slaughtered and packed in that city amounted to about 400,000 annually) devoted to putting up hams and trying out the grease from the rest of the hog, used about 40,000 head of swine in a year for those purposes.

The entire carcasses of the hogs, excepting the hams, were put into large tanks and subjected to steaming at the pressure of seventy pounds to the square inch, which reduced the whole mass to one consistency and the bones to powder. The fat was drawn off through cocks and the rest was taken for manure. The heads, ribs, back-bones, feet and other trimmings, taken off by packers, were used in the same way, to extract every particle of grease. Six hundred hogs passed through these tanks every working day in the year.

That single establishment turned out in one year 3,600,000 pounds of lard, five-sixths of which was first quality, refined by steam. At that time there were thirty or forty lard oil factories in Cincinnati, each doing an immense business. One of these manufactured into oil and stearine 140,000 pounds a month, the year round; and 11,000,000 pounds of lard were run into lard-oil in a year, making 24,000 barrels. Much of this oil was used in cities on the Atlantic sea-board in adulterating sperm oil, and large quantities were sent to France to adulterate olive oil. The skill of French chemists enabled them to incorporate from sixty-five to seventy per cent. of this miserable oil with that of the olive. Of the 150,000 gallons of olive oil imported each year into the United States, used in salads for our tables, how much was the product of American hogs?

The stearine was manufactured into candles by hydraulic pressure, and more than 3,000,000 pounds of "star candles" were made in Cincinnati, in one year. The offal was used by soap manufacturers there. They tried out the grease and made more than 100,000 pounds of soap every week. Glue manufactories used up the hoofs; a hundred hands were employed in preparing bristles for the brush manufacturers; prussiate of potash used up the hair part of the hoofs and other parts of offal in making vast quantities of prussiate of potash for the print factories of New England and wherever it
was wanted for coloring purposes, and the blood of the hogs, caught at the bleeding platform, was manufactured into Prussian blue. Not a particle of the hog was wasted.

Added to these various industries connected with swine-raising, the coopers who make the barrels, hogsheads and lard-kegs for the products of the slaughtering houses, and those employed in getting out hoop-poles and making staves and headings, make up an enormous item in the statistics of labor in our country. It was computed at the time we are considering, that in and around Cincinnati alone, with those engaged in slaughtering and packing, at least ten thousand men were employed in the cold season, when they might have found very little else to do. These operations in connection with swine-raising, be it remembered, were carried on fifteen years ago. Add to this the products of similar industries carried on at many points in the West besides Cincinnati, and the enormous increase since, and the figures would show a most marvellous result.

Having considered the subject of the live stock—four-footed beasts—on our farms, let us now turn to that of the food products of these farms, for their use and for foreign markets.

First in importance are the Grass and Hay crops, for, throughout the northern portion of our Union, horned-cattle and horses are stall-fed from three to six months of the year, and sheep for nearly the same length of time.

Allusion has already been made to the fact that, a hundred years ago, very little attention had been given to the cultivation of forage grasses, and the miserable condition of cattle then in winter. According to Jared Eliot, the cultivation of timothy, the most important of our forage grasses, was not begun in this country until near the middle of the last century. It was found in a swamp near the Piscataqua river, in New Hampshire, by a man bearing the appropriate name of Herd, who propagated it. It was finally carried to Maryland and Virginia by Timothy Hanson, where it received the name of Timothy's (timothy) grass. The orchard grass was cultivated in Virginia about the year 1750. The cultivated blue grass of Kentucky seems to be indigenous to the country between the mountain ranges and the Mississippi river, and has sprung up in the pathway of settlements all over the western country.

Everywhere the great law of Nature, obeying the fiat of the Creator,—"Let the earth bring forth grass"—clothes the earth with verdure, while the hand of man, submitting to the sentence of the curse-blessing, "In the sweat of thy face shalt thou eat bread," has improved this natural product, and increased its abundance and nutritive qualities by cultivation. This improvement and increase has been more marked within the present century than ever before, and especially within the last thirty years, when implements for facilitating the harvesting and storing of the grass crop have come into
common use. Clover was very little cultivated in this country until near the close of the last century, and its great utility in the process of fertilization by mellowing the soil in which it grows, is a discovery of which practical use has only quite recently been made.

It has been said that the hay crop does not form a legitimate part of our agricultural products, since it is a tax imposed by a rigorous climate in winter, involving the expenditure of a vast amount of money, time, and hard labor by the farmer. This remark applies in full force to only a portion of our territory, for the necessity of cultivating grass to be consumed as hay in winter does not exist in many of our more southern States to anything like the extent it does in the region north of latitudes 36° or 37°. In Alabama, in 1870, only about 11,000 tons of hay were made, while there existed in that State 884,000 head of cattle, horses, mules, and sheep. Of course the pastures did not supply the remainder of the food for this live stock, for its soil is not very productive in grasses, but they did to a large extent. Considerable quantities of hay are sent to the ports of that State and of others from the northern States. In Maine (the extreme north-eastern State in the Union,) at the same time the hay crop was about 1,000,000 tons, while the number of cattle, horses, and sheep, was about 1,000,000. The entire crop must have been consumed in that State, giving, at the same time, a vast amount of fertilizing manure.

The hay crop did not appear as an item in our national census until the year 1840, when it amounted to only 10,250,000 tons in the entire country. In 1850 it was less than 14,000,000 tons, and in 1860, when improved implements for harvesting it were coming into general use, it was 19,000,000 tons. The product in 1870, was a little more than 27,316,000 tons, or more than one hundred per cent. increase in twenty years. The value of the crop at that time was at least $300,000,000, and that of the grass pastured, an equal amount, making the total value of the grass and hay crop $600,000,000.

Of the great hay crop of 1870, the State of New York produced more than one-fifth, its product being a little more than 5,614,000 tons. The State of Florida produced the least—only 17 tons. Arkansas, of the regular hay-producing states, gave the next least amount; it was less than 7,000 tons. Maine, as we have observed, produced that year, about 1,000,000; Vermont the same; Pennsylvania almost 2,900,000; Ohio about 2,200,000; Michigan 1,291,000; Indiana a little more than 1,000,000; Wisconsin 1,288,000; Illinois 2,748,000, and Iowa 1,778,000. A greater portion of the entire crop is consumed by the live-stock of our country. For the year ending the 30th of June, 1875, the entire amount exported was only 7,183 tons, and valued at $110,225.

The Indian corn product of our country is enormous. That plant seems to be indigenous to America, as it was found under cultivation here by the
Indians, when the Europeans first came. It was also found growing wild in Central America; and the older historians of Peru speak of it as being under cultivation there in the reign of the Incas. Schoolcraft tells us that it entered into the mythology of the Indians of the region of the upper lakes. In legend they tell us that a youth, on the verge of manhood, went into the forest to fast, where he built himself a lodge and painted his face in sombre colors; and then he asked the Master of Life for some precious gift that should benefit his race. Being weak from fasting, he lay down in his lodge and gazed through its opening into the blue depths of the heavens, from which descended a visible spirit in the form of a beautiful young man dressed in green, and having green plumes on his head. This embodied spirit bade the young Indian to rise and wrestle with him, as the only way to obtain the coveted blessing. He did so, and found his strength renewed. For four days the wrestlings were repeated, the youth feeling, each time, an increasing moral and supernatural energy, while his bodily strength declined. This mysterious energy promised him the final victory. On the third day his celestial visitor said to him:

"To-morrow will be the seventh day of your fast, and the last time I shall wrestle with you. You will triumph over me and gain your wishes. As soon as you have thrown me down, strip off my clothes, and bury me on the spot in soft, fresh earth. When you have done this, leave me, but come occasionally to visit the place to keep the weeds from growing. Once or twice cover me with fresh earth."

The spirit then departed but returned the next day, and, as he had predicted, the youth threw him on the ground. The young man obeyed his visitor's instructions faithfully, and very soon was delighted to see the green plumes of the heavenly stranger shooting up through the mold. He carefully weeded the ground around them and kept it fresh and soft, and in due time his eyes were charmed at beholding a full grown plant, bending with fruit that soon became golden just as the frost touched it. It gracefully waved its long leaves and its yellow tassels in the autumn wind.

The young man called his parents to behold the new plant. "It is Men-du-min," said his father; "it is the grain of the Great Spirit." They invited their friends to a feast on the excellent food, and there were great rejoicings. Such is the legend of the origin of Indian Corn or Maize.

When the English settlers went to Virginia they found this maize cultivated by the natives, and named it Indian corn; and it proved to be a great blessing to the immigrants on several occasions, saving them from starvation. When the settlers found it necessary to till the ground for their own sustenance, they cultivated this corn, and side by side it grew with tobacco, which soon became the staple product of Virginia. Other settlers, in other parts of the country, found it growing and at once began its cultivation. Its flexi-
bility of organization is so wonderful, that it flourishes on rich moist soils in great heat, and on elevations full eight thousand feet above the level of the sea. Wherever the absence of frost will allow it to ripen it is one of the surest of crops, as it is one of the most beautiful and kingly of all the cereals of our country.

From the earliest settlement of our republic the cultivation of Indian corn had been constantly increasing down to the late civil war; and, unlike other cereals, there had been no decrease in the product in any State of the Union. That increase had been at the rate of at least sixty per cent in ten years, for twenty years.

Indian corn appears among the notices of the earlier exports from our country. In 1748, South Carolina exported almost 40,000 bushels. In 1753 North Carolina sent abroad more than 60,000 bushels, and from Savannah the Georgia planters exported nearly 14,000 bushels in 1770. It was from the region of the Savannah river that the Huguenot settlers at Port Royal received corn from the Indians full 300 years ago. For several years previous to the Revolution, Virginia exported 600,000 bushels a year. From the port of Philadelphia, Pennsylvanian farmers sent over 60,000 bushels annually, as early as 1752, and twenty years later the exportation amounted to about 260,000 bushels. Between two and three thousand bushels were shipped from Portsmouth, New Hampshire, in 1776. Previous to that time Indian corn had been imported there. The total amount of this grain exported annually from all the English American colonies at the breaking out of the old war for independence, was between 560,000 and 580,000 bushels. At the beginning of this century the annual export amounted to over 2,000,000 bushels, about 338,000 bushels in the form of meal.

It is only within the last forty or fifty years, when the region beyond the mountains and the Mississippi river were rapidly filling up with a farming population, and the great avenues for transportation from that region to the sea-board began to be opened, that the exports of Indian corn assumed great proportions in the records of our foreign commerce. Even its annual product in our country, was not included in the National Census reports until 1840, when the aggregate yield was nearly 400,000,000 bushels. Before 1830, the value of the crop as a sure one was not appreciated; and Indian corn was not much used as human food in Europe until a comparatively recent period. The prejudices of the English against it, as such, yet largely prevail; and in earlier times it was considered good for food for swine only. In the summer of 1777, General Prescott, who was in command of British troops on Rhode Island, was captured, and sent under a guard to the head-quarters of Washington at New Windsor, on the Hudson. While on his journey, Prescott dined at the tavern of Captain Alden at Lebanon, Connecticut. When the wife of the captain brought to the general the favorite
American dish of *succotash*—boiled green corn and beans—that officer considering it was an intended insult, threw the contents of the plate over the floor, exclaiming: "What! do you treat me to the food of hogs?" When the captain heard of this, he came in and gave Prescott a sound drubbing with a horse-whip, for his insolent words to Mrs. Alden. Some time afterwards, when Prescott was exchanged and reinstated, a committeeman who, with others, visited the general on business, was treated by him very rudely until he left the room. After he went out the general asked: "Did I not treat him uncivil?" "Yes you did," was the reply. "Then," said the general, "I'll tell you the reason; he looked so much like a damned Connecticut man who horse-whipped me, that I could not endure his presence."

In the year 1850, the Indian corn crop of our country reached about 600,000,000 bushels, occupying an area of 31,000,000 acres, and valued at about $300,000,000. It was a gain in ten years of 57 per cent, while the population of the country increased 35 per cent. in the same time. The largest production we have ever had, probably, was in 1855, when it amounted to full 1,000,000,000 bushels, valued at over $400,000,000—about three-sixteenths of the entire agricultural products of the country in that year. The rich lands of the west, and the fertile regions of some of the Southern States, were then yielding their wealth of this kind in greatest abundance. It has never reached that amount since. In 1860 the product was almost 900,000,000 bushels. Since the Civil War, the average has been somewhat less. According to the census of 1870, the product that year was about 800,000,000 bushels. It has increased since then. A few years ago, corn was so abundant in Iowa and one or two others of the newer western States, and the price then was so low, while wood was very scarce and high in the prairie region, that large quantities of corn in the car were used as fuel.
CHAPTER X.

INDIAN corn is largely used in the manufacture of starch in our country, chiefly for the purposes of stiffening fabrics and for human food. It is also produced from the other cereals and from potatoes.

Starch is spoken of by Pliny as being made from wheat in the island of Chios. No special mention appears to have been made of it by any modern writer until the time when the stiffening of the enormous ruffs, worn by men and women in the reign of Queen Elizabeth of England, brought it into extensive use. Laws concerning it were made in England early in the last century, when it was used with indigo to stiffen and clear linen, and by the perfumers in making their hair-powders while the coiffure was such a special care in making up the toilet in the reigns of Queen Anne and the three Georges. Its use for any other purpose was strictly forbidden by law. The development of the cotton manufacture in the last half of that century, and also of calico printing, created a new and extensive demand for starch; and in 1796, the British Society of Arts gave their prize medal to Mrs. Gibbs of Portland, for her discovery of the arum maculatum as a fruitful source of it. Indian corn has been found to contain the greatest proportion of starch, and potatoes the least.

Fifty years ago, starch was made chiefly from potatoes and wheat, the latter having, next to Indian corn, the greater proportion of the desired product. The starch so manufactured, of an inferior quality, was the best then known in the American market. Very little that was better was then received from abroad. A change for the better was, however, soon effected by the perseverance of a single man, Thomas Kingsford, a native of England, and discoverer of the present method of extracting starch from maize or Indian corn. He was engaged in the manufacture of starch from wheat, but was, for some time before he tried any experiments, satisfied that a much better quality of starch might be obtained. He began a series of experiments by the use of a combination of chemicals, which resulted in decided improvements in the quality of the product. The history of these experiments is interesting.

Mr. Kingsford had been made familiar with the use of chemicals while connected with extensive chemical works in England. He had observed the
peculiar qualities of our Indian corn when he came to this country, and in 1841, he suggested to starch-makers the practicability of extracting starch from its ripe grain. The idea was treated as visionary—to his mind it appeared feasible. It took possession of much of his thoughts, and at the beginning of 1842, he began experiments to test his theory. Purchasing a small quantity of Indian meal, he soaked it for awhile, and then washed it through fine sieves, hoping to secure the starch. It remained only Indian meal. He then procured some shelled corn, soaked it for several days in the lye of wood-ashes, in order to soften the grain, and sought to reduce the grains to a pulp by the use of a mortar and pestle. This done, he washed out the starch from the other matter, but his methods were not successful. Then he soaked another quantity of corn, and passed it between the rollers of a rusted sugar-mill which he borrowed from a grocer and cleaned as thoroughly as he could, but some remaining rust discolored his starch. Abandoning this mill, he procured a pair of granite rollers, moved upon shafts in a frame, and by these he reduced the corn to a clear pulp, by repeated passages between these rollers. When he strained and washed, and settled the starch by the mode pursued with the product of wheat, he found it so mixed with gluten, albumen, woody fibre, and other matter, that he could not separate them.

Mr. Kingsford now tried various kinds of acids, hoping to produce a separation, but without success. Then he made a solution of wood-ash lye, and added it to the mixture. That experiment was a failure, also, as were some others. Almost discouraged, but still holding on to his faith that superior starch might be procured from Indian corn, he ground another quantity, and treated the mixture with a solution of lime. Again success evaded him. He had thrown the first lot treated with a lye solution into a tub, and to that he added the last lot in the same vessel, and seemed to be at his wit's end. On entering the room a few days afterward to put it in order, he discovered, to his great joy and surprise, when he emptied the tub, a quantity of beautiful white starch thoroughly separated. He was almost overcome by his emotions of delight. He had discovered the great secret. With zeal and vigor he pursued experiments, and in the later part of 1842, he procured the first sample of starch from Indian corn fit for market. There was an unanimous decision in favor of the superiority of Mr. Kingsford’s starch over that of all other kinds then known to the trade; a reputation which it has since maintained in this country and beyond the seas. Whenever, in great exhibitions in America and Europe, Kingsford’s starch has been present, it has never failed to receive the highest prize medal.

When Mr. Kingsford’s discovery became known, and it was seen that Indian corn was a superior starch-producer, others tried to avail themselves of it, by attempting to make starch in imitation of his. These imitations were of greatly inferior quality, and failed.
Osceola Starch Factory, Oswego, N.Y.
J. Kingsford & Son.
Incorporated, 1848.
Assured of the ultimate success of his discovery, Mr. Kingsford determined to turn the knowledge into practical and profitable use. In 1846 he associated with himself his son, Thomson Kingsford, under the firm name of T. Kingsford and Son, who built a factory in Jersey City, New Jersey, where the business was carried on successfully until they removed to Oswego, New York. The value of the discovery becoming known to some gentlemen in Auburn, New York, they proposed a connection with the firm in the formation of a capital-stock company, and in 1848 the Oswego Starch Factory was incorporated under the general manufacturing laws of the State, T. Kingsford and Sons, manufacturers.

The growth of the business at Oswego has been wonderful. In 1849 the establishment manufactured 1,327,128 pounds of starch; the next five years 15,451,404 pounds; the succeeding five years 34,737,545 pounds; the five years next succeeding, 36,109,518 pounds, and the next five years 32,687,478 pounds. The next six years, which ended with 1875, the product was almost 86,500,000 pounds. The total amount produced, since 1849, is 227,031,489 pounds.

The last years of the factory operations have been at the rate of 21,500,000 pounds of starch annually, or about 35 tons a day, being by far the largest amount produced by any other starch-factory in the world, consuming about 1,000,000 bushels of Indian corn every year. To pack this immense product requires 700,000 pounds of paper and 4,000,000 feet of lumber for boxes. The business was commenced with a paid-up capital of $50,000, which has been increased from time to time until it is now $500,000. There were employed at the beginning sixty-five workmen; the average number for the last five years has been 734. The largest number employed in any one year was 1057.

There were, in 1870, 195 starch-factories in the United States, employing an aggregate of 2,072 persons of both sexes, to whom nearly $1,000,000 were paid in wages; employing a capital of $2,742,000; using materials valued at about $3,900,000, and giving a total product worth about $6,000,000. It will be seen that the Oswego Starch Factory employs one-third of all the workmen in the business. In 1875, the export of American starch amounted to 7,387,000 pounds, or a little more than one-third of the product of the Oswego establishment.

The dimensions of the main buildings of the Oswego Starch Factory in which the starch is made and packed (and which are constructed in the most substantial manner, of stone, brick, and iron) are 733 feet front, and extend back to the Oswego river 200 feet. Some portions of the buildings are seven stories in height. The river furnishes ample and inexhaustible water-power at all seasons of the year. Besides these edifices, there are others of large dimensions, such as the box-factory, store-houses, machine-shops, carpenter-
shop, and other out-buildings. There are twelve acres of floor and five acres of roof; also 38,800 panes of glass, equal to about the surface of an acre. The factories contain 689 cisterns or vats, bound by over 27 miles of hoop-iron, and containing an aggregate capacity of 3,150,000 gallons of water for the purpose of effectually cleaning the starch from every conceivable impurity. There are 48 pumps capable of raising 850,000 gallons of water each hour; six and a quarter miles of gutters for distributing the starch and water; four miles of water-pipes ranging from two inches to twenty-four inches in diameter, and 33 miles of steam-pipes for drying the starch and heating the works. There are also 7,240 feet of belting.

For grinding the corn there are 24 pairs of burr-stones, and six pairs of heavy iron rollers. There are five miles of shafting; fourteen turbine water-wheels of an aggregate of 1220 horse-power, and ten steam-engines of 845 horse-power. There are 690 sieves for straining the starch; 13 large steam-boilers, and 24 machines for packing and weighing the starch, capable of packing 72,000 packages a day. They can manufacture 70,000 packing cases each day; and 6,000 tons of coal are consumed in the works annually.

Such is now the Oswego Starch Factory, the largest in the world, having its agencies in all parts of the United States, and in many places in Great Britain, on the continent of Europe and in Australia. It is situated at the mouth of the Oswego river, in the midst of a flourishing city of about 25,000 inhabitants, on the border of Lake Ontario—a city possessing rare facilities for the transportation of products to all the markets of the earth, by water and railways.

Less than one hundred years ago there was not a starch-factory in all our broad land, excepting the domestic ones in every household, where inferior starch was made for family use, chiefly from potatoes, and sometimes from wheat. For its own protection, the establishment at Oswego has, among its workmen, a well-organized fire company, with over 4,000 feet of hose, three hose carriages, and hooks and ladders; and for the social enjoyment of the members, an elegant Firemen's Hall has been fitted up in one of the buildings.

Before the present century, starch was used almost exclusively for laundry purposes; now it is devoted to the use of print-works, paper-mills, for furniture paints, confectionery, et cetera. Prepared Corn and Corn Starch, first introduced by the elder Kingsford, are now largely employed in all kinds of culinary and baking operations. These preparations have ample certificates of their purity, and their value as wholesome food.

Now the flour of Indian corn is largely used for human food, in Europe, and its excellence and cheapness as such is becoming more and more apparent. Within a few years, the population in countries beyond the Atlantic has outran the capacity for agricultural productions, and the result has been
what an English writer foretold nearly twenty years ago, by saying: "One fact is clear, that it is to America that we must, in future, look for the largest amount of cereal produce." To supply the increasing needs of our trans-Atlantic brethren in this regard, our extending territories, embracing vast tracts of the most fertile virgin soil, are rapidly filling with industrious agriculturists, who, year after year, will add greatly, not only to the acreage of farming lands, but to the soil-products of our country.

During the fiscal year ending with June, 1873, the amount of the public land of the United States disposed of for various purposes, such as military bounty lands, homestead entries, agricultural college scrip locations, certified to rail-roads, certified for wagon-roads, lands approved to the States as swamp, certified for agricultural colleges, certified for common schools, certified for universities, certified for seminaries, internal improvement selections approved to States, Sioux half-breed scrip locations, Chippewa half-breed scrip locations, and cash sales, amounted to a little more than 13,000,000 acres. Of this amount, more than 1,626,000 acres were sold for cash. On the 30th of June, 1874, the amount disposed of during the year then ended, was about 9,532,000 acres; and the amount disposed of during the year ending June 30, 1875, was a little more than 7,071,000 acres.

This decrease in the amount of lands disposed of may be accounted for in various ways—the ravages of grasshoppers and great drouths in regions most inviting for homestead and timber-culture settlements; falling off of emigration; general depression in business, and the lack of new extensions of railway facilities into wild regions, by which markets might be reached from settlements there. The Commissioner of the General Land Office believes that the annual diminution in sales will continue, because the lands in regions of greater fertility have largely passed into the hands of private owners. Previous to 1873, there was an extreme extension of railroads into the uncultivated regions of the West. This having almost ceased, purchasers have turned their attention to the more settled portions of the country, where large tracts of land are yet found in private hands. There are yet more than 1,000,000,000 acres of public land to be surveyed and disposed of. There are vast regions which have yet been untrodden by the foot of the white man. A few years ago, when Mr. Schoolcraft was looking for the true source of the Mississippi River, he discovered an immense basin (with a lake in it forty miles in length) which, estimating the quality of the soil by the timber-growth there, he thought might produce food for a population of 80,000,000.

The Wheat crop of our country is next in importance to that of Indian corn among its cereal productions, and with our present superior methods of culture, is perfectly elastic as to quantity for home consumption, or for exportation. Our commercial statistics show that when Europe, by reason
of a short crop, or war, wanted our wheat or wheat flour, we could supply the demand to any required extent. The capacity of our farmers to meet such demands is unknown, for no requirement has discovered the limit. If foreign countries need our surplus, and are ready to pay for it, we can fully supply them. For example: in 1850, there was only a limited demand for our breadstuffs in Europe, and there were only a little more than 8,500,000 bushels of wheat exported from this country; but in the years 1854 and 1855, the period of the war in the Crimea, begun on the Danube late in 1853, we exported more than 27,000,000 bushels. It seems as if the more Europe wants, the more we have to spare, and the less required abroad, the more freely it is used at home.

Wheat was not extensively cultivated in our country until toward the close of the colonial period. Gosnold sowed some in 1602, on the Elizabeth Islands, off the southern coast of Massachusetts, but he remained there only a few weeks, and saw no harvest. It was raised in Virginia as early as 1611, but tobacco being a more profitable crop for the planters there, it very soon almost expelled wheat. Finally, at the middle of the last century, when the soil had been exhausted in Virginia by successive crops of tobacco, wheat was raised more extensively in that colony; and for several years before the Revolution, an average of 800,000 bushels of that grain were annually exported.

In 1626, the Dutch in New Netherland sent some wheat to Holland, to show what American soil could produce; and some was raised in Plymouth colony at about the same time. But it was never cultivated very extensively in New England in colonial times, owing to its being subject to blight and mildew, which rendered it a less reliable crop than Indian corn. Now, the new methods of tillage—deep plowing, good drainage, and scientific manuring—have made the wheat crop almost as certain, and quite as profitable, in New England, as that of any other cereal.

Wheat is everywhere subjected to smut, rust, injury by frost, drouth, and severe summer storms, as well as the ravages of insects. When certain of the latter, like that of the wheat-fly, appear in a wheat-growing region, there is no known remedy excepting the total abandonment of the culture of the grain until the pest disappears. Such has been the operation in the celebrated wheat-growing section of the Genesee Valley, in the State of New York. The fly appeared there about twenty-five years ago, and made the wheat crop so uncertain that the farmers turned their attention to other products, and potatoes now yield to the intelligent cultivator greater profit per acre than wheat ever did. No doubt wheat might now be raised there as profitably as formerly.

When fifty years ago the great Erie canal (which President Madison said could not be constructed with the national revenue at command, but which
through the faith and works of De Witt Clinton and others, was constructed
by the State of New York in eight years, at a cost of $9,000,000) was com-
pleted, and opened to the farmers of the West a great aqueous highway to
the markets on the sea-board, the cultivation of wheat in the virgin soil of
the lake region rapidly increased.

Considerable quantities of wheat had been raised in the rich valleys of
the Mohawk, (through which the great canal, 350 miles in length passes,) and
of the Hudson, as well as in New Jersey and Pennsylvania before the Revolu-
tion; and some exports to Europe, in seasons of scarcity, were made as
carly as the middle of the last century. But since the canals and railways,
constructed within the last fifty years, have opened the vast and rich regions
of the Ohio valley and of the great lakes, to the sea-board markets, the farmers
of the east have turned their labor and lands into more profitable uses than
wheat-growing, and have left that industry to a great extent, in the hands
of their fellow-husbandmen in “the West,” a term formerly applied to middle
and Western New York, then to Ohio, but now anywhere between the region
of the greater lakes and the Mississippi river, and the Rocky mountains or the
Pacific coast. Western cities have become the grain centres of the country.
Chicago, one of the wonders of the world in the rapidity of its growth and
importance, was in embryo in 1829, in which year it was laid out into a vil-
lage, and lots were first sold. It is on the western shore of Lake Michigan,
and at the time mentioned, only a small fort and a two or three houses of traders
were there. In 1840 the population was 4,853; in 1870, it was within about
1,000 of being 300,000, nearly one-half of it of foreign birth. It was
acknowledged twenty years ago, to be the greatest primary grain depot in
the world, and it remains the greatest grain market on the earth, that
product forming a basis of speculation there as stocks do in Wall street
in New York. It is the centre of a vast railway system, connecting the east
with the west, by full 10,000 miles of railroad, all tributary to Chicago,
which make annual profit of $40,000,000, out of full $100,000,000 of receipts.
No less than 350 trains enter and leave Chicago daily, making 700 arrivals
and departures every day. It is also the great commercial centre of the
Northwest, and in commercial importance ranks next to New York city. Its
commerce at this time is probably about $500,000,000 annually.

The total receipts of breadstuffs at Chicago this year (reducing flour to
bushels) will probably reach the amount of 100,000,000 bushels, consisting
of wheat, say 15,000,000 bushels; corn, at least 55,000,000 bushels; oats,
full 20,000,000 bushels; rye, barley, and flour. The total amount of bread-
stuffs shipped from that port in 1872, was 83,000,000 bushels, and will prob-
ably reach 90,000,000 this year. The grain is received and shipped in bulk
by means of elevators, which take it from the cars, and empty it into vessels
or other cars, by apparatus worked by steam.
There are no reliable statistics of the aggregate wheat-product of our country, previous to 1840, in which year it was 85,000,000 bushels; in 1850 it was full 100,000,000; in 1860, a little more than 173,000,000, and in 1870 288,000,000. Of this vast crop of wheat, Illinois yielded the largest amount, it being over 30,000,000 bushels; Iowa more than 29,000,000; Ohio about 28,000,000; Wisconsin a little less than 26,000,000; Pennsylvania about 20,000,000; Minnesota about 19,000,000; Michigan 16,000,000; Missouri over 14,000,000; New York more than 12,000,000; Tennessee over 6,000,000, and Kentucky, 5,700,000. When we consider there are vast tracts of fertile land in the North-west, adapted to wheat-culture, yet untouched by the tiller’s hand, we are forced to conclude that the increase of this product, in our country, in the future, will be as great as in the past, and that the yield of this important cereal—the “brain-food of the world”—will be almost illimitable.

In the handling of our cereal crops for storage and distribution, great improvements have been made within a very few years. Formerly all the grain carried in vehicles by land and water was handled entirely by human muscles. Now in this labor, the Grain Elevator, an American contrivance, performs a most important part in the commerce of our country, saving a vast amount of manual labor and money expenses. These elevators have been in general use less than twenty-five years, and first appeared on the shores of our great lakes at the centre of the grain-trade; now they may be seen at every considerable sea, lake, and river port, greatly facilitating our foreign and domestic commercial operations in grain and other agricultural products.

A model elevator is now owned by the International Navigation Company of Philadelphia, which was organized in the spring of 1871, and having constant steamship intercourse with Europe by the “Red Star” and “American” lines of ocean vessels, plying between Philadelphia and Antwerp and Liverpool, Peter Wright and Sons, General Agents.

The foreign grain-trade of Philadelphia rapidly increasing, and demanding greater facilities for the reception, storage and delivering and transferring the grain and general merchandise arriving from the interior by railways, the company purchased a large tract of land on Girard Point, at the junction of the Schuylkill and Delaware rivers, and there constructed commodious wharves and warehouses, and erected a grand elevator at the cost of $1,000,000. It is probably the largest and most complete structure of its kind in the world. It stands upon a pier worthy of its burden, 1,000 feet in length, and 250 feet in width, having docks with twenty feet depth of water, and sufficient to accommodate at one time a dozen of the largest ocean steamers, and twice that number of sailing vessels. This immense pier contains many large warehouses for the storage of grain and various
merchandise, and a refreshment saloon. The Elevator was completed in 1874, and the first grain it received was 20,000 bushels of red wheat which was sent from Milwaukee, and shipped for Antwerp.

The materials used in the construction of the Elevator are principally brick, iron, and oak wood, the best known to engineers for the construction of a substantial edifice to bear great strain. It is practically fire-proof, and the insurance on its contents is consequently low—only one and one-quarter per cent. per annum. Its foundation is composed of immense granite blocks resting upon 4,000 piles, and capable of sustaining a burden of more than 50,000 tons of merchandise in addition to the weight of the building. The latter is 200 feet in length by 100 feet in width, and is 115 feet in height to the peak of the roof. The outer walls are of brick, and surmounted by corrugated wrought iron gable ends and roof. The storage-bins are made of plate iron, supported by heavy oak timbers resting upon the granite blocks. There are 36 bins with a capacity of about 15,000 bushels each, and 23 bins that hold about 10,000 bushels each, making a total storage capacity of about 800,000 bushels, or over 20,000 tons of grain.

There are twelve elevating machines, each capable of lifting 4,000 bushels an hour, or 480,000 bushels in a day of ten hours; an amount of grain equal to more than one-half the storage capacity of the Elevator. This amount may be lifted from cars and stored each day—a greater quantity of grain than can be handled by any elevator in existence. The cars are run into the building and unloaded by steam-shovels. Tracks running each side of the Elevator hoppers admit of twenty-four cars being put in positions for unloading at the same time, so that when the first are unloaded on one side of the hoppers, work may then be commenced on the second twelve cars on the other side, while the empty cars first unloaded are being run out of the building at the other end, and by means of a transfer track are shifted to tracks upon either side of the Elevator, and put upon sidings, when twelve more loaded cars are placed in position alongside of the hoppers. By this arrangement the men working the machines are kept continually employed, and no time is lost.

The Elevator proper consists of the usual-shaped iron buckets tightly bolted to India-rubber belting and revolving upon immense pulleys at top and bottom. These are cased in iron. The hoppers from which they are fed, and into which the grain is discharged from the cars, are all made of iron, and so formed that the grain finds its way rapidly to the bottom where it is caught up by the buckets and carried aloft. The iron "legs," instead of wooden ones almost universally used in other elevators, are a great improvement, as they render the occurrence of fire from friction impossible, besides being much more durable and economical. The grain is carried in these buckets to the extreme top of the building, whence it is discharged into iron hoppers in which it is weighed and thence distributed among the storage bins.
The weighing hoppers are iron, and hold 450 bushels each, or about the contents of one car. Each elevator has two of these hoppers, making twenty-four in all and each is fitted with a Fairbanks standard scale. After the contents of a car is elevated and run into one weighing hopper, the flow of grain from the succeeding car, coming up the same elevator, is directed, instantly, by an ingenious contrivance, into the other hopper, and by the time it is all up the contents of the first hopper have been weighed and run off into a bin, and it is ready to receive the next car load. This admirable arrangement makes it easy to weigh and store the grain as fast as it can be received and elevated. The shifting-board, by which the grain is directed to either hopper, is not found in any other elevator.

The process of shifting the grain is similar to that of receiving it, excepting that when the grain is in store it is taken from the bottom of the bins through a valve, run into the Elevator hopper where it was originally received from the cars, elevated again, passed through the weighing-hoppers, weighed, and instead of being run into the bins, is run on to the shipping conveyers, which carry it to the vessel. When the grain is not stored but merely carried direct from the cars to the vessels, it does not pass through the bins as is the case in most other elevators, but being elevated and weighed, is run directly on the shipping conveyer to the vessel. These shipping conveyers are rubber belts thirty inches wide, perfectly flat, running on pulleys and rollers, receiving the grain from a small hopper fed from the weighing-hoppers, and carry it about twenty-five feet under an iron archway extending outside of the building, discharging it into an iron pipe that conducts it to the vessel. This flat belt carries swiftly along 4,500 bushels of grain in an hour, without throwing a single kernel off at the sides. Each one of these loads one vessel, so that with twelve conveyers as many vessels may be loaded at one time. The whole machinery is worked by a double engine of 400 horse-power, placed in the upper part of the building, communicating movements by means of shafting. The application of this power is so delicately arranged that the machinery may be stopped almost instantly.

The most perfect precautions against fire are employed. The boiler-house is detached from the main building, and in it are steam pumps that will throw 1,500 gallons of water a minute, higher than the building. Three large permanent water-pipes extend up into the building, and have hose attachments. Watchmen are on the alert day and night, and telegraphic attachments are made by which the watchmen may instantly give an alarm to the Fire Department in Philadelphia. These arrangements enable the proprietors to obtain insurance at a low rate, and with the facilities for the cheap transfer of grain from cars to vessels, give this Elevator and the Navigation Company who own it, great advantages over others. Situated as the warehouses and Elevator is upon tide-water, the terminus of steam-ship navi-
uation, and connected by railways with all the grain-growing regions of the country, this company promises to make Philadelphia one of the greatest grain-markets of the world. The advantage to owners of property stored in those warehouses is, that they may, at all times, and at any season of the year, have the choice of home or export demand. This Elevator affords greater facility than any other to each medium of transportation, for speedily unloading vessels or cars, and quickly releasing them for further duty.

In connection with the great work herein delineated and described, may properly be mentioned the facts that the harbor at the Delaware Breakwater is one of the finest on the Atlantic sea-board: that it is directly in the track of commerce between the Northern and Southern States and South America, and convenient as a port of call for vessels from Europe seeking freight. There is telegraphic communication from the Breakwater to all parts of the world. Philadelphia is nearer than any other port, to the producing centres of the country, taking Chicago as a basis.

The American agriculturists and ship owners now control the wheat markets of the world. Hitherto the productive region of Southern Russia, on the borders of the Black Sea, was the great store-house from which Western Europe might draw a supply of food when short crops required, and Odessa was the great wheat-mart in the East. Now, the superiority of the Americans over the Russians, in the raising and transportation of wheat to Western Europe, is certified and practically acknowledged by events of the day. Our exports of wheat to Great Britain alone, in 1875, were fifty per cent. of the whole foreign supply, while that of Russia was only twenty per cent. This competition is working disastrously upon the agricultural interests of Russia and other wheat growing countries abroad. Our total exports of wheat amounted, in 1875, to more than 53,000,000 bushels of grain, and nearly 4,000,000 barrels of flour.

Until within the last fifty years, Rye was extensively used in our country for bread, but wheat has since so largely taken its place on our tables, that a comparatively small crop is now raised. It was formerly used more extensively for distillation and the manufacture of malt liquors than now. In the early period of the colonization of New England, it was raised there, and the flour was mixed with the meal of Indian corn, in making bread.

The early Scotch-Irish settlers in Western Pennsylvania, cultivated this grain quite extensively, for it furnished them with food and an article for barter. But it was bulky and cheap. Their surplus, for commerce, had to be carried over the Alleghany mountains on the backs of horses or mules, to find a market. In this way, only four bushels could be carried on one animal. Twenty-five bushels could be carried in the form of whiskey, and as neither conscience, nor church, nor state (as in the "old country") interposed, they erected distilleries. They understood the business, for they
were descended from a whiskey-making, whiskey-loving people. All their rye crops, excepting what they used for food, were made into whiskey; and as early as the close of the war of the Revolution, many a horse was seen going eastward over the Alleghanies, with twenty-five bushels of rye on his back in the shape of "Old Monongahela." Finally the excise-laws of the new government reached that region in their operations. The people resisted the tax, and the famous "Whiskey Insurrection" broke out in 1794.

Rye is still a profitable crop in some sections of the country, especially in the Middle and Eastern States, not only for its grain, but for its straw, the latter being now generally used for bedding for stalled horses and in the manufacture of paper. The rye crop has been fluctuating, in its annual production, between 14,000,000 and 21,000,000 bushels, for about thirty-five years. In 1840, it was less than 19,000,000; in 1850, a little more than 14,000,000; in 1860, about 21,000,000, and in 1870, nearly 17,000,000 bushels. In 1874, the amount was greater, and we exported more than 1,500,000 bushels. During the fiscal year ending in June, 1875, the amount exported was only about 207,000 bushels. The largest crop of rye raised in 1870, was in Pennsylvania, which amounted to over 3,500,000 bushels. New York was the next largest producer of this grain, its crop being nearly 2,500,000 bushels. Illinois had then become a large producer of rye, its crop being only about 22,000 bushels less than that of New York. In the amazingly fruitful year in the cereals, of 1860, Pennsylvania raised about 5,500,000 bushels of rye; New York, 4,787,000 bushels; but Illinois yielded only a little more than 951,000 bushels.

The Oat crop in our country is an important one. As it is nearly all consumed as food for our domestic animals, it does not make a conspicuous figure in our commercial statistics. The yield in 1840, was a little more than 123,000,000 bushels; in 1850, it was almost 146,600,000; in 1860, it was 172,600,000; and in 1870, over 282,000,000. This grain was introduced here by the early English colonists, and has been cultivated ever since. For some years previous to the year 1820, it was so abundant, that about 70,000 bushels were exported annually. More than 800,000 bushels were exported in 1875. The State of Illinois produced the largest quantity in 1870, the amount being almost 43,000,000 bushels. Pennsylvania gave us 36,500,000 bushels; New York, 35,300,000; Ohio, 25,300,000; Iowa, 21,000,000; Wisconsin, 20,000,000; Missouri, 16,600,000; and Minnesota, 10,700,000.
CHAPTER XI.

O UR Barley crop is not a very extensive one compared with the other cereals, the whole product in 1870 being only about 30,000,000 bushels. Of this quantity, Colorado was the greatest producer, the amount raised there in that year being almost 9,000,000 bushels. New York raised about 7,500,000 bushels, and Illinois 2,500,000 bushels. This grain was raised in small quantities by the early settlers. Some samples of the grain raised in New Netherland were sent to Holland in 1626. At the close of the last century, it was the chief agricultural product of Rhode Island. It has ever since been largely cultivated in that State, the product of 1870 being 33,500 bushels, while its rye crop was only 20,200 bushels, and its wheat crop only about 800 bushels. Its potato crop that year was its largest winnings from the soil, being 651,000 bushels.

The barley crop in our country is largely used in the manufacture of beer or ale, the amount exported in 1875, having been only about 91,000 bushels. This grain was used by the ancient Hebrews in the making of bread, and it was the principal cereal product of Judea in the time of the Redeemer. Herodotus tells us that the ancient Egyptians made their wine of barley—evidently a fermented liquor made from malted grain, that is, the barley steeped in water until it germinated, and then dried in a kiln, thus evolving the saccharine principle. Tacitus says such beer was in common use among the Germans and Gauls. Aristotle speaks of its use in Greece as an intoxicating drink, and Theophrastus calls it "the wine of barley." It was a favorite beverage among the Saxons and Danes who invaded England, and who brewed it from barley very much as their Anglo-Saxon descendants do now. It was described by an old writer as "a pleasant, warming, strengthening, and intoxicating liquor." It inspired Burns to write the mournful drama of "John Barley-corn, and the three Kings," in which the treatment of the grain in malting from the threshing to the drying, is thus alluded to:

"They laid him down upon his back,  
And cudgelled him full sore;  
They hung him up before the storm  
And turned him o'er and o'er."
They filled up a darksome pit
With water to the brim;
They heaved in John Barley-corn—
There let him sink or swim.

They laid him out upon the floor
To work him farther woe;
And still as signs of life appeared,
They tossed him to and fro.

They wasted o'er a scorching flame
The marrow of his bones;
But a miller used him worst of all,
For he crush'd him 'tween two stones.

The number of breweries of malt-liquors in our country in 1870, was 1972, and their product amounted in value to about $55,707,000. There are now probably 2,000 of them. They employed about 12,800 persons, who received in wages $6,759,000, and consumed materials valued at over $28,177,000. Only one brewery in the United States at that time, produced over 100,000 barrels of ale in a year. The Germans make a distinction between ale and beer, the former being produced by rapid fermentation, in which the yeast rises to the surface, while the latter is fomented in cool cellars by a slow process in which the yeast settles to the bottom of the vessels. This is the Bavarian method employed in making Lager-Beer, an industry that has been introduced into our country mostly within the last twenty-five years. In both methods the same materials are used, namely, barley, hops, and water. The process consists in producing a saccharine extract from barley, to which is added hops for flavoring and preserving it, and causing it to undergo vinous fermentation. Precisely in what manner the hop performs its functions has not been satisfactorily explained, nor has there ever been found a substitute for it. The English ale brewers prefer very "hard" water, containing large quantities of earthy sulphates; while the brewers of Bavarian or Lager Beer prefer "soft" water, or which contains less mineral matter. The fermentation of Lager beer occupies a much longer time than that of common ale, the latter occupying only six or eight days, while the other requires from four to six weeks.

The wort, which is prepared very much in the same manner as for other beer, is pumped from the hop back into the shallow coolers in the upper story of the brewery, and is reduced either in them or afterward, by passing it over the refrigerator, to about 45°. It then passes into the fermenting vessels, placed in cool cellars having a temperature of from 40° to 45°. The yeast is stirred into the wort, and in the course of two or three days the fermentation begins.
I believe the ale-brewery that has been longest in existence in this country, and which at one time, was the most extensive, producing 30,000 barrels of liquor a year, is that of M. Vassar & Co., at Poughkeepsie, New York. It was established at the beginning of the present century, by the father of Mathew Vassar, the founder of Vassar College for women, and was successfully carried on by Mathew and his nephews. The latter still pursue the business under the old firm name.

Probably the most extensive brewery of ale and porter, in the United States, at this time, is that of William Massey and Co., situated on Filbert and Tenth streets, Philadelphia, and occupying about 300 feet on the former and 150 feet on the latter. It was founded in 1822, by the farmers of Chester and Delaware counties, to provide a market for their barley crops and to secure a supply of "grains"—malted barley—to feed their milch-cows with in the early spring, late autumn, and winter. The project failed, and the establishment was sold to the "Brewers' Association of Philadelphia," who afterward sold it to Mordecai L. Dawson, a member of the Association, whose ancestors had been prominent in that business for eighty years.

Mr. Dawson conducted the business successfully for several years, until in 1849 he disposed of it to Poultnet, Collins & Massey, who continued it until 1854, when, by the withdrawal of Collins, the firm became Poultney & Massey, who greatly enlarged the establishment the next year. Several changes in the proprietorship, and enlargements of the establishment now took place, and in 1869 the firm took the name of William Massey & Co. In 1875, Mr. Massey became sole proprietor, and conducts it under the old firm name of William Massey & Co.

The establishment has grown in capacity, from the production of 20,000 barrels of ale and porter in 1850, to 113,000 barrels in 1873. In that year was its maximum production. In the manufacture of that amount, 250,000 bushels of barley and 125 tons of hops were consumed. The cellars and vaults are extensive. Besides furnishing storage room for a large quantity of ale and porter in casks, they contain 74 vats, with a capacity of from 100 to 300 barrels each.

The group of buildings of this great establishment comprise the largest malting and brewing works in Pennsylvania, if not in the Union. The capacity of the brewery is now about 200,000 barrels, and of the malt-houses 250,000 bushels of barley. Mr. Massey employs 130 men, and his pay-roll is $65,000 a year. The value of his product, annually, is about $1,000,000.

Alsop and Sons, Burton, England, employ 1,300 persons, of whom 100 are clerks. Their two breweries are capable of producing 16,000 barrels of
ale a week. The new brewery covers forty acres, and the ground is traversed by twelve miles of rail.

The most extensive establishment for the brewing of Bavarian beer, is the George Ehret Hell Gate Lager Beer Brewery, in the city of New York, George Ehret, proprietor. It is situated on Ninety-second street, between Second and Third Avenues, not far from the ferry to Astoria at the foot of that street.

It was founded by Mr. Ehret in 1866. His first brewing was in January, 1867, when he employed eight men, two wagons, and five horses. At the present time he employs from ninety to one hundred men, thirty-five wagons, and thirty horses.

In September, 1870, this establishment was entirely destroyed by fire. It was rebuilt on a much larger scale, and the first brewing in the new buildings was late in January, 1871. The sales that year were 33,572 barrels. From that time the business has rapidly increased. In 1872, the sales were 56,020 barrels; in 1873, they were 74,497 barrels; in 1874, they amounted to 101,050 barrels; and in 1875 they were 130,000 barrels. This was the largest amount of beer ever brewed in the United States by one establishment. This product is sold extensively in barrels and bottles in almost every State in the Union.

The buildings of the Hell Gate Brewery now cover nearly thirty-two entire city lots, and further extensions will soon be made. The greater part of the machinery is propelled by a thirty horse-power steam engine, which is to be replaced by a larger one.

The present storage capacity of the cellars is about 45,000 barrels, and they are kept cool in summer by ice placed above the cellars, in ice houses occupying an area of 200 by 75 feet, and containing 5,000 tons of ice. The consumption of ice during 1875 was about 15,000 tons. The quantity of malt brewed during that year was over 300,000 bushels; this year it will be about 400,000 bushels. During the same year the establishment consumed 1,500 tons of coal, being kept in operation day and night.

The Buckwheat crop in our country is not increasing in proportion to the increase in population or the product of other grain. It is generally a profitable crop, not only as an article of merchandise, but as a cleanser of land of weeds, and fitting it for new seeding with timothy grass or clover. The crop in 1850 was 9,000,000 bushels; in 1860—the fruitful year for cereals, it was over 17,500,000 bushels, and in 1870 nearly 10,000,000 bushels. The Dutch introduced this grain here, and it was first cultivated on Manhattan island, about the year 1626. They used it solely as provender for their horses. It was also cultivated by the Swedes on the Delaware. New
George Ehrets
Hellgate Lager Bier Brewery
92d & 93d Sts. betw. 2d & 3d Aves. N.Y.
York produced in 1870, about 4,000,000 bushels, and Pennsylvania over 2,800,000. No one of the other States yielded over half a million bushels.

Rice, one of the most abundant articles of food for man, in warm climates—next to wheat in the extent to which it gives sustenance to the human race—has held an important place in the cereal productions of our country from the beginning of the nation. Cultivated in India and China, and the islands off the coasts of Asia from immemorial ages, its birth-place is unknown. It consists of a vast number of varieties; and in our country it is cultivated as far north as Virginia and Illinois. It flourishes best in marshy places, where it may be overflowed, hence the most abundant rice crops are found along the low shores of the sea, or in tide-water swamps. There is a kind of upland rice that is also quite extensively cultivated in the southern portions of our republic.

Rice grows upon stalks like wheat, and at about the same average height. It is cut with a sickle, bound in sheaves, and placed in small stacks to cure, when it is removed to barn-yards and put in stacks that will yield from 200 to 400 bushels of the grain. Until early in the present century, the grain was beaten out with a flail in our country. Mills for the purpose had been used in England as early as 1780, but the first one seen in the United States was brought from Scotland in 1811. It was run by wind, and threshed and winnowed about 500 bushels each day. In 1829, Calvin Emmons, of New York, invented a rice mill, which is now generally used. From the rougher milling the grain passes into another process—a sort of grinding—by which the grain is freed from the hulls and so made ready for the market.

The growth of rice culture in South Carolina was the measure of the increase of the slave population by importations. When the Carolinas resolved to make that culture an important pursuit it was necessary to remove the cypress forests. To do this required a great number of laborers. These were imported from Africa year after year as the area of rice culture spread. In the year 1738, there were full 40,000 negro slaves in South Carolina. That year 90,000 barrels of rice were imported. The culture increased and so did the slaves, until the breaking out of the Civil War, when about 900,000 acres of rice lands were under cultivation.

Our rice product has been diminishing for several years, and it almost ceased during the Civil War. It has not since recovered from that blow, and our importations of this cereal have been quite extensive. The yield of our rice-fields in 1850 was a little more than 215,300,000 pounds. In 1860 it was a little less than 187,000,000 pounds; and in 1870 it was about 74,000,000. In 1874 we imported foreign rice in quantity about equal to our entire crop, and in 1875 we received from abroad about 60,000,000 pounds. It may again become a large industry.

The Potato is one of the most important food products of our soil. It is
believed to be a native of South America where, in Peru and Chili, it is
found growing wild. From these, new and hardy varieties have been pro-
duced in our country, notably the Goodrich, the Garnet Chili, and the Early
Rose. These are results of experiments with the South American potato by
the late Rev. C. E. Goodrich, of Utica, New York. There are now several
other excellent varieties known here, the product of careful culture.

The early Spanish adventurers in South America, carried the batatas (the
Spanish name for the sweet potato,) from Quito, among the loftier Andes,
to Spain, from which it was doubtless taken to North America by Narvaez
or De Soto, who attempted the conquest of Florida. The Spaniard did not
find it cultivated in Mexico or in our country by the aboriginal inhabitants,
and the Castilians undoubtedly informed the Indians of the Carolinas of its
use. When Raleigh's navigators reached Roanoke Island they found the
potato under cultivation there by the natives; and these seamen carried it to
England in 1586. At the same time, it having been taken into Italy from
Spain, it had become common food for the people there. From Italy some
were sent into Flanders in 1588, but their cultivation was very slowly intro-
duced into other parts of Europe. Even in Ireland, where, at times, within
the last thirty or forty years, the potato has been the chief dependence of
the people for food, it was very little cultivated a hundred years ago.

The sweet potato, which was cultivated by the Chinese many centuries
ago, was found in the West Indies by Columbus, and was among the
presents which he carried to Queen Isabella. It is a different plant from the
common potato, being of the convolvulus family, and its flower is very much
like that of the morning-glory. It is largely cultivated in latitudes as high
as Southern New Jersey, although it is only a few years since its cultivation
was scarcely attempted north of Virginia. It is now regarded as a profitable
crop in Ohio, Illinois, and other Western States. Only a few years ago the
northern markets were chiefly supplied by the Carolinas and Georgia. Their
supplies are now largely found in New Jersey.

The total production of the sweet potato in our country in 1870 was
nearly 22,000,000 bushels, of which amount North Carolina produced over
3,000,000 bushels; Georgia more than 2,600,000, and Texas over 2,000,000.
The sweet potato has much more sugar and less starch than the common or
"Irish" potato, as it is called. The latter is composed largely of starch, and
it is used very extensively in our country in the production of the starch of
commerce, of which, as already mentioned, over $6,000,000 worth of various
kinds is annually manufactured in the United States. In 1875, over
7,300,000 pounds of starch, valued at $442,600, were exported. The entire
yield of the "Irish" potato in 1870 was 143,300,000 bushels, of which amount
the State of New York gave 28,500,000 bushels; Pennsylvania about
13,000,000; Ohio and Illinois about 11,000,000 each; Michigan 10,300,000:
Maine nearly 8,000,000; Wisconsin over 6,600,000; Iowa about 6,000,000; Indiana 5,400,000, and Vermont about 5,000,000 bushels.

The tobacco plant is an important agricultural production of our country, and makes a conspicuous figure in our commercial statistics. It was unknown to Europeans before the discovery of America. When Columbus landed upon Cuba, a native chief politely offered him a cigar. Later adventurers found it almost everywhere on the main-land in North and South America, where it was smoked in pipes made of reeds or baked earth. The more ancient inhabitants of our continent so used it, for in the mounds, perhaps built by pre-historic races, tobacco-pipes of earth are found. The old Peruvians used it only as snuff for medicinal purposes. It was cultivated and smoked by the natives of Virginia and the Carolinas when Raleigh's vessels visited the American coasts; and some carried by them to their employer, was the first that was seen in England. They took Indian pipes with them; and Raleigh first smoked the plant, and taught his Queen (Elizabeth) to do so. One day, while he was a court favorite, he laid a wager with the Queen, that he could tell her the exact weight of the smoke that arose from her pipe. He won it by first weighing the tobacco put in its bowl, and afterward weighing the ashes that remained; the difference was the weight of the smoke. "It is the first time," said the Queen, as she put coin into the courtier's hands, "that I ever knew smoke to be turned into gold."

The most peculiar action of the prepared tobacco plant as it is generally used, is as a sedative narcotic, calming mental and bodily restlessness, and producing a state of delightful languor and repose most agreeable to those accustomed to its use. This has made its use very extensive, and elicited the poet's apostrophe:

"Thy quiet spirit lulls the lab'ring brain,
Lures back to thought the flights of vacant mirth,
Consoles the mourner, soothes the couch of pain,
And breathes contentment round the humble hearth;
While savage warriors, soften'd by thy breath,
Unbind the captive hate had doom'd to death."

The use of tobacco has been the theme of praise, censure, ridicule, and denunciation, and caused legislative prohibitions, and excommunications by ecclesiastical authority. The vicious King James the First of England, whom Dickens described as "cunning, covetous, wasteful, idle, drunken, greedy, dirty, cowardly, a great swearer, and the most conceited man on earth," wrote against its use in 1616, saying it was "a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black, stinking fume thereof nearest resembling the Stygian..."
smoke of the pit that is bottomless." Eight years afterward Pope Urban VIII. issued a decree of excommunication against all in the Christian church who took snuff and persisted in it.

In 1634, the smoking of tobacco in Russia was prohibited under the penalty of having the nose cut off; and in some other countries, the forfeiture of the lands of the cultivator of it, was the penalty. But the wiser Richelieu, the great French minister, imposed a duty upon it, and so swelled the revenues of France. Louis the Fourteenth farmed out its culture and trade to one individual for $145,000 a year. This consideration was increased; and at the beginning of our old war for independence, the revenue from that source alone, to the French government, was $5,500,000 a year. The revenue from the same source, to the French government, must now amount to full $25,000,000 annually. Great Britain probably derives a revenue from its duties on tobacco, about equal to that of France.

The English emigrants to Virginia found the cultivation of the tobacco plant more profitable than anything else. John Rolfe, who married Pocahontas, was the first European who tried to cultivate it there. The successful experiment was made in 1612, and very soon tobacco was seen filling the farms and gardens of the settlers. It became the staple and the currency of the colony. Goods were bought and sold for so many hogsheads of tobacco. When, in 1620, ninety young women, "pure and uncorrupt" were sent from England to Virginia to become wives of the planters, they were sold to the young men who chose them for a specified number of hogsheads of tobacco, some more, some less, according to their personal attractions. An Indian, with a bunch of tobacco leaves, became the symbol of Virginia.

So early as 1622, the annual tobacco product of Virginia was 60,000 pounds. Within twenty years afterward, it was 120,000 pounds. As early as 1646, its cultivation was introduced among the Dutch of New Netherland. Before the war of the Revolution, it had extended into Maryland, the Carolinas, Georgia, Louisiana, and Kentucky, and America gave almost the entire supply to Europe, a hundred years ago. But at that time the product of an acre was less than it had been, owing to the exhaustion of the soil by successive crops without any compensating manures. Yet between 1744 and 1776, the export of tobacco from this country averaged 40,000,000 pounds a year.

Within the last fifty years, the cultivation of tobacco in the United States has increased in geographical area and the amount of production. It has become a prominent crop in Massachusetts and Connecticut, the former producing, in 1870, over 7,313,000 pounds, and the latter more than 8,328,000 pounds. The entire product of the United States in that year, was almost 263,000,000 pounds. Kentucky has become the greatest tobacco
region of the Union. It gave us, in 1870, over 105,300,000 pounds. Virginia and West Virginia, (formerly the “Old Dominion”) together yielded a little over 39,000,000 pounds; Tennessee was the next largest producer, its yield being 21,500,000 pounds; Ohio gave us about 19,000,000; Maryland 16,000,000; Missouri 12,320,000; North Carolina 11,000,000; Indiana 9,325,000, and Illinois 5,250,000. The State of New York produced 2,350,000 pounds, and Pennsylvania about 3,500,000 pounds. The fruitful year for the farmer, 1860, gave a total product of over 434,000,000 pounds, or 171,000,000 more than in 1870.

Our exports of tobacco, in leaf, cigars, and snuff, in 1875, were about 224,000,000 pounds, of which amount all but 22,336 pounds were in leaf. Our importation of tobacco, in 1875, principally from Cuba, amounted to over 7,624,000 pounds. The total value of tobacco exported in 1875, was $2,118,000.

It has been estimated that the amount of tobacco consumed annually by the whole human family, reckoning 1,000,000,000 souls, is 2,000,000 tons, or 4,000,000,000 pounds—70 ounces a head. It has also been estimated that the annual production of tobacco weighs as much as the wheat consumed by 10,000,000 Englishmen; and that its money value is as great as that of all the wheat consumed in Great Britain.

The Hop culture has become a considerable agricultural industry in our country. The production has very much increased within thirty years. The entire crop, in 1840, was 1,238,000 pounds; in 1850, it was 3,500,000 pounds. In 1860, it was about 11,000,000 pounds, and in 1870, a little less than 25,500,000 pounds. This plant was introduced into New England, New Netherland, and Virginia, at an early period of their respective settlements. Its cultivation was encouraged by legislative action in Virginia, in 1657, yet down to the beginning of the present century, the annual product in this country was very limited. In all New England, the annual average did not then exceed 40,000 pounds.

The methods used in preparing the hops for market were very defective, and made the American crop inferior to that of any other country. They were dried by wood fires until near the close of the last century, which browned and smoked them. In 1791, they were first dried by a charcoal fire, and so beautiful was the result, that the demand for American hops rapidly increased, prices rose, and for awhile hop culture became a mania. Cuttings for plants brought enormous prices. In 1797, a new method of packing was introduced. Before that time, they were carelessly packed in common round bags, and became crushed and injured. At the above date, square bales with screws were first used, and the advantage to the crop was very great.
The State of New York is by far the greatest hop-producing region in our country. Its crop in 1870 was more than two-thirds of the entire product of the Union—more than 17,500,000 pounds. Wisconsin stood next to New York, its crop being 4,630,000 pounds. Michigan produced over 828,200 pounds, and Vermont, 528,000 pounds. California is becoming quite an extensive hop-growing State, its product, in 1870, being 625,000 pounds. Massachusetts, which was, at the beginning of this century, the leading producer of hops, gave us only about 62,000 pounds.

Our Sugar product, from the cane, is much less than it was before the late Civil War. In 1850, it was 247,500 hogsheads. In 1860, it was 231,000 hogsheads, and in 1870, only 87,000 hogsheads. The maple sugar product has fluctuated since 1850, and in 1870 it was less than in former years. In 1850, it was 34,254,000 pounds; in 1860, over 40,000,000, and in 1870, it was 28,500,000.

The amount of molasses manufactured from cane decreased more than one-half between 1860 and 1870. In the former year it was about 15,000,000 gallons, and in the latter it was 6,500,000 gallons. The molasses product of the maple was 1,600,000 gallons in 1860, and only 920,000 gallons in 1870. Our importations of foreign sugars have materially increased. In 1875 we imported 1,700,000,000 pounds of brown sugar; about 15,250 pounds of refined sugar; about 102,000,000 pounds of molasses and syrup of sugar-cane; and over 49,000,000 gallons of molasses. The value of the sugars imported, was about $70,000,000; of the syrup of cane, over $717,000, and of molasses nearly $2,200,000.

The sugar-cane was cultivated in Asia in the remoter ages, especially in China, from which we have received the Sorghum plant. It is probably referred to in the Old Testament, as the “sweet calamus” or sweet cane, but we have no account of the manufacture of sugar from the boiling of the cane before the 5th century. The Saracens introduced it into Sicily and the eastern islands of the Mediterranean sea. The Crusaders found the cane abundant in Syria, and it was cultivated in the countries of the Levant. The Moors carried it into Spain, from whence it was taken to the Canary islands. It was wafted from there across the Atlantic ocean to Brazil, where it may have been growing wild.

Sugar was made from the cane in the West India islands, before Columbus had concluded his voyages; but it was not cultivated in our country before the middle of the last century. About the year 1751, some plants were sent by Jesuits from San Domingo with negro slaves, to the banks of the Mississippi, just above New Orleans, where some of their brethren began its cultivation. The first sugar mill was constructed on the plantation of M. Debruieul, a little further down the stream, about the year 1758, but the juice of the cane was not converted into sugar until 1764. The business was
so prosperous, that in 1770 sugar was the staple product of that region of country.

When Louisiana was ceded to Spain, sugar-making seems to have ceased there, and no mention is made of that product until 1791, when the first sugar-house, under the Spanish government, was erected by M. Solis in the parish of St. Bernard. But the business increased so slowly, that at the beginning of the present century, when Louisiana was purchased by the United States, there were very few sugar-mills in that province. In 1818 the crop amounted to about 25,000 hogsheads, up to which time, and later, cattle gave the motive power for the mills. Steam power was introduced in 1822.

The sugar-cane is cultivated in Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North and South Carolina, Tennessee, and Texas. Louisiana is the chief cane sugar producing State. Of the 87,000 hogsheads of sugar produced in 1870, nearly 81,000 were made in Louisiana. In 1874 there were 1,224 sugar houses in that State, of which number 907 used steam power. Sugar is also produced in large quantities from the juice of the hard maple tree. Its manufacture from this substance began in New England at the middle of the last century, and thence it extended through the wooded portions our country, where the sugar maple abounds, particularly in New York, Pennsylvania, Michigan, and Ohio. In that branch of industry, Vermont takes the lead. Its maple sugar product in 1870 was about 9,000,000 pounds (nearly one-third of the whole); and 12,000 gallons of molasses were manufactured in that State from maple sap. Ohio produced a little over 2,000,000 pounds of maple sugar, and about 353,000 gallons of molasses.

The cultivation of the *Sorghum* plant since its introduction into this country in 1856, for the production of molasses, has become quite extensive, especially in Ohio, Indiana, Illinois, Iowa, Missouri, Kentucky, and Tennessee. The entire product of Sorghum molasses in 1860 was about 7,000,000 gallons, and in 1870 over 16,000,000. Ohio and Indiana were the larger, and about equal producers, each giving us about 2,024,000 gallons.

The refining of cane sugar and molasses has become an extensive industry in our country. The number of establishments devoted to this purpose, in 1870, was fifty-nine, of which eighteen were in New York and fifteen in Pennsylvania. This business was begun in New York before the old war for independence, in immense buildings owned by Livingstons, Van Cortlandts, and Rhinelanders. These buildings were used by the British during the Revolution as prisons for captive Americans taken in battle.

In 1870 the fifty-nine sugar refining establishments employed 4,600 persons who received annually over $3,177,000 in wages. The number of pounds
of sugar refined that year was about 804,500,000, valued at about $44,351,000. The amount of molasses refined was 24,000,000 gallons, valued at $7,749,000.

A model establishment for sugar refining is that of the Revere Sugar Refinery at East Cambridge, Massachusetts, owned by Messrs. Nash, Spaulding and Company. It was established in December, 1871, since which time extensive additions and improvements have been made in its machinery and capacity. The buildings of this refinery front on Water street, and there is also a front on Miller's river. The daily product of the establishment is now about 600 barrels of refined sugar, but it has a capacity for producing 800 or 900 barrels each day.
CHAPTER XII.

The fibrous products of our soil are chiefly Cotton, Wool, Flax and Hemp. The cultivation of Jute has been practiced to some extent, with a prospect of complete success, particularly in California. The demand for it in the manufacture of gunny-cloth and other coarse fabrics is rapidly increasing. In 1875 we imported more than 112,000 tons of raw jute, against 40,200 tons the year before. The history and extent of our cotton and wool product have already been considered, the former from page 59 to page 64, inclusive, and the latter from page 106 to page 108 inclusive.

The cultivation of Flax was introduced into this country by the earlier settlers everywhere. The New England colonists raised both flax and hemp; so also did those of Virginia. The Dutch sent some flax, raised in New Netherland, to Holland, so early as 1626; and from that time until toward the middle of the last century, it was cultivated here only for domestic manufacture.

Hemp was also raised in considerable quantities in New York, New Jersey and Pennsylvania, a hundred years ago, and flax-seed was then an article of some importance in the commerce of the country. In 1770, the amount of that seed exported from the colonies was 312,600 bushels. The export decreased slowly for twenty years. In 1790 the United States exported 292,400 bushels; in 1800 a little less than 290,000 bushels, and in 1810 about 240,500 bushels. After that the cultivation of flax and hemp was extended, especially in Kentucky, for the manufacture of cordage, bagging, et cetera. As early as 1810, hemp had become a staple crop in Kentucky.

In 1840, our total product of flax and hemp was 97,281 tons. In 1850 the product was 7,710,000 pounds of flax, 34,871 tons of hemp, and about 563,000 bushels of flax-seed. In 1860 the crop was 4,720,000 pounds of flax and 74,500 tons of hemp; and in 1870 about 27,133,000 pounds of flax and 12,746 tons of hemp.

The Silk-culture and manufacture is becoming an extremely important branch of our national industry. Silk is the product, chiefly, of the caterpillar of the mulberry-tree moth. Ages before any mention was made of silk by Western writers, its growth and manufacture was com-
mon in the East—Farther India. Centuries before Christ it was a staple product of China. When the Romans invaded Parthia, and in battle subdued some legions of these Asiatics, they found among the flags taken from the enemy, several made of silk. As Rome extended her conquests eastward, her army leaders became acquainted with this beautiful product of China. That product found its way into Italy, although it was actually worth its weight in gold, ounce for ounce. The extravagance of both sexes in wearing it, finally caused sumptuary laws to be made to check the evil, and the Persian monopoly of the trade with the East, was assailed by the Romans, but without success. It was then supposed that silk was a down gathered from the trees in China; but its true character was unfolded in the year 530, when two Persian monks, who had learned the art of silk-culture and manufacture in China, carried their knowledge to Rome, and laid it at the feet of Pope Boniface the Second. They had borne silk-worms' eggs in a bit of hollow bamboo, and when they were hatched, the worms were fed on the leaves of the common black mulberry.

So the silk-culture was introduced into Europe. It flourished among the Greek islands, and in time spread to Sicily, where silk was raised and the art of spinning and weaving it was established by Greek captives, at the middle of the twelfth century. A knowledge of the art of silk-weaving passed into Italy, where the products of the loom soon rivalled, in plain fabrics, those of the East.

Charlemagne, early in the ninth century, sent two silk vests, which came from Persia, to the King of Mercia, in Great Britain, the first fabric of the kind ever seen on that island, unless upon some Italian woman during its Roman occupation. The Moors introduced the silk-culture into Spain; and when Ferdinand and Isabella took Granada from them in 1492 (the year when Columbus discovered America), silk-manufacture was carried on there quite extensively.

The business had already been introduced into France, where Henry the Fourth caused mulberry trees to be planted and silk-worms to be propagated in all parts of his kingdom. That country supplied England with silk fabrics. James the First made an attempt to establish the manufacture of silk in his dominions, but failed. In the reign of James' grandson, Charles the Second, it had become an important English industry, employing about 40,000 persons in the realm. The revocation of the Edict of Nantes caused a large immigration of skilled workmen into England from France. Among these were many silk-weavers who established manufactories in England.

Thomas Lombe, a London merchant (afterward Sir Thomas), went to Italy disguised as a workman, learned the trade of "throwing" silk by machinery, bribed an Italian workman to go with him to England, and at
Derby he set up a mill for manufacturing organzine or twisted silk-thread, in 1718, which turned out 320,000,000 yards each day. His mill was modeled after that of the King of Sardinia.

James the First tried to establish the silk-culture in his American colonies, but failed. He sent silk-worm eggs to Virginia, where the caterpillars hatched from them fed on the common black mulberry-leaf, which was indigenous there. He offered a bounty for silk cloth manufactured in Virginia, but tobacco, which he detested, was more profitable to the planters, and they let the worms die. But in the reign of Charles the Second, some silk fabric was sent from Virginia to that monarch, which he acknowledged by a letter in 1668. The business seemed to be very insignificant at that time and afterward.

The "Company of the West" introduced the cultivation of silk into Louisiana early in the last century; and the business was encouraged in Georgia, to which province artisans were sent at the beginning of the settlement. General Oglethorpe took eight pounds of Georgia raised cocoons to England in 1734. Sir Thomas Lombe manufactured it into organzine, and of this product the British Queen Caroline had a gown made in which she appeared at the court levee on her husband's birth-day. The cultivation of silk continued in Georgia until the period of the Revolution, under the fostering stimulant of bounties offered by the government, and by the Society of Arts in London. When, in 1766 these bounties were withdrawn, and the price of silk reduced one-half, the business rapidly declined. The product of Georgia in 1766 was only 20,000 pounds; the product in 1770 was only 290 pounds. The last lot of Georgia silk was offered for sale in 1790.

Silk was cultivated and manufactured in New England, before the Revolution. The first silk coat and stockings of New England production, were worn by Governor Law of Connecticut, in 1747; and three years afterward his daughter wore the first silk dress of domestic manufacture. In 1766 Dr. Aspinwall established a manufactory of silk at Mansfield, in Connecticut. He sent half an ounce of mulberry seed to every parish in the province, and the legislature offered a bounty on mulberry trees and raw silk. The business took firm root in Mansfield, and has continued until our day. In 1788 a company was incorporated by the Connecticut legislature to manufacture silk cloth, and the same year President Stiles of Yale College appeared at the college commencement in a gown woven from Connecticut silk.

In the autumn of 1789, Washington made a short tour in New England. In his diary at that time he mentions seeing the white mulberry growing, "raised from the seed to feed the silk-worm." He also saw samples of lustring "exceedingly good," he wrote, "which had been manufactured from the cocoons raised in this town, and silk thread very fine. This, except the weaving, is the work of private families, without interference with other
business, and is likely to turn out a beneficial amusement. In the township of Mansfield they are further advanced in this business."

Other manufactories sprang up in Connecticut and other parts of New England after the Revolution, and in some places a considerable quantity of thread and light manufactures of silk was produced. In Ipswich, Massachusetts, 40,000 yards of silk and thread lace were made in the year 1790. In New York, New Jersey, and Pennsylvania, early attempts were made to establish this industry. So early as 1769, the American Philosophical Society, of Philadelphia, on the recommendation of Dr. Franklin, commenced a subscription for establishing a filature of silk in that city; and the following year a silk dress was made for Queen Charlotte of England, from the product of the industry in silk-culture of Mrs. Wright, a Quakeress of Lancaster, Pennsylvania.

In 1815, William H. Hortsmann, of Cassel, in Germany, who had learned the art of silk-weaving in France, established a manufactory of various kinds of silk trimmings in Philadelphia. Nine years later he introduced into the United States from Germany, the use of plaiting and braiding machines. He was also the first to bring into our country the Jacquard loom for weaving patterns on textile fabrics. In 1838 he introduced power-loom weaving for narrow textile fabrics, which were made superior to anything of the kind manufactured abroad; and he became a successful competitor in the making of nearly all kinds of lace work and small wares of French manufacture; also gold lace, military goods, and carriage laces. The business is yet carried on by Mr. Hortsmann's sons, and is one of the largest and most successful of the silk manufactories of our country.

Until 1828, all the silk raised in the United States was spun on the common spinning-wheel. In that year, an English lad came to Mansfield, who was an expert "throwster." His name was Edmund Golding. He described a machine used for that purpose in England. Some citizens determined to have one made under his directions. They formed a partnership under the title of "The Mansfield Silk Company," in 1829. The machine was made; and though rude in construction, it answered the purpose very well.

A "Silk Bill," drawn by P. S. Duponceau, of Philadelphia, and presented to Congress, for the promotion of silk culture in the United States, after being under discussion two sessions, was rejected in 1832, when State action on the subject began. The Connecticut legislature, at its next session,

"Resolved, That whoever shall transplant one hundred white mulberry-trees, of three or more years' growth, on his, her, or their land, within this State, adapted to the growth and cultivation of the same, at such distances from each other as will best favor their full growth and the collection of their leaves, shall receive, at the end of two years next after said trees shall have
been transplanted as aforesaid, one dollar, and in the same proportion of a greater number transplanted as aforesaid, upon proof and certificate thereof as hereafter prescribed, and that such trees were, at the end of two years after transplanting, in a healthy and growing condition."

It was also enacted that, where silk was reeled from cocoons by the improved method, fifty cents a pound should be paid to the person reeling it, or causing it to be reeled. The legislature also gave a bounty of $1,500 to the Mansfield Silk Company. The "improved method" spoken of was the invention of Nathan Rixford, who produced machinery superior to any then known.

This legislative action in Connecticut excited a general interest in the silk culture, and the legislatures of Maine, Massachusetts, New Jersey, and Pennsylvania followed the example. New varieties of mulberry-trees were soon introduced, prominent among which was the Morus multicaulis, the Alpine and Brussia.

The value of the multicaulis was greatly overrated. A fever of speculation in that species of mulberry-trees was excited, which reminded one of the "Tulip mania" in Holland a little more than two hundred years ago, when that bulb was first introduced into Europe from Persia. Speculation in this flower ran mad. As high as $25,000 was paid for a single rare bulb. One man, with an income of $50,000 a year, was reduced to poverty in the space of a few months by speculations in tulip bulbs. The city of Harlem alone, derived a revenue of $50,000,000 in three years from this floral gambling. A taste for tulips has ever since prevailed in Holland; and no longer ago than 1846, a florist of Amsterdam paid $3,000 for a bulb of a new species called "The Citadel of Antwerp." One Dutch nobleman boasted that his garden contained five thousand varieties of tulips.

The effects of the Morus multicaulis fever were not so excessive, but they were equally absurd. The excitement was at its height in 1839, and the fortunes of many men of affluence were utterly wasted in mad speculations. Plants were sold for more than $100 each. The fictitious money value of the trees exceeded the worth of their products; and in 1843 and 1844, that bubble of speculation burst. A violent reaction took place in the public mind that was greatly injurious to the silk industry in America. A general blight of the Morus multicaulis in 1844, gave the finishing blow to the growth of that tree, and silk culture in the United States ceased.

Silk manufacturing companies were formed while the Morus multicaulis fever raged, and preparations were made for raising cocoons and manufacturing raw silk extensively in our country; but when that mania culminated in 1839, the Atlantic Silk Company, of Nantucket, Massachusetts, the Valentine Silk Company, of Providence, Rhode Island, the Poughkeepsie Silk Company,
of Poughkeepsie, New York, and the Northampton Silk Company, of Florence, Massachusetts, had sunk their capital and ceased operations.

But the cultivation of the mulberry continued for awhile longer, and silk manufactories sprang up here and there, and pursued the business with more or less success, especially in the sewing silk branch. The improvements which had been made in machinery enabled the American manufacturers to compete successfully with foreigners; and at a convention of silk manufacturers, held in the city of New York in the fall of 1843, action was taken to assert American superiority in this industry. This convention recommended, in view of the fact that American manufacturers of silk and other textile fabrics found it necessary to attach foreign labels to their goods to command a ready sale, that the American silk manufacturers should "set a good example to their brethren in other manufactures, by attaching their own name to their own goods." Some did so, and in 1852, the Franklin Institute, of Philadelphia, bestowed the highest reward on W. H. Hortsmann & Sons for their superior fancy taffeta and bonnet ribbons.

The silk manufacture continued to make slow progress until the passage of the tariff acts of March and August, 1861, and June, 1864. These gave a great impulse to the silk weaving industry in this country, as exhibited by Dr. Edmund Young, the accomplished head of the National Bureau of Statistics. The value of raw silk consumed by manufacturers in the fiscal year ending June 30, 1860, foreign gold cost, was nearly $1,163,000. In the year ending June 30, 1873, the amount was $6,415,000, or an increase of 600 per cent. The value of the imported manufactures of silk consumed in the United States for the year ending June 30, 1860, was $32,663,000, foreign gold cost; in the year ending with June, 1873, the amount was a little over $29,125,000 or a decrease of about ten per cent.

Under the fostering care of these tariff acts, the silk industry of this country has much increased in importance. It promises to increase in the future, in larger ratio, with or without protective tariffs.

In the winter of 1865-66, the legislature of California offered a bounty for the new planting of mulberry trees and the production of cocoons, but the bill was soon repealed, for the results were not very satisfactory. In 1872 the "Union Pacific Silk Company," at San Francisco, was incorporated with a capital of $250,000, for the purpose of developing silk-making on the Pacific coast. They commenced silk weaving early in 1875, with fifty looms, while other manufacturers in the East were making rapid strides toward success.

In the same year (1872) the "Silk Association of America" was formed, with their headquarters in New York city. Ward Cheney, of Connecticut, was chosen President of the Association: John N. Stearns, of New York, Treasurer, and Franklin Allen, of the same city, Secretary. In his first
report to the Association, (May, 1873) the secretary showed that notwithstanding the year ending with December, 1872, was not as fruitful in American silk manufacture as the previous year, there was produced by our manufacturing establishments silk goods of the value of over $25,000,000, the product of less than $15,317,000 invested capital by 147 establishments in the several States of Massachusetts, New Hampshire, Vermont, Connecticut, New York, New Jersey, Pennsylvania, Maryland, and Virginia, which employed 11,713 operatives, who received as wages, $4,878,000. According to the Third Annual Report, (May, 1875), the value of the products of silk manufactured in the United States in 1874, was over $20,082,000 consisting of the following named fabrics: train; organzine; spun, fringe, floss and sewing silks; machine twist; dress, neck-tie and millinery silks; handkerchiefs, foulards; ribbons; braids and bindings; laces; veils and veiling, and military, upholstering and ladies’ dress trimmings. Total amount of silk threads (reeled and spun) consumed was 1,038,000 pounds. Consumed in sewing and twist, 497,142 pounds, and in weaving, 540,800 pounds.

The promises of extensive and profitable silk culture and manufacture in our country in the near future, are many and bright. The inventive genius of Americans can and will enable our manufacturers to defy competition in this as in other industries. A Connecticut silk manufacturer told one of our Congressmen, in 1875, that he was able, with improved machinery, while paying from three to five dollars a day to workmen, to compete with the Chinese who receive from three to five cents a day. Machinery does the work of a thousand Chinese hands in a given time. A member of the British legation at Washington said, lately: “There can be little doubt that the celerity with which every advantage of improved process or labor-saving machinery is brought out and then introduced by the Americans, is owing to the constant pressure of high rates of wages, and the comparatively certain protection of capital invested in inventions.”

We shall soon add geographical area, and wonder, to Lamartine’s reflections: “The weaving of silk, reaching from the extremity of India to the centre of France, supplies several hundred millions with the means of subsistence. A small insect, by spinning its own tomb, has nourished, paid, peopled and civilized one-third of the inhabitants of the earth. Never has political economy exhibited to the admiration of mankind a greater phenomenon of industry under a more insignificant form.”

May not the time be near when the cultivation of the mulberry and the raising of silk-worms shall be so common that we may add to the value of our home products the sum (and much more) now paid annually for imported silk, raw and manufactured? That sum amounted, in the year ending with December, 1874, to more than $27,000,000. The ports of New York and San Francisco received ninety-nine per cent. of the raw silk imported, and
that of New York from ninety-two to ninety-five per cent. of manufactured silks imported. In the year above mentioned the value of raw silk received at the two ports was about $4,000,000, the foreign gold cost, freight and charges not included. The value of manufactured silk received at New York was about $23,293,000. Since 1871 the value of our imports of silk, raw and manufactured, has decreased. In 1871 the amount was $40,000,000. In 1872, a few thousand dollars less; in 1873 it was little more than $29,600,000, and in 1874 it was $27,293,000. The value of the importation of raw silk, in the year ending with June, 1875, was a little over $1,101,000. The largest importation of raw silk in that year was by William Ryle, which amounted to 186,000 pounds; the most extensive importation of cocoons was by Cheney Brothers, amounting to 398,000 pounds.

The cultivation of Fruit as an article of commerce, is almost a new business in our country. The apple was probably carried to England by the Romans, for Pliny mentions twenty varieties growing around old Rome, in his day. The early English settlers introduced the tree into this country. The first known to have been planted, was a small orchard on Governor's Island, in Boston harbor, which in 1639 bore "ten fair pippins." The next year Governor Endicott planted a nursery of young apple trees on his farm at Salem (now Danvers), and sold five hundred of them for two hundred and fifty acres of land. The Indians spread the cultivation of the fruit, somewhat; but down to the period of the Revolution very little attention was given to the cultivation of good varieties; indeed for some time after that war, it would have been difficult to find in all the land as many varieties as we may now see in the orchard of a thrifty farmer. They were chiefly seedling apples, and were raised principally for the purpose of making cider and vinegar. None of the fine varieties of our day were then known.

With fruit as with other products of the soil, there was a prejudice against the introduction of new kinds a hundred years ago. Whoever did so was regarded as an innovator; and a man past three-score years of age who should be seen setting out an orchard, was regarded as smitten with dotage or a fit subject for ridicule by the whole neighborhood. But a change began to appear with the opening of the present century, and from that time until about 1825, many large orchards of choice apple, pear, and peach trees were planted. The latter fruit, probably a native of China, was introduced into Virginia at an early day, where the tree has been known to live full seventy years. The pear, of which there are now about 3,000 varieties (1,000 varieties cultivated in our country), is a hardy, long-lived tree. Some of them planted in Michigan by the early French settlers, yet bear fruit. I saw one a few years ago, at Monroe, in that State, supposed to be more than a hundred years old. The Stuyvesant pear tree, that stood on the corner of
Third avenue and Thirteenth street, in New York, and died in 1867, was known to be over two hundred years old, and bore fruit to the last.

The fruit crop of our country did not receive recognition in the national census, until 1830. Then considerable attention was given to fruit-growing, especially of apples, pears, and peaches in New York, New Jersey, and Pennsylvania. It is said that so late as 1825, there was not a nursery for the sale of apple and pear trees in all New England, and every fruit tree then planted there, was obtained from the above-named States, or from abroad. So small was the demand, that three nurseries, occupying not more than five hundred acres, supplied all the wants of the United States and Canadas. Now nurseries may be counted by hundreds, and about 30,000,000 trees are sold annually.

The culture of the grape was almost wholly unknown in our country, forty years ago, and it has assumed immense proportions in comparison with other fruits, only within about fifteen years. That delicious fruit grew wild in many parts of our country, but only the Catawba and Isabella were cultivated to any extent twenty-five years ago; now the varieties are numbered by hundreds. The grape is now cultivated and wine produced from it, in almost every State and Territory in the Union; and California, settled within less than thirty years, has become the greatest wine-producing State of the Union. Of a total product of 20,000,000 gallons in 1873, California gave us 5,000,000, or one-quarter of the whole. The other States that produced largely, were Ohio, whose product was 3,500,000 gallons; New York 3,000,000; Missouri, 2,500,000; Illinois 2,500,000, and Pennsylvania 2,000,000. The total value of the product of the grape crop in the United States in 1873, could not have been less than $30,000,000; and the enormous annual increase in the cultivation and product of the vine, promises to make this industry a large source of wealth to the nation. The product of the orchards of our country, occupying more than a million acres, was valued in 1870, at $48,000,000. In 1875, we exported over 4,000,000 pounds of dried apples, valued at $324,000.

The interest in fruit culture has been rapidly spreading for a few years. The first Horticultural Society in the United States was founded in 1829, and for several years, it, and other kindred societies had a sickly existence, because of a lack of public interest in them. Fruits of choice varieties were luxuries that might be indulged in only by the rich. Now the choicest varieties of tree fruits and berries are cultivated everywhere. In most of the States Pomological and Horticultural Societies are found, and book-stores abound with volumes of instruction for the orchardist and gardener. Our country is rapidly becoming the greatest fruit-grower in the world.

We have now considered the principal products of the United States classed under the title of Agriculture; it remains for us to take a brief view
of the facts concerning the value of the farms, and of their annual products according the census of 1870.

The number of acres included in actually surveyed farms, and in possession of private owners, was nearly 408,000,000. Of this amount, about 189,000,000 acres were improved, making a little more than fifty-three per cent. unimproved. The average size of the farms was 153 acres. The total value of these lands was $9,263,000,000, and of farming implements $337,000,000. The total value of the products, including betterments and additions to stock, was $2,500,000,000; of animals slaughtered and sold for slaughter, $399,000,000; home manufactures, $23,500,000; forest products $37,000,000; market garden products about $21,000,000; orchard products $48,000,000, making a total value of the entire agricultural products of the republic in one year, of $3,028,500,000, or equal to the entire amount of the national debt at the close of the late Civil War. The total value of the live stock was over $1,525,000,000. The total amount of wages paid in one year for this production, was a little more than $310,000,000.

Illinois had the largest number of acres in farm lands, it being 25,882,861. Of this amount, 19,329,952 were improved in 1870. In 1850, the amount of improved land in that State, was 5,039,545 acres, showing an increase in twenty years of over 14,000,000 acres. The population of Illinois in 1850, was 851,470; in 1870, it was 2,539,891.

Georgia contains the largest number of acres in farms, next to Illinois, being 23,647,941, with only 6,831,856 acres improved. In 1860 the number of improved acres was 8,062,758, or about 1,231,000 more than in 1870. The great decrease in the amount of improved land in that State in a single decade, was owing to the effects of civil war, which occupied over four years of that period. A similar decrease in the amount of improved lands was observed in all of the States in which slave-labor had been employed, excepting Delaware, Kentucky, Missouri, Tennessee, and Texas.

In the development of national industries, Manufactures come next to agriculture. They are its consequences, for implements of labor must be made for the tiller of the soil. To the mines and the forests, we must look for the materials for the implements and machinery to assist human labor.

The mining interest in the United States has become a very important one. It includes the objects of iron, copper, lead, zinc, the precious metals, coal, mineral oil, peat, and stone-quarrying. The entire mining business of the country includes 7,974 establishments, employing over 41,000 steam-engines and 134 water-wheels, and 154,300 persons. Of the latter, there are over 66,000 men, and about 7,000 boys above ground, and more than 77,000 men, and 4,000 boys below ground. To these, the aggregate amount of wages paid annually, is a little more than $74,400,000. The capital employed is $222,385,000. The annual product is, in value, $152,599,000. Pennsylvania
has 3,086 of the mining establishments (chiefly for iron, coal, and oil), and employs over 81,000 persons. Of the latter, about 46,000 are under ground. The capital employed in mining in that State was nearly $84,660,000 in 1870, and the annual product of all the mines was valued at $76,208,390.

The products of the iron and coal mines of our country are the most important in our manufacturing industries and commercial operations. Iron ore is found over a vast extent of our domain, and the relations of the coal beds to the iron deposits are most remarkable. The earlier settlers in this country, and particularly the first adventurers, who were impelled to come hither by a thirst for the precious metals, with a full expectation that they would be found here in abundance, discovered iron in many places along the borders of the Atlantic coast, but the gold fields for which they sought lay concealed on the Pacific slope until our day.

According to Mr. Hewitt, United States Commissioner to the Paris Exposition in 1867, the position of the coal measures of this country suggests the idea of an immense bowl filled with mineral treasure; the outer rim of which skirts along the Atlantic to the Gulf of Mexico, and thence returning by the Plains which lie at the eastern base of the Rocky Mountains, passes by the great lakes to the place of beginning, on the borders of Pennsylvania and New York. The rim of this basin is filled with exhaustless stores of iron ore of every variety known in the world, and of the best quality. The veins of coal cut this rim, and the iron extends back to the coal beds in the bowl. Along the Atlantic slope, from the borders of the Hudson river to the State of Georgia, a distance of about 1,000 miles, is the magnetic range. Parallel with this, in the great limestone valley which lies along the margin of the coal fields, are the brown hematites, in exhaustless quantities. In this coal basin is found fossiliferous ore, lying in a stratum beginning in New York and terminating in Alabama. It is a thin seam, fifteen feet in thickness, and beneath it, above the tide water level, are coal seams, exposed on mountain sides whose flanks are covered with magnificent timber, available for the manufacture of charcoal iron.

In Missouri and Arkansas is found a range of red oxide of iron, rising in mountains hundreds of feet above the surface, or in beds beneath the soil, ending at Lake Superior in deposits of ore that excite the wonder and admiration of the beholder. In the Adirondack region of New York are immense deposits of iron yet undeveloped. There the beds of large streams are of iron ore, and upon the same foundation rest huge mountains, towering from three to five or six thousand feet above tide-water. On the western shores of Lake Champlain are found deposits of magnetic ore, and among the coal beds in Pennsylvania are found scattered deposits of hematite and fossiliferous ore. These deposits, lying beside the coal, inaugurated the great iron industry of our day. "From these vast treasures," says Mr.
Hewitt, "the world may draw its supply for centuries to come, and there the inquirer may rest contented, without further question; for all the coal of the rest of the world might be deposited within this iron rim, and its square miles would not occupy one-quarter of the coal area of the United States." We shall soon become large exporters of iron to foreign countries. That business has already begun. In 1874, we exported nearly 193,000 cwt. of pig-iron, and about 30,000 cwt. of bar-iron. In 1875, we exported 316,000 cwt. of pig-iron, and over 106,000 cwt. of bar-iron. The aggregate value in the latter year was nearly $900,000.

Concerning the origin of our coal beds, philosophers have put forth different theories, nearly all arguing that coal is a vegetable product. There are five leading theories. The drift theory supposes the deposits, on low swampy shores of ancient rivers or lagoons, of the immense antediluvian flora, torn from their birth-places by great floods, and which, in the course of ages, became coal. The peat bog or marsh theory, supposes that the giant vegetation on the shores of rivers or lakes, had a fixed deposit where it grew, and finally became coal. The marine theory supposes that it is the product of deposits of sea-weed, when the ocean covered our continent, of which geology testifies. The petroleum theory supposes that the juices of immense plants, by a peculiar combination with the dust and ashes of numerous active volcanoes, produced a sediment that became coal; and the mineral theory supposes that four great elements in nature, namely, carbon, hydrogen, oxygen and nitrogen, united by the intense heat of volcanoes, produced the coal deposits, for of such elements our coal is composed. A volcanic theory traverses the whole science of geology in relation to the earth's structure, and may not be clearly defined in the small space here afforded us. The existence of impressions of fern-like plants, some of them with stems at least thirty feet in length, upon the slaty roofs of some of the anthracite coal beds, seems to prove that coal is a vegetable production, by some process yet unknown.

The productive coal-fields of our country cover an area of about 292,000 square miles, while the total estimated area is almost a million square miles, being double that of all the other known coal-fields of the globe combined.

The total amount of the world's product of coal in 1872, was about 228,000,000 tons, of which the United States furnished 44,000,000. We have now, in our country, about 1,600 collieries, employing almost 100,000 persons above and below the ground; and the total value of our annual coal product, anthracite and bituminous, is estimated at nearly $80,000,000.
CHAPTER XIII.

The principal deposits of coal in our country are in Rhode Island; the Alleghany coal-field, extending from Alabama to southern New York, and occupying portions of the first-named State, Georgia, Tennessee, Kentucky, Virginia, West Virginia, Ohio and Pennsylvania; the Central coal-field covering 40,400 square miles, and extending through Indiana, Illinois, and Kentucky; the Michigan coal-field, and the yet undeveloped Great Western coal-field, the largest in the world, whose existence was scarcely suspected a few years ago, and, not until recently has it found a place on any geological map. It occupies an area almost square in form with a short leaning cone extending from its northern part. It stretches from Central and Western Texas, on the south, far into the British Possessions on the north, and from near the western shores of the Mississippi on the east, to the eastern slopes of the Rocky mountains. In Wyoming Territory it crosses that lofty range near the South Pass, in a narrow tongue which almost meets the narrow point of an immense coal-field that projects from the British Possessions into, and covers, a large part of Montana Territory. There is, also, a narrow coal-field extending north from the Rio Grande through New Mexico into Colorado; also small coal-fields in Arizona, Nevada, and California.

The business of coal-mining for commercial purposes, has entirely grown up during the last fifty or sixty years. That coal existed in the soil of Pennsylvania, was known before the Revolution. So early as 1769, Mr. (afterward judge) Obadiah Gore, a blacksmith settled in the Wyoming Valley, used some of the coal found on the surface of the soil there, for his forge. It answered the purpose well. He continued to use it, and forty years afterward he tried the successful experiment of burning it in a grate as fuel. At about the same time Judge Fell of Wilkesbarre, discovered the value of "stone coal" as fuel. The judge, who was a Free-mason, made the following record:

"February 11, of Masonry 5808. Made the experiment of burning the common stone coal of the Valley, in a grate, in a common fire-place in my house, and find it will answer the purpose of fuel; making a clearer and better fire, at less expense, than burning wood in the common way.

"JESSE FELL."

Borough of Wilkes Barre, February 11, 1808.
These gentlemen may be regarded as the first discoverers of the usefulness of anthracite coal for fuel.

Soon after the beginning of the old war for independence, an armory was established at Carlisle, in Pennsylvania, where there were several blacksmith shops, in which anthracite coal was used. Whether Mr. Gore or his brother was with them, is not known; but the fact is attested on good authority that in 1776, and afterward during the war, two Durham boat-loads of coal were sent annually to the shore of the Susquehanna opposite where Harrisburgh now is, landed there, taken in wagons to the armory at Carlisle, and used there.

About the year 1790, Philip Gintner, an old hunter of the Lehigh, living in a cabin not far from the present borough of Mauch Chunk, in Carbon county, Pennsylvania, when returning home at twilight after a fruitless day’s hunt, quite discouraged, for his family were in want of food, stumbled against a black stone that rolled on before him. He had heard that there was coal in that region, so he took the stone home with him, and Colonel Joseph Weiss carried it to Philadelphia where a test pronounced it “stone” or “anthracite” coal. An association for mining it was formed in 1792, called the “Lehigh Coal Mine Company,” but they did little more than form an organization, excepting the taking up of nearly 10,000 acres of unlocated land in the vicinity of the present borough of Mauch Chunk. The coal was used only by blacksmiths in the neighborhood until 1806, when William Turnbull took two or three hundred bushels in an “ark” to Philadelphia. Experiments with it as fuel were tried and failed. An attempt was made in 1812, to work the mine, but without success.

A blacksmith in Schuylkill county named Whetstone, first used anthracite in that region, for his forge, and brought it into notice in 1795. In 1800 William Morris, owning land near Port Carbon, took a wagon-load of coal to Philadelphia, but could not sell it. In 1812, Colonel George Shoemaker took nine wagon-loads to the same city, with no better success. At his earnest solicitations, Mellen & Bishop tried the coal at their rolling-mills in Delaware county, and were pleased with the result. They called public attention to the usefulness of anthracite as fuel, through the newspapers of Philadelphia. That was a turning-point in the history of coal-mining in this country.

Until that time the blacksmiths had depended upon the bituminous coal brought from Virginia, the extensive beds of that kind which now abound in Western Pennsylvania not then having been discovered. Now the value of anthracite was proven, and sagacious men foresaw that in these “black diamonds” lay enormous wealth. The Schuylkill Navigation Company was incorporated, and in 1815 they began the construction of a canal from Philadelphia to Mauch Chunk, 108 miles in length. It was completed in
COAL PRODUCTS AND LEAD.

the course of three or four years, at a cost of about $3,000,000, and was chiefly intended for the transportation of lumber from the heavily-wooded region of Schuylkill county. The more sagacious among the directors believed coal would become an important item of freight, nor were they disappointed.

In 1825, the coal trade first assumed large proportions. Anthracite began to be used for fuel in houses and in manufactories. Individuals purchased coal lands and coal companies were formed. In the year 1820, the whole amount of anthracite sent to market was 365 tons. Twenty-two years afterward the amount was 1,108,000 tons. In 1868 the amount was 13,500,000. At the present time the annual products of the coal-fields of Pennsylvania are about 27,000,000 tons.

The entire coal product of our country, in 1874, was about 50,000,000 tons. Of this amount over 24,000,000 tons were anthracite, and more than 25,000,000 tons were bituminous coal. Of lignite there were over 1,200,000 tons. The contribution of Pennsylvania was seventy-two per cent. of the whole, the mines of that State yielding all the anthracite. Ohio gives about eight per cent. of the whole coal product, Maryland five per cent., Illinois five per cent., while no other State yielded as high as two per cent.

The discovery of mineral coal in our country has led to great internal improvements, especially in Pennsylvania. Nine canals and about thirty railroads have been constructed in that State, chiefly for the transportation of coal; and so full is their freight list in prosperous times, it is calculated that in three years the freight will pay the cost of constructing a railway. Coal has created immense wealth by multiplying manufacturing establishments in various States; and to its anthracite chiefly, and much to its bituminous coal, Pennsylvania owes the immense importance of its iron interest.

The most important Lead deposits in our country are found in the Valley of the Mississippi, and known respectively as the Upper and Lower mines. The former are included in the States of Wisconsin, Illinois and Iowa, and the latter in Missouri. The extent of the upper lead-producing region is about 4,000 square miles, more than one-half of which is in the State of Wisconsin; but the richest deposits are in Iowa and Illinois, between Dubuque, Galena and Shultsburg.

The merit of the first discovery of this lead deposit is given to Le Sueur, who made a voyage up the Mississippi in search of ores, in the year 1700; but the first mining was doubtless performed by Julien Dubuque, in 1788, on the site of the present city of that name, where the first settler lived until his death in 1809. But mining did not become general there until about fifty years ago. These mineral lands were ceded to the United States by the Indians, and in 1847 they were thrown open for entry and purchase, at
which time the product was about 25,000 tons of lead a year. Since that
time the production has materially decreased.

The lead deposits in Missouri were first discovered and worked by
Reynoult and La Motte, in 1720, under the protection of a patent given by
the French government to John Law's famous Mississippi Company. Little
was done, however, before 1798, when Moses Austin, of Virginia, sunk the
first regular shaft in Missouri and erected a reverberatory furnace and shot-
tower there. Twenty years later there were no less than forty-five lead
mines in Missouri; and so late as 1854, the annual yield of these mines (many
of them then abandoned) was almost 4,000,000 pounds of lead. Three-
fourths of all the lead obtained in that State has been from clay diggings
overlying rock; and it is supposed that a much larger amount might be
obtained by scientific working of the mines in the rock, which has never yet
been done. There are numerous deposits of lead in the Atlantic States, but
none of them have been profitably worked.

Lead, in its pure state, enters largely into our manufactures in the form
of sheet-lead and lead-pipe, and in combination with other metals, it assumes
the form of pewter and solder. With arsenic it is used in making shot,
and its oxide combined with carbonic acid makes White Lead, which is
used chiefly as a paint, forming the body of many colors made of pig-
ments.

Before the Revolution there was very little call for paint in this country,
as a painted house was so rare that it was one of the most certain of outward
signs of opulence. In colonial times most of the churches were without
paint outside and inside; and it is related that a clergyman at Charlestown,
Massachusetts, was arraigned in 1639, for having paint on his house. When
it was finally discovered that paint preserved the wood from decay, it began
to be used more freely, but it was many years after the Revolution that
white lead and painters' colors continued to be imported.

It was a little before or during the Revolution, that Mr. Wetherill, of
Philadelphia, set up the first manufactory of white-lead in the United States.
The business increased slowly, however, and so late as 1815 there were only
three or four establishments of the kind in our country, whose annual product
did not exceed 400 tons. After that the white-lead manufacture was carried
on in several cities—Pittsburgh, Buffalo, Albany, Boston, Brooklyn and New
York. One was early established in Cincinnati (the third west of the moun-
tains) then a village of about 6,000 inhabitants. One in Philadelphia, in 1811,
manufactured, also, painters' colors of over twenty hues.

One of the oldest and the most extensive of the lead manufactories in
our country, is that of the Boston Lead Company, J. H. Chadwick & Co. pro-
prietors. It was founded by Hon. W. B. Swett, A. D. Williams, and Charles
Davis. It was incorporated in the spring of 1829, with a capital stock of
BOSTON LEAD COMPANY.

$52,000, which was increased in 1831 to $102,000. It was again increased in 1865 to $250,000, and the following year to $500,000.

The capacity of the works of the company from 1829 to 1850, was for the annual production of 800 tons of white lead, 500 tons of sheet lead, 300 tons of lead pipe, and 100 tons of red lead and litharge. From 1850 to 1863, the capacity was 1,200 tons of white lead, 250 tons of red lead and litharge, 800 tons of sheet lead, and 1,000 tons of lead pipe. Then the works were enlarged, and from 1863 until the present time, their capacity has been 3,000 tons of white lead, 600 tons of red lead and litharge, 7,000 tons of lead pipe, 2,000 tons of sheet lead, and 1,000 tons of tin-lined lead pipe and tin pipe.

These works are situated on the corner of Hampden and Albany streets, in Boston. The main building is of brick, four stories in height, with basement 200 feet in length, and 60 feet in width. The machinery in this is driven by a double horizontal engine of 200 horse-power. There is a double set of upright steam pumps of 20 horse-power each. Another brick building, same height, 55 feet in length, and 40 feet in width, is used for a carpenter's shop and for storage. In that building the machinery is driven by an engine of 15 horse-power. Besides these, there is a corroding house of brick, two stories in height, 205 feet in length, and 70 feet in width, and another of wood, 83 feet in length, and 32 feet in width; also a brick building, three stories in height, for oxide of lead and cooperage department, in which machinery is driven by a horizontal engine of 25 horse-power. There are other buildings occupied by blacksmiths and machinists, for stables, storage, and sheds; the whole works occupying about three acres of ground.

On the premises of the Boston Lead Company are manufactured annually, for the sending of their white and red lead and litharge to market, about 80,000 kegs. In their machine, carpenter, and blacksmith shops is performed all needful work for the establishment. They use annually about 300,000 feet of lumber, and 3,000 tons of anthracite coal.

The Dutch first manufactured white lead for paint, and their processes, by which durability and opaqueness were obtained, have stood the test of centuries. Only in manipulation have there been improvements. By the use of compact machinery, more perfect results have been obtained, and by the drying by steam, the dust, which was so detrimental to the health of workmen, is avoided. The Boston Lead Company adhere to the old Dutch process, and produce the most perfect results in their white and red leads.

Under patents issued in 1863, 1864, and 1865, the Boston Lead Company manufacture a most important article, known as the Patent Lead-encased Block-tin Pipe, by which the poisonous effects of lead pipe, used as a conduit for liquids, is entirely avoided. It consists simply of an inner surface formed of block-tin, so firmly united to the exterior or leaden layer by a
thin film of solder, that the pipe may be bent and hammered into any shape without detaching them, thus giving it the same facility of manipulation as that enjoyed by the ordinary lead pipe. The process of manufacture of this as well as the ordinary lead pipe, by this company, is very ingenious. In the old processes of making common lead pipe, a cast slug of the metal was drawn through dies in lengths of not more than ten feet; in this improved method, the melted lead is run into a cylinder, and after the space of about three minutes, which time allows it to set, hydraulic pumps are started, and force out the pipe all formed and completed for market, of any required length and size. The lead-encased block-tin pipe has been subjected to the severest tests by chemists and others; and the uniform testimony is that it does not impart the least impurity to water passing through it. This is a quality of the highest importance, and must commend the pipe for use in the conveyance of water to be drank or for culinary purposes.

We have observed that lead, combined with arsenic, is employed in the manufacture of shot. The process in making drop shot is simple. The pig lead is melted in a pot, and into the middle of it a proper quantity of arsenic is introduced and well stirred in the mass. Then the pot is covered and left several hours for the two metals to thoroughly combine, when it is tested, taken to the top of a high tower, and there again melted in a furnace. Then it is poured through a colander, the holes in which differ according to the size of the shot made. The lead thus separated, falls into a well of water, having acquired a perfectly globular form in its descent, where it is cooled. Lifted from the well in iron buckets on an endless chain, it is taken up to the drying room, and when perfectly dried, is removed to the polishing room, where the polishing process is performed. The perfect and imperfect shot are then separated by being passed over a series of inclined planes, the perfect shot moving rapidly in a straight line, and falling into a box a few inches from the end of the plane, and the imperfect shot moving slowly in a zig-zag direction, and falling into boxes arranged to receive them. Then the good shot are sized, weighed, and bagged for market. A process has been patented in our country for making shot at a lower elevation, by forcing a strong current of air upon it as it falls in the wells, and so avoids the expense of high towers.

The oldest and the best appointed and successful of the drop-shot works in America, is that of the Philadelphia Shot Tower, of which Thomas W. Sparks is proprietor. The tower is built of brick, 150 feet in height, with a well 30 feet in depth, making a total of 180 feet. It is so perfect in its form for the successful resistance of the wind, that the national Light-house Board have repeatedly copied it in the erection of light-houses exposed to severe gales. The tower, with several other buildings used for the business, occupies numbers 125 to 133 Carpenter street, Philadelphia, and
there, in addition to drop-shot, bar-lead and buck-shot are extensively manufactured.

It was early in the present century when this tower was constructed. Down to that time, shot had been procured chiefly from England, and none, of much consequence, was made here. The embargo laid by our government on trade with Great Britain, in 1808, and the consequent shutting off of a supply of shot from this country, induced Messrs. Bishop and Sparks to erect this tower, and inaugurate the business of drop-shot making. Very soon afterward, Paul Beck erected a tower on the Schuylkill.

When the war of 1812-'15 broke out, and the establishment of Bishop and Sparks began to manufacture bullets, conical balls, et cetera, for use in that war, the senior partner, who was a member of the Society of Friends or Quakers, and whose principles would not allow him to be engaged in the manufacture of implements of war, withdrew from the firm. Mr. Sparks continued to carry on the business successfully until his death in 1855, when his nephew, Thomas Sparks, who had been connected with the business since 1838, became sole proprietor. During the Civil War, he patriotically placed his establishment at the service of the government, where various kinds of balls, both round and compound conicals, were made, and sent to the various arsenals. He introduced some valuable machinery for the purpose of shot-making, which is moved by steam power. At his death, in 1874, his son, Thomas W. Sparks, became sole owner and manager of the business, and so continues. For twenty years after this tower was built, the shot was made by allowing it to fall into a large tub of water, without regard to shape or size. Now, each of the 16 sizes of shot has its standard diameter and average weight and number of pellets to the ounce.

Zinc, a metal of the general tone in color, of lead, is found in small quantities, in several of our States, but the largest deposits seem to be in New Jersey and Pennsylvania. It is generally found mixed with lead, arsenic, sulphur, calamine, and other mineral substances.

Four varieties of ore are employed in the manufacture of zinc for commercial purposes, namely, carbonate of calamine, electric calamine, blende, and red oxide of zinc. The latter is found in abundance in Essex county, New Jersey. Pure zinc is used in commerce in three forms—in rolled plates for metal roofing, lining for tubs and tanks, and for protecting wood from the heat of stoves; as a chemical solution, in galvanizing iron to prevent its rusting; and, converted by heat into a white, feathery powder, and mixed with linseed oil, in making a brilliant white paint that rivals white lead.

Zinc appears to have been first known in Europe, in the thirteenth century, to the Dominican monk, Albertus Magnus; and Paracelsus who died in 1541, was the first to describe the metal, and give it the name of zinc—German, zink. The alchemists seem to have been interested in
keeping it unknown, believing it possessed the properties for converting the baser metals into gold. The first person who intentionally manufactured zinc, was Henkel, about the year 1730; and a knowledge of that industry was introduced into England by Dr. John Lawson, a Scotchman.

The first zinc produced in the United States, was made about the year 1838, under the direction of Ferdinand R. Hassler, by John Hitz, for the brass designed for the standard weights and measures ordered by Congress. The zinc was made at the United States arsenal at Washington, from the red oxide of New Jersey, but the expense was so great as to discourage its manufacture for a long time afterwards.

The manufacture of zinc in plates was first attempted, in this country, by the New Jersey Zinc Company formed in 1849. It was a failure. The Lehigh Zinc Company at Bethlehem, attempted the same thing, at their works, but also failed, at first; but they finally succeeded by a process discovered almost simultaneously by Joseph Wharton and Samuel Wetherill; and there were manufactured at one time, as many as 4,000,000 pounds a year. But the production of sheet zinc was not profitable, and the attention of American manufacturers was soon turned to making white paint from the oxide of the metal. This was first done in France toward the close of the last century, but in an inferior manner, where the use of this white oxide was recommended because of its freedom from the dangerous effects of white lead.

The New Jersey Zinc Company first undertook the manufacture of the white paint from zinc, in this country, by a process which is purely American, established by Richard Jones in Philadelphia. The business was begun at Newark, New Jersey, at about the year 1851. Two years afterward, Samuel Wetherill, of Philadelphia, began its manufacture by a process which he had patented, from ores furnished by the Lehigh Zinc Works, and was successful. Other establishments of the kind have since started up in our country, and very little sheet zinc is now made here. Much of the material used in the manufacture of white zinc in the United States, is imported. In 1875 we received from abroad in the form of blocks or pigs, about 2,088,000 pounds of zinc, and 7,239,000 pounds in sheets.

The annual zinc product of the world now, is estimated at about 80,000 tons. In 1870 there were 75 establishments in the United States for the manufacture of white paint from lead and zinc, in which 2,000 persons were employed, who received over $1,000,000 in wages. These establishments employed, in the aggregate, $7,400,000 capital, and their annual product was valued at $11,212,000.

Copper forms an important item in the mining statistics of our country. It is doubtless one of the first metals known to man. The "brass" spoken of as used by Tubal Cain, in the earlier historic period of our race, was
doubtless copper. In that grand Oriental poem, the Book of Job, supposed to be the oldest literary production extant, we read of copper that was "molten out of the stones"; and it is said that Cheops, the first bad monarch of Egypt, who built the greater pyramid now standing, worked a copper mine in the peninsula of Sinai. The old Egyptians possessed the art of hardening copper with alloy, for making implements that hewed their stones. The ancient Syrians, Phoenicians, Greeks, and Romans, used enormous quantities of the metal in constructing monuments and statues of bronze. They knew how to make castings which have astonished the moderns by their vastness and beauty. The brazen statue of Apollo that bestrode the entrance to the harbor of Rhodes, between whose legs ships sailed in and out, after having been thrown down by an earthquake, and permitted to lie in fragments almost a thousand years, was purchased by a Jew, and it required nine hundred camels to carry away the pieces. It is supposed to have weighed over 70,000 pounds.

There are evidences that copper mines were worked in our country by the mysterious inhabitants who were here before the advent of the Indian races that were encountered by the Europeans when they came. The Aztecs of Mexico made use of axes and chisels wrought of copper, and hardened by alloy so as to fashion the hard granite of the quarry, like those of ancient Egypt. The Peruvians, also, used copper for the same purposes. Humboldt describes a chisel found in a silver mine of the Incas, near Cuzco, which was 94 per cent. copper and 6 per cent. tin. This is almost the identical composition of a chisel found by Wilkinson, at Thebes, in which was one per cent. of iron.

Various mountain regions in Europe produce copper, but for years, in the last century, the copper mines of Cornwall, England, were the most productive on the globe. The great Appalachian mountain system in America, extending from Newfoundland through Quebec and Vermont into Virginia, Tennessee, the Carolinas, and Georgia, abound in copper deposits. So also do portions of the Rocky mountains; but the most important copper mines, in our country, known and worked scientifically, are those on the southern shores of Lake Superior, where the metal appears in the bedded trappean rocks, with interstratified sandstones and conglomerates, which are everywhere copper-bearing. There the copper is found in its native or metallic state, cutting the strata in veins, and associated with quartz, spars, and crystalline minerals. Masses of pure copper have been found in that region weighing many tons, but it is generally met with in smaller masses and grains. One mine (the Calumet and Hecla) yielded, in 1872, the enormous amount of 8,000 tons of fine copper, almost one-tenth of the entire product of the globe at that time, which was estimated at over 75,000 tons, worth $500 a ton.
Another important copper region in our country is in parts of Virginia, North Carolina, Tennessee, and Georgia, lying adjacent. For several years prior to the breaking out of the late Civil War, numerous mines were imperfectly worked, in that region, where sulphuretted ores are found in crystalline schists. The war, and great depression in the price of copper, caused these mines to be abandoned for a time, with two or three exceptions. It is believed that with the aid of perfect machinery and scientific skill, these mines may make that region a second Cornwall in the production of rich copper ore.

According to the census of 1870, there were in that year, 40 copper mining establishments in the United States, employing 5,404 persons, of whom 3,247 worked under ground. The amount of wages paid them was $2,700,000, and the invested capital was nearly $8,000,000. The value of the annual product was over $5,200,000. The mines were distributed as follows:

In Arizona two, yielding an annual product of $7,000; Maryland two, product $71,500; Michigan twenty-seven, product $4,312,167; Nevada one, product $30,000; North Carolina one, product $66,000; Pennsylvania two, product $7,800; Vermont two, product $358,845; Virginia one, product $8,000. Of the Michigan mines, eleven were in Houghton county, six in Keweenaw county, and ten in Ontonagon county. In 1875, there were exported to foreign countries, from our mines, 51,305 cwt. of copper ore, and from our smelting furnaces, 5,123,470 pounds in the form of pigs, bars, sheets, and old copper. The total value of these exports was almost $1,800,000.

The first copper mines worked in the United States were remarkable for the richness of the ore. They were chiefly in New Jersey and Connecticut, and the ores were generally of vitreous and variegated copper, with some malachite. At Simsbury, in the latter State, was a mine that furnished a considerable quantity of ore from 1709 until the middle of that century, when it was purchased by the commonwealth as a place for penal servitude. For about sixty years that mine was a state prison, and was worked by convicts, but without much profit. A company bought it in 1830, but worked it only a short time. In 1836, a more productive mine was opened at Bristol, Connecticut, on the same geological range, and it was worked with vigor for several years, until 1857, when it was abandoned. That mine, it is said, produced larger amounts of rich vitreous and pyritous ores than have been obtained from any other mine in our country. During the time the mine was worked, over 1,800 tons of ore were sent to market, and produced more than $200,000. The yield of pure copper ranged from 18 to 50 per cent.

In the last century, a valuable bed of copper ore was discovered at Bell-
LAKE SUPERIOR COPPER MINES. 

ville, in New Jersey, and yielded great wealth to a family of Schuylers settled there. Aarent Schuyler purchased a large tract of rough wild land near the Passaic river; and so unremunerative was his toil upon it, that he contemplated selling it. One day his negro servant brought to him a mineral substance found on the farm, which Mr. Schuyler took to New York. It proved to be copper ore. He turned his attention to this new product of his soil, and sent the ore to England. An enormous income was derived from the mine, for the ore yielded about eighty per cent. of pure copper. Before the old war for independence, vast treasures were drawn from that mine, and the then owner refused an offer of $2,000,000 for it. Its supply of treasure at length failed, and like other copper mines in New Jersey, it was abandoned. In 1858, a New York company attempted to work the mine, but its poverty was too manifest to encourage them to go on.

The modern working of the Lake Superior copper mines was begun in 1845, when there were discovered some traces of miners work there with stone tools, ages before. The principal mine first opened was the "Cliff" by a Boston and Pittsburgh Company. In 1847, parallel lines of trenches were discovered near the Ontonagon river, extending for miles along the trap hills. They proved to be on the course of veins of copper, and these excavations extended down to the solid rock, where were found large quantities of rude hammers made of a hard kind of green stone from the trap rocks in the vicinity. Around the middle of each one was a groove, intended to secure a handle. These were the tools with which the ancient miners of the "stone age" beat out these copper ores from the rocks which were almost as hard as their hammers.

Who were the miners? and when did they live? are questions that may never be answered satisfactorily, any more than the often repeated query, Who were the mound-builders? The traces of their industry attest their great antiquity. Some of the trenches had been full twenty-five feet in depth, and when discovered, were filled with gravel and other material, almost to the brim—a result which must have required centuries to accomplish, in the condition of that region. And upon the surface of these fillings were standing large trees, and around them stumps of larger ones. In making excavations, a mass of copper supported upon blocks of wood, with ashes and charred wood under it, was found buried in the gravel nearly twenty-five feet below the surface, entirely separated from the vein. It seems to have been too heavy for the ancient miners to lift out of the pit. When it was taken out in 1848, it was found to weigh over six tons. It was ten feet in length, three feet in width, and nearly two feet in thickness. The veins of metal under this mass were found to be very rich.

The Jesuit missionaries had noticed copper ore on the borders of Lake Superior, as early as the middle of the seventeenth century, when they
observed that the Indians revered, as sacred, large pieces of the pure metal taken from the earth. From time to time thereafter explorers and traders in that country told of the metal there, but the existence of the great metal deposit was scarcely suspected before Dr. Houghton, the State Geologist of Michigan, made the first scientific survey of that region. His revelations soon brought adventurers there from the Eastern States, and mining was vigorously begun.

The rich copper region in Tennessee just mentioned, lies along the southern line of Polk county, and extends into Gilmer county in Georgia. The ore was first discovered there in 1847, lying from seventy-five to one hundred feet below the surface. It is associated with large masses of hematite iron ore that forms out-cropping ledges. Mining commenced there in 1851, and several companies were soon formed for working. Many of these were incorporated into the Union Consolidated Mining Company, in 1857. Considerable copper deposits have been found in the lead regions of Wisconsin, Iowa, and Missouri; and quite a rich bed has been recently opened in Chester county, Pennsylvania.

The many purposes to which copper is devoted in the useful arts, make it rank next to iron in its intrinsic value. In ancient times it was known and used where iron was unknown, and the relative abundance of the two metals has been shown by copper tools, found in some places in Europe, edged with iron. One of its most important uses now, is for the sheathing of the bottoms of ships, a practice first introduced in 1761, in the royal navy of Great Britain. Before that time, sheet lead had been used for the purpose; afterward lead was wholly superseded by copper. It is also extensively used for boilers, kettles, stills, condensers, pans and other utensils for manufacturing purposes, the arts, and domestic use. In 1870 there were in the United States, thirty-four establishments for smelting, milling and rolling copper, employing 1300 persons, and giving an annual product valued at about $14,000,000. There were also sixty-five copper-smithing establishments, employing about six hundred and fifty persons, the annual product of which was almost $1,800,000.
CHAPTER XIV.

One of the most important uses of copper is in alloy with zinc in the formation of the yellow substance known as Brass, which contains a number of excellent qualities that renders it superior to copper for many purposes in the arts. Its softness, strength, and durability, its general freedom from rust, and its susceptibility to a high polish, renders it exceedingly useful in finer work. Of all the alloys of one metal with another, none is more useful than brass. It is employed in the bearings of machinery, and for parts of machinery where iron would be objectionable or where ornamentation is desired; for making musical, optical, and other scientific instruments; for various kinds of tubing, tacks, bolts, screws, et cetera.

Originally brass was made by an alloy of copper with zinc ores, but in 1781, James Emerson obtained a patent for making the alloy by the fusion of the two metals in their purity. The usual process now is, to place the copper and the zinc, in thin plates, in alternate layers in a crucible, and smelt them under a thick layer of charcoal. When the fusion is complete, the alloy is cast into granite moulds with clay. The usual proportion of the metals in the alloy, is two parts of copper with one of zinc.

There were, in 1870, in the United States, 316 establishments for the manufacture of brass and brass work, employing an aggregate of 4,582 persons, to whom wages were paid to the amount of $2,351,000. The capital employed in these establishments, amounted to $6,590,000, and the annual product was valued at $9,960,000.

The largest establishment in this country for the manufacture of brass work and plumbers’ goods, is that of Hayden, Gere and Company, at Haydenville, a pleasant village on Mill river, in Massachusetts, on the extreme western border of the Connecticut valley, six miles from Northampton, on the line of the New Haven and Northampton railway. A hundred years ago, that region was an unbroken wilderness. The first settler there was John Miller, a stout beaver-trapper.

The first mill erected on the site of Haydenville, for manufacturing purposes, was built by Daniel and David Hayden, in 1809, where, with Seth Thompson and Melitier Everett they began the manufacture of cotton-
yarn with one hundred and twenty-eight spindles. The business was very flourishing during the war with Great Britain that soon afterward broke out, their yarn selling as high as one dollar a pound. When peace came the business declined, and in 1822, the mill was closed. Then the late ex-lieutenant governor, Joel Hayden (who died in 1873), nephew of the original mill-owners, with James Congdon, began the manufacture of power-looms in the old building.

In 1831, Joel and Josiah Hayden began the manufacture there of japanned and tin buttons. The mill was destroyed by fire the next year. It was rebuilt on a larger scale in 1833, and that structure formed the main part of the establishment that was swept away by the great disaster in the Mill river valley, in May, 1874. The button-making business was continued, and there the first flexible metal-shanked lasting or prunella buttons made by machinery, were manufactured in this country. These took the place of the sewed buttons made by Samuel Williston, whose wife's nimble fingers produced the first of the kind in the United States. Mr. Williston kept a country store, and sold wooden buttons, then almost universally used. His wife covered some of them neatly with cloth. These became popular. They contrived machinery to do the work, the first employed for that purpose in the United States. From this seed an immense manufactory of sewed buttons grew up at Easthampton, where half the covered buttons of the world were made. Mr. Williston died in 1874, worth several million dollars. Hayden and Williston made arrangements for carrying on the button business together, and employed about two hundred persons, chiefly women, until 1848, when Mr. Williston removed the business to Easthampton.

In 1851, Joel Hayden and A. D. Sanders began the manufacture of plumbers' goods on a small scale, occupying the button factory for the purpose. Associated with them were Sereno Kingsley and Edward W. Gere, with the firm name of Hayden, Sanders & Co. The business rapidly increased, and it was carried on extensively by Hayden, Gere and Company (Collins Gere) when, on the morning of the 16th of May, 1874, the Williamsburg dam from which water-power was supplied for manufactories, suddenly gave away. A destructive flood of water swept down the valley, demolishing many buildings and destroying about one hundred and fifty human lives, in the villages of Williamsburg, Haydenville and Leeds. The great establishment of Hayden, Gere and Company, consisting of nine brick buildings, was utterly destroyed. All that remained of the nine buildings was about one-half of the upper shop. The work of reconstruction immediately commenced, and the present buildings were erected, in which when in full operation, there are 400 persons employed, who produce about $1,000,000 worth of goods annually.

Our country has become one of the richest gold-producing regions of
the world. The chief gold belts are two; one on the Atlantic slope known as the Appalachian gold-field, and the other on the Pacific slope, including California and the neighboring States and territories. The Appalachian belt extends from Virginia south-westerly, through North and South Carolina into Georgia, and includes a portion of Tennessee and Alabama. The gold is not found in a continuous belt, but at intervals along the general lines indicated.

The greatest amount of gold found on the Atlantic slope has been obtained in the more westerly counties of North Carolina. Considerable has been gathered in Virginia, South Carolina and Georgia. But the great gold-producing region of our country is on the Pacific slope. A little gold had been found here and there, in Virginia and North Carolina, toward the close of the last century, but mining for it was not commenced until the earlier part of this century. The first product of our mines, offered at the National Mint, was sent from North Carolina, in 1824. Up to 1827, that State was the only one in which gold was produced in any notable quantity, its yield being from 1804 to that time, $110,000.

The first mint deposit from South Carolina was of the value of $3,500 in 1829, and from Virginia $2,500, the same year. The first deposit from Georgia was $212,000 the following year. In 1837 the gold product in these Southern States had become so large that a branch mint was established at Charlottesville, North Carolina, and the next year another was put in operation at Dahlonega, in Georgia. These were suspended when the Civil War broke out in 1861, but the one at Charlotte was re-opened as an assay office in 1869.

When gold was discovered in California, in great abundance, mining for it in our Southern States was almost abandoned, and yet as late as 1873, there was deposited in the mints, gold to the amount of $2,400 from Virginia, $120,300 from North Carolina, $160 from South Carolina, $35,400 from Georgia, and $599 from Alabama. The total amount deposited from the Southern States to July, 1873, was as follows: from Virginia, $1,632,000; from North Carolina almost $10,000,000; from South Carolina $1,378,000; from Georgia $7,268,000; from Tennessee $79,000, and from Alabama $212,000; making a total of a little more than $20,500,000.

The historian of Sir Francis Drake's voyage to the western coast of North America, late in the sixteenth century, speaks of gold in California. More than a hundred years later, a Roman Catholic priest connected with a mission on San Francisco bay, published an account of gold in that country; and from time to time afterwards, through all of the last century, its existence there was publicly noticed. But it was not until the middle of the present century, that the wonderful richness of the Pacific slope in the precious metals, was discovered.
In April, 1847, Mr. Sloat published a statement in Hunt's Merchants' Magazine, that California was rich in gold; a conclusion drawn from his own observations. On the 9th of February, 1848, three Americans (two of them Mormons) were engaged in repairing the race at Sutter's Mill, on the American Fork of the Sacramento river, when the little daughter of Mr. Marshall the overseer, picked up in the river a lump of gold which she carried to her father as a pretty stone. He did not know its value, but the Mormons did, for they had been gold-hunters. They tried to keep the discovery a secret; but the next month, the Rev. C. S. Lyman wrote to the American Journal of Science: "Gold has been found recently on the Sacramento, near Sutter's Fort. It occurs in small masses in the sands of a new mill race, and is said to promise well."

This news spread and created much interest in our country. In December, 1848, President Polk, in his annual message referred to the discovery, and a raging "gold fever" spread over the country. An unparalleled tide of emigration had already poured into California (which had lately become a Territory of the United States), from Mexico, South America, the Atlantic States of our Republic, and from Europe and Asia. Within six months after the discovery at Sutter's mill, there were 4,000 men engaged in the "gold diggings," producing daily gold valued at from $30,000 to $50,000. Population increased rapidly from emigration, and within two years it was sufficient to entitle the Territory to a place in the Union of States. At first there were no women there, almost every man being an adventurer in search of gold. It was at first picked out of slaty rocks, sand and gravel, but the most productive deposits were in quartz rocks. Mills for crushing these rocks began to be set up in 1851, and rapidly increased in numbers. In 1870 there were over 400 of these mills in that State, the aggregate cost of which was $6,500,000. The total value of gold found in California from 1848 to 1873, was $1,000,000,000, and in the United States, $1,241,000,000.

The great gold belt of the Pacific region is on the western slopes of the Sierra Nevada, and extends northwardly from latitude 35° into Oregon, a distance of about 500 miles, with an average width of 40 miles. The principal mining region is between the parallels of 37° and 40°. The entire territory of the United States west of the Rocky Mountains produce more or less gold, and Oregon now mines about $2,000,000 of the metal, annually. It has also been found in Washington Territory. The total annual product of the United States is estimated at about forty-three per cent. of that of the whole world, which is thought to be about $131,000,000.

Australia next to the United States, is the greatest gold-producer in the world, its annual contribution being over $31,000,000. It is estimated that about three-fourths of the gold product of the world, is used for coinage (it being the generally adopted standard for the currency of various countries) and
about one-fourth in the arts, the greater proportion in personal ornaments. The value of the exports of domestic gold from the United States in 1875, was of bullion, $2,233,775, and coin $59,309,770, making a total of $61,243,545. In 1873 the total amount was about $68,000,000.

Our country had not been known as a Silver producing land before the gold mining began in California, and set adventurers "prospecting" for precious metals in all the rugged regions of the western parts of our continent. Silver had been found in small quantities in North Carolina, and among the copper deposits, but not sufficient for special notice as a contribution to our mints. In 1859 there was a change. That year James Phinney and Henry Comstock, prospecting in what is now Storey county, on the eastern side of Mount Davidson, in Nevada, in the Washoe region, discovered a mine of silver, but had so little idea of its value that the former sold his share in the discovery for a small amount of gold dust, and the latter parted with his soon afterward. The name given to the mine was that of "Comstock," and the "Comstock lode" is the richest known silver mine on the face of the earth.

In 1861 the lode appeared as a wall of black sulphuret, bedded in quartz and granite, on the steep side of a barren mountain, 200 miles from travelled ways—a solitary desert region. Four years afterward, a town of 20,000 inhabitants stood over that lode, named Virginia City. Within that four years, full $2,500,000 had been invested in the development of the lode, which had then (September 1, 1865) yielded silver valued at $30,500,000. Since then immense treasure has been drawn from the bosom of that mountain, and from other silver mines in Nevada, which are its greatest source of opulence. From 1861 to 1874, only thirteen years, the silver mines of Nevada, which are found in all parts of the State, have yielded $181,350,000. The Comstock lode alone has given $146,000,000. During the same time, this new State has contributed to the national wealth $63,000,000 in gold. A branch mint has been established at Carson City, and Nevada promises to be one of the richest mineral states in the Union.

Silver has also been found in Arizona and other Territories. Of these, Idaho promises to be one of the richest. The mountains of Colorado, in the Wasatch range that overlooks the Salt Lake region, are found to be very productive of silver. It is believed that our annual product of silver, now, is about $100,000,000. Our exports of silver in 1875 amounted to $17,198,000 in bullion, and $5,115,670 in coin.

Platinum, much used in the arts in our country, is found here in small quantities in deposits of gold and copper. Mercury or Quicksilver, a fluid metal resembling silver, has been mined to a considerable extent in Santa Clara county, California, in the Coast range of mountains, in that State, but the yield is less now than formerly. The value of the product in California,
in 1873, was a little more than $2,000,000. According to the report of the Paris Exposition, California yielded more than one-half the product of the globe, in 1867. The largest deposit of quicksilver in the world is at Almaden, in Spain, from which, according to Pliny, the Romans, at the beginning of the Christian era, obtained annually about 700,000 pounds of cinnabar, the red oxide of mercury, known as vermillion. It has been found in considerable quantities in Mexico, and also in Peru.

Tin is not found in any workable quantity in the United States, though no country in the world uses so much of it as ours. It has been found in small traces, in the form of oxida, with other ores, in New Hampshire, Massachusetts, on the borders of the Hudson River, in New Jersey, and in Virginia.

Nickel, employed chiefly in producing the alloy known in the arts as German silver, is found in a few places in our country. It has been mined at Chatham, Connecticut, and in Lancaster, Pennsylvania. In the latter place it has been found among copper deposits; and from that locality the nickel was taken for making the new coin of the United States in 1857, which was 12 parts nickel and 88 parts copper. It has also been found in small quantities in Carroll county, Maryland, Mine La Motte, Missouri, and in Gaston and Lincoln counties, North Carolina.

Nickel plating has become an important industry in the United States, within a very few years. So early as 1862, the possibility of depositing nickel, like copper, silver, and gold, by means of a battery, was suspected by one or two chemists in Europe, but to Isaac Adams, of Boston, is due the honor of the discovery of a method for perfectly accomplishing the purpose.

Among the mineral productions of our country, Petroleum or rock oil, holds a most conspicuous place as an article for domestic use and of commerce. It is obtained from the earth, at first by a natural flow like a spring, and afterward by pumping.

Petroleum was known to the ancient Greeks and Romans under the different names of bitumen and naphtha. There is a petroleum spring in one of the Ionian islands which is mentioned by Herodotus, and must have been flowing more than 2,200 years. In many places in Western Asia, on the borders of the Caspian sea, and the slopes of the Caucasus, it has been found in abundance, for centuries. It is also found in Northern Italy, where the Romans procured fuel for their lamps. It is also found in the island of Trinidad; in the province of Ontario (Upper Canada) and in portions of Pennsylvania, Ohio, New York, and West Virginia, and in Lower California.

The early settlers around the head-waters of the Alleghany river, in Pennsylvania and New York, were acquainted with the existence of petroleum there. A stream in Alleghany county in New York, and another in Venango county, Pennsylvania, tributaries of the Alleghany river, were each
named Oil creek because of the appearance of oil on their banks. The surface of the latter stream was frequently covered with oil that oozed from its banks, and the inhabitants gathered it by spreading woollen cloths on the water, and wringing them when saturated with oil. The Indians used it in mixing pigments for painting themselves for war. The French commander at Fort Du Quesne, in a letter to Montcalm, speaks of a pow-wow of the savages on the banks of the Pennsylvania Oil creek, where they set fire to the petroleum on its surface, and lighted up the surrounding country with its blaze.

In 1820 springs of petroleum were struck in Ohio, while borings for salt water were made, one of which sent out so much oil, that it interfered with the water. It was spoken of rather as a nuisance than a wonderful treasure which was not then suspected. Mr. S. P. Hildreth guessed its value when he wrote in 1826: "It affords a clear, brisk light, when burned in this way [in lamps in workshops] and it will be a valuable article for lighting the street lamps in the future cities of Ohio." But its real value remained unappreciated until about twenty years ago, when Messrs. Bowditch and Drake of New Haven, Connecticut, undertook to search for oil. Colonel Drake went to Titusville, on Oil creek, Pennsylvania, in 1859, bored through the rock, and in August that year, struck oil at the depth of seventy-one feet, when a thousand gallons a day were pumped up. This was the beginning of regular boring for petroleum, in this country.

In 1861, operations began in other places in that region; also in the Kanawha Valley in Western Virginia, and in Ohio. A vast number of petroleum fountains have been opened, some of them yielding 1,000 barrels of oil a day, exciting the wonder, and in some instances the fears, of the people. Passing through the Kanawha region in the spring of 1861, I saw the surface of the river all aflame with burning oil, at one place; and I was told that a clergyman near Harper's Ferry had lately denounced as impious, the taking of the oil from the earth, because the Lord had placed it there for the final conflagration of the globe!

The oil-fields of Pennsylvania alone have yielded an enormous amount of petroleum. It has been, since the discovery and beginning of operations in 1859 and 1860, until the first of January, 1874, an average daily product of about 11,000 barrels. The total yield during that time was 55,461,319 barrels of forty gallons each, or about 2,221,500,000 gallons. There were exported from our country to foreign ports, in the year 1875, about 220,000,000 gallons of petroleum in various forms, besides more than 100,000 barrels as residuum in the form of tar, pitch, et cetera, from which the bodies had been distilled. Of that amount, 191,500,000 gallons were kerosene and other forms of illuminating oils.

The products of petroleum used in the arts and for domestic purposes,
are numerous. It was administered as a medicine before it was applied to lubrication and illumination; and it seems to possess medicinal virtues when applied externally to skin diseases. Soon after its general utility was discovered, refineries of petroleum were established in almost every sea-port from Baltimore northward, and many now exist in other parts of the Union. One after another discovered useful applications for petroleum, until now eleven commercial articles are produced from it, some of which are consumed in enormous quantities. These are: Rhigolene, Gasolene, C. Naphtha, B. Naphtha, A. Naphtha, Xerosene, Mineral Sperm Oil, Neutral Lubricating oil, Paraffine, Paraffine wax, Vassaline, and Residuum.

The manufacture of petroleum products in our country has become an enormous item in the statistics of our domestic economy and foreign commerce. Undoubtedly the finest petroleum refinery in the United States and probably in the world, is that of the Downer Kerosene Oil Company of Boston and Corry in Pennsylvania, of which Joshua Merrill is manufacturing chemist. The works in Boston were first established for the production of hydro-carbon oils from coal, boghead shale and albertite; but since 1865, nothing but petroleum has been used there. The branch at Corry is employed only in the distillation of the crude oil, the distillates being shipped to Boston, where all of the above-named products are manufactured, excepting paraffine, lubricating oil and residuum. The product of the establishment annually is over 300,000 gallons naphtha; 1,250,000 gallons kerosene; 250,000 gallons mineral sperm; 600,000 gallons neutral lubricating oil, and 500,000 pounds of paraffine wax. Some of the refineries nearer the oil region, handle annually, particularly in the production of kerosene, such enormous amounts of oil, that the product of the Downer Oil Company seems almost insignificant.

It is the naphtha obtained from petroleum, mixed with kerosene, that has caused all the dreadful accidents that have occurred in the use of that oil. It is more dangerous than gun-powder. Being very cheap, the unscrupulous manufacturer of kerosene is tempted to mix it with his oil, and these men are the murderers of the numerous women and children slain by explosions of kerosene lamps. Without naphtha, kerosene is as safe as sperm whale oil. Almost every State in our Union have passed laws regulating the sale and storage of kerosene to prevent accidents; so, also, have European governments. To test the safety of kerosene, fill a pint tin cup nearly full of water, and warm it until the thermometer shows 120°. Then pour some kerosene on the water, stir it a little, and pass a lighted match across and near it. If the oil ignites, the fluid is unsafe.

Our country is well supplied with Salt from saline waters brought up from the bosom of the earth, for only in South-western Virginia and Louisiana, is rock-salt known to exist. Salt is produced, by evaporation, in a majority
of the States and Territories of the Union, but the great bulk of that production is given from wells or springs near Syracuse, in New York; the Saginaw Valley, Michigan, and the Kanawha Valley, West Virginia, including the wells at Pomeroy, in Meigs county, Ohio. These three localities, with an aggregate of 200 establishments, produced in 1870, about 16,000,000 bushels of salt. The total number of salt-making establishments in the United States at that time was 282, and the total product that year, was 17,606,000 bushels.

The salt springs in New York, are principally in Onondaga county, on the borders of Onondaga Lake, at Syracuse, Geddes, and Salina. They were known to the Indians before the advent of the white man; and during the old war for independence salt was procured from them for the public service. These waters belong to the State of New York, and are sold to the manufacturers of salt for a royalty of one cent on every bushel of crystals produced.

Very little was done in working the salt springs in Michigan, until about 1860, since which time that industry has rapidly developed there, and has become, next to New York, the most extensive of its kind in the Union. The product in 1874, was over 5,000,000 bushels. Some of the wells in the Kanawha Valley have been sunk to the depth of 1,000 and 1,500 feet. Wells there, so early as 1829, produced 1,000,000 bushels of salt annually. The product in 1876 was 4,634,000 bushels. The production of Pennsylvania has reached over 1,000,000 bushels, but since 1860, it has declined. The deposit of rock-salt in the State of Louisiana, discovered in 1862, was found on the island of Petite Anse, in Vermillion bay. There are numerous salt lakes in the vicinity of the great mountain ranges west of the Mississippi. Salt Lake, in Utah, seventy-five miles in length and thirty in breadth, contains over twenty per cent. of common salt, and two per cent. of other salts. It requires about three hundred and forty gallons of ordinary sea-water to make a bushel of salt. The Kanawha Valley water will produce a bushel from seventy-five gallons; and the old wells of Onondaga, forty to forty-five. The water of the new wells there require only thirty-five gallons to make a bushel of salt.

We find, in portions of our country, beds of stone from which valuable Hydraulic Cement is manufactured. It is found in stratified rocks of the aqueous deposits, lying principally in strata of the silurian system connected with the Appalachian chain of mountains. It is an argillaceous limestone, which yields on calcination, the proper proportions of lime, alumina and silica, to unite with water and form a hard substance without slaking or expanding, and to indurate continuously. The most extensive manufacturers of the cement are in Ulster county, New York, the deposits there occupying the narrow valley of Rondout creek, along the line of the Delaware and Hudson Canal.
Iron ore, fuel, and water-power presented in abundance to the attention of the early English and other colonists in this country, caused them to attempt the making of pig and bar iron first for domestic use and then for exportation. The first of these establishments was a bloomery set up by the Virginia Company in 1661, a dozen miles below the Falls of the James river, on the site of Richmond. There iron was first forged in America. The works were destroyed by the Indians the following year.

In 1631, the settlers in Massachusetts built iron works at Lynn, and at Hammersmith in 1644. A furnace and forge were erected at Taunton in 1652. These were among the earliest efforts at the production of iron in the United States for manufacturing purposes. They were very soon repeated in New England and in the other colonies, and finally excited the jealousy of the iron-workers and merchants of Great Britain. When, as early as 1719, American-made iron bars began to find their way into England, the iron interest there procured the passage of a law for the prohibition of the manufacture of any hammered or bar-iron, or nail-rods by forges or other works in the colonies. A dozen years later a report to parliament showed that in New England there were six furnaces, nineteen forges, one slitting-mill for making nail-rods, and one nail factory.

Finally, so jealous of the colonial enterprise and industry, in this branch of production and manufacture, became the iron interest in Great Britain, that parliament, in passing an act in 1750, for the encouragement of the importation of pig and bar-iron from America, put severe restrictions upon the further manufacture of the metal here. It enacted that "no mill or other engine for slitting or rolling iron, or any plating forge to work with a tilt-hammer, or any furnace for making steel shall be erected, or after such erection to be continued," in any of the British colonies in America, under a penalty of $1,000.

It was further declared that such manufacture of iron or steel in the colonies, should be considered as "a nuisance" to be abated within thirty days after notice being given. Other manufactures were equally restrained. The exportation of hats even from one colony to the other, was forbidden; and a hatter was not allowed to have more than three apprentices at one time. The people of the Carolinas were forbidden to cut down the pine trees of their vast forests, and convert their wood into staves, and their juices into tar, turpentine, and rosin, for commercial purposes. Equal restrictions were imposed upon commerce of almost every kind, by navigation laws, for the British government was determined to make the American colonies absolutely dependent upon the mother country.

With slight modifications these unjust, ungenerous and oppressive laws remained in force during the remaining period of colonial rule, and formed one of the counts in the indictment preferred by the American people against
King George, when, in their Great Declaration a hundred years ago, they gave their reasons for declaring the colonies to be "free and independent States."

At the beginning of the old war for independence, all the iron exported from the colonies to Great Britain (and none was sent elsewhere) was in the shape of pigs and bars. It served to purchase articles manufactured of the same metal, for the colonists, as we have seen, were dependent upon Great Britain for every thing made of iron and steel, excepting such rude ones as were manufactured by the common blacksmiths of the country.

The exportation was quite limited, not exceeding 8,000 tons annually, and the entire production was small compared with the amount now produced in our country. Our exportation of raw iron and steel has always been insignificant, and amounted in 1874, in the form of pig, bar, plate, rails, and sheet-iron, and ingots, bars, sheets, and wire of steel, to a total of only little more than 20,000 tons. Of this amount, over 14,000 tons was pig-iron, while the product of about 800 furnaces in the United States in 1873, (the beginning of the period of great depression in all kinds of business in our country) was about 3,000,000 tons.

Up to about 1840, charcoal had been in universal use in the United States in the smelting of iron ores, for wood was abundant. In 1836 coke was used in a single furnace in Fayette county, Pennsylvania. In 1837 anthracite was first used at Mauch Chunk and at Pottsville. Raw bituminous coal was first used for the purpose in the summer of 1846, at Loweville, Mahoning county, Ohio.

The war of the Revolution stimulated the production and manufacture of iron in this country, and furnaces and forges appeared in many parts of the colonies, especially in Pennsylvania and New York. Slitting-mills for slitting hammered iron into nail rods became numerous. After the Revolution there was a great change in the methods of production. The puddling furnace, for making pig-iron malleable, invented by Cort in 1783, and the use of rolls by the same inventor, were introduced here; and from 1790 to 1810, rolling-mills gradually took the place of forges. At the present time there are only a few of the latter in operation, making hammered iron in small quantities. These are in Virginia, North Carolina, and Tennessee. Many forges for making blooms for boiler-plates from charcoal pig-iron, still exist in Pennsylvania.

In 1810 there were 330 forges and 34 rolling and slitting mills in the United States, in which were made 24,500 tons of bar and plate iron, and nearly 8,000 tons of nails; in 1873, there were 335 rolling-mills in our country, making rails, bar, sheet, and plate iron and nails. These made in that year over 1,600,000 tons of rolled iron, including Bessemer steel rails, and 215,000 tons of nails. In 1872, the year before the "panic" which
seriously affected the iron business, the total product of iron and steel in the United States, of unmanufactured metal in every form, was about 5,000,000 tons.

The manufacture of Bessemer steel in this country, was first begun at Wyandotte, Michigan, in 1865. It is so called from a process patented by Henry Bessemer, of England, in 1856, which consists in forcing a current of air or gas through the particles of molten pig-iron in a vessel called a converter to keep up the combustion of carbon, and so thoroughly to decarbonize the iron as to make superior steel of any temper. The ingot from which the first Bessemer steel rail was made in this country, was taken from Wyandotte to Chicago, and rolled into a rail at the North Chicago Rolling-mill, in 1865. The first rails of the kind made upon order, were rolled at the great Cambria Iron works at Johnstown, Pennsylvania, from ingots made at Harrisburg, in 1867. There are now about a dozen Bessemer steel works in the United States. These produced, in 1874, about 190,000 tons of steel, and 165,000 tons of rails.

Cast steel had been made in this country so early as the decade 1830 and 1840. Blistered steel, was made much earlier—even in colonial times. In 1727, a blacksmith at Granby, Connecticut, asked the legislature to aid him in a "curious art" which he had discovered, "by which to convert, change, or transmit common iron into good steel, sufficient for any use." He said he was "the very first that ever performed such an operation in America."

There were, in 1874, about forty steel manufactories in the United States, exclusive of Bessemer, which produced, that year, about 50,000 tons. We are beginning to export crude and unmanufactured iron in considerable quantities, and there seems to be a promise that these exportations will be regular, and will rapidly increase in amount. The value of such exportations (pig, bar, boiler-plate, railroad bars or rails, sheet, band, and hoop) in 1875, was more than $900,000.
CHAPTER XV.

THE manufacture of iron is carried on in our country, in every conceivable way, as skillfully and, in some branches, as extensively, as in any other country on the face of the globe. Our artisans now produce manufactured iron in every form, from the pinions and escapements of the finest watches, to rails for roads, great trusses and cables for bridges, magnificent fronts of buildings, and locomotives and immense steam-engines.

Pennsylvania has become the leading State in the production and manufacture of iron in nearly all its departments. The first rolling-mill in Pittsburgh, now the most important locality in the Union in that branch of the iron interest, was erected there in 1812.

The first mills in our country which made railroad iron were the Mount Savage Works, in Maryland; Montour Iron Works at Danville, Pennsylvania, and the Great Western Works at Brady’s Bend, in the same State, all of which were put in operation between the years 1840 and 1843. The Mount Savage mills made rails in the shape of an inverted letter U, while the others made inverted T rails of the pattern now used. In 1874, there were over sixty rolling-mills in which railroad iron was made, and the product that year was about 750,000 tons, showing a great falling off since 1872, when the total production was 1,000,000 tons of rails.

Among the great iron manufacturing establishments of our country that of the Cambria Iron Company, at Johnstown, Pennsylvania, is a leader. E. Y. Townsend is president of the company, Charles S. Wurts the vice-president, and John T. Killé, secretary and treasurer. Hon. Daniel J. Morrell is the general manager, and has been since 1855. In March, 1870, when he was a member of Congress, Mr. Morrell introduced into the House of Representatives, the bill to provide for the celebration of the Centennial anniversary of independence, at Philadelphia.

Cambria county lies in a lofty position on the western slope of the great Alleghany range; and Johnstown, where the Cambria Iron Works are situated, is on a broad flat, encircled by mountains, at the confluence of the Stony Creek and Little Conemaugh. It is in the midst of abundant materials of every kind for the manufacture of iron. The company was organized in 1853. It was projected by Dr. Peter Shomberger and George S. King of
Johnstown, the former a pioneer in the iron industry, and has grown to be an enormous establishment in the space of about twenty years.

The projectors enlisted capitalists in New York and Philadelphia in the enterprise, but it proved to be a disastrous failure at first. In 1854 and also 1855, the struggling company was compelled to suspend payments. In the latter year it was re-organized, with Mr. Morrell as manager, in whose hands the enterprise has been uniformly successful through all the vicissitudes of the iron interest in our country, for the last twenty years. It is now the foremost of them all, employing in the various branches, about 7,000 persons, men, women, and boys, and transacting a business, in 1873, when the "panic" began, amounting to about $10,000,000 a year. The company owns an aggregate of ore and coal lands of more than 50,000 acres in Cambria county and elsewhere. From these rich possessions they are able to draw a mixture of ores which, carefully worked in their own blast-furnaces, produces iron of the best quality in strength and durability.

The Conemaugh valley is only a few hundred feet in width. On its western side, near the works, lies a seam of semi-bituminous coal that seems to be inexhaustible. It makes the best of coke, and is therefore of incalculable value for use in the blast-furnaces. Under this coal is a bed of the finest water cement. On the opposite side of the little valley are vast beds of iron ore, coal, and limestone, from which were taken 1,400 tons of coal and 500 tons of ore daily at the time we are considering. The whole amount of coal was consumed in the works of the company, excepting what was sold to the inhabitants of Johnstown and vicinity.

The consumption of coal in the works is enormous. To produce a ton of pig-iron, requires six tons of ore, coal, and limestone, and the blast-furnaces of the company produced 300 tons of pig-iron a day, in 1873. Their bloomery and rolling-mills turned out 300 tons of iron and steel rails a day—in a year about 70,000 tons of iron rails and more than 30,000 tons of steel rails. The works cover about sixty acres of ground. The rolling-mill alone occupies seven acres. It contains seven trains of rolls, each train having five pairs of rolls. To keep these rolls supplied with heated metal requires twenty-eight heating furnaces, while two double puddling furnaces furnish the heaters with the puddled balls. An eye-witness wrote: "It is a busy scene enough during the daytime, but at night, when the glow from the furnaces is intensely brilliant, and men stripped to the waist, are rushing here, and there, and everywhere with great masses of heated iron and puddle-balls, it becomes almost unearthly, and one stands watching the operations with fascinated gaze. In the adjoining steel works, where the process of making Bessemer steel is carried on, one could almost imagine himself in the lower regions, and that the orifice of the huge converter was one of the mouths of hell itself. So powerful was the light emitted, that I fancied it
cast shadows on the ground on which the sun was shining brightly; and so intense is the glare that it is impossible to look steadily at it. I see some of the workmen wear spectacles."

The *Cambria Iron Company* had then nine blast-furnaces in operation. Only four of these were at Johnstown; the remainder were distributed as follows: one at Cavenaugh, about two miles from Johnstown; two at Holydaysburgh, to the south of Altoona; one at Frankstown, in Blair county; and another at Bennington, on the summit of the Alleghany mountains. For the transportation of coal and ore from the adjacent mines to these furnaces and the mills, and to do the heavy work of the concern, the company employed eleven locomotive engines, of all sizes. The railway tracks about the works, if stretched in a straight line, would extend thirty-six miles.

Besides the works devoted exclusively to handling iron, the Company have a fine stone-quarry; a saw-mill where a large amount of lumber is produced; a brick-field that turned out about 6,000,000 bricks annually; a coke yard; gas works; and an extensive woolen factory, capable of turning out about 4,000 yards of cassimeres, tweeds, and flannels a year, a considerable portion of which never leaves Johnstown. They have, also, an enormous general store of dry-goods, groceries, et cetera, in which business to the amount of more than $1,000,000 was transacted annually. It is optional with the workmen to buy at the store or not, but the practice of doing so is almost universal, because strict fairness is found there. They have also a slaughter-house, and graze their own sheep and cattle.

Schools and libraries have been established by the Company for the instruction of the families of the workmen. There are also societies among them. There is a sick and wounded fund, to which each workman contributes $1 a month, and when sick or disabled by accident, he is entitled to have the services of any one or more of twelve doctors that he may desire, and their visits as often as he may choose. At the end of each three months, the twelve doctors send in their bills, which are paid by the treasurer of the fund, according to the service which each has performed.

The Company, to encourage industry and thrift, hold out inducements for the workmen to build cottages for themselves. They sell them lots and furnish them with lumber to build with, and the Company are paid by deducting so much a month from the wages. Mr. Morrell, the generous, able, and wise manager of the establishment, has endeavored to make himself and those whom he employs, like members of one great family, having interests in common. He acts upon the great truth, that the more you elevate the laborer, and the more prosperous he is, the more valuable is his labor.

Such is a brief outline picture of the great *Cambria Iron Company* as they were when in full operation in 1873, and as they will be again on the return of that prosperity which will surely come at no distant day.
In the mechanic arts in which metals are used, almost every operation now seen in our country was practically unknown at the beginning of the century just closed. Down to the period when the Americans waged a bloodless war against Great Britain with the engine of non-importation agreements, almost every mechanical contrivance used by the Americans—edge tools, cutlery, and mills—was imported. With the shutting off of that source of supply, our native genius was stimulated to the performance of various exploits in the mechanic arts that were of immense national value when the political independence of the States was achieved. The women fought the enemy with the little flax and bigger wool-wheel, and clothed their fathers, brothers, husbands, and sons with homespun and hunting-shirts while they fought the armies of Great Britain and Germany in the field.

When the war for independence was closed, that genius, wedded to patriotism, put forth its energies to achieve commercial independence of Great Britain, and various manufacturing establishments were soon seen in our own country. In the year when the last hostile soldier left our shores (1783), Oliver Evans introduced his improved grain-mill. Rumsey and Fitch almost simultaneously conceived the possibility of navigation by steam, and were trying their experiments as early as 1784 and 1785. The first cotton-mill in America was built at Beverly, Massachusetts, in 1787, and the same year, or not much later, Jacob Perkins, a citizen of that State, established a nail-cutting machine, for which he afterward obtained a patent. Samuel Slater introduced Arkwright's spinning machines into our country in 1790. In 1793, Whitney's cotton-gin, and a few years later, Smith's (called Whittmore's) card cloth machine, gave a great impetus to the manufacture of cotton cloth in our country.

Other great inventions speedily followed, that have made the genius of the Americans renowned wherever commerce displays her ensigns. Our Patent Office illustrates this fact in a remarkable degree. The number of patents issued in England in the decade ending in 1800, was 675; in the United States, during the same period, 306. In the next decade the number issued in England was 936, and in the United States, 1,086. In the decade of 1860 and 1870, the number of English patents granted was 35,079, and the number issued in the United States was 79,612. Our patent system was established in 1790, and from that time to 1870, the total number of patents issued was 120,028. The greater impulse given to invention in our country seems to have begun with the decade of 1850 and 1860. Between 1840 and 1850 there were only 5,042 patents issued in the United States; from 1850 to 1860, there were 23,140.

The labor-saving power of the steam engine is wonderful. It has been estimated that the great Pyramid of Ghizeh, in the valley of the Nile, occu-
NEW INDUSTRIES INTRODUCED.

pied the labor of 100,000 men for twenty years in the labor of piling up the stones alone. Steam engines to-day, worked by 36,000 men, would raise the same quantity of material to the same height in eighteen hours. Three thousand such pyramids might be erected by steam power with 36,000 men, in the period occupied by the builders of the one at Ghizeh.

The steam engine has, in a great degree, superseded the use of water-power in great manufacturing establishments, even in rural districts; and in most of the arts where much force is required, it has taken the place of human muscle. It drives machinery of all kinds for workers in wood, metals, and fibre; it drives the machine that prints our books and newspapers, and that which makes the paper and ink of which they are composed. It weaves the carpets, plain and gorgeous, on which the poor and the opulent tread; it assists in constructing the beautiful watch and the delicate sewing machine, and in fashioning and polishing the rich woods, making the elegant bronzes, brilliant chandeliers, sumptuous curtains, immense mirrors, costly furniture, and beautiful paper-hangings which adorn the drawing-rooms of the wealthy. It bores huge mountains for the passage of the railway train which it draws, and it manufactures the pins and needles, the scissors and thimbles, the bodkin and pen-knife that fill a lady's work-basket. It washes, irons, sews for us. In a word, it is a servant more obedient than any controlled by the magician's wand. The Steam Engine is a beneficent entity, more powerful in its magical feats than any spirit told of in the thousand and one Arabian Nights' Entertainments.

The fallacy of the idea that a labor-saving machine is necessarily injurious to the working man has been thoroughly exposed by the practical teachings of the steam engine. It has been well said in the discussion of the question—Has the introduction of machinery hurt the laboring classes?—"A few workmen were thrown out of employment to make room for hundreds of employés upon the railroad, to say nothing of the thousands benefited by their construction, and that of the cars, locomotives, station-houses, et cetera. A handful of weavers and spinners have been temporarily removed, to be reinstated, with thousands of their fellow men and women, at full as good pay as before."

The working power of the steam engine has spread the arts of civilization over the earth in a most wonderful manner, and advanced our race in those arts and the amenities of social life more within the present century than in a thousand years previously. It has relieved human muscle from an immense strain, and given freedom to the intellect for greater achievements in the world of thought out of which proceed great inventions.

One of the most extensive of the steam engine manufactories of our country is that of the Corliss Steam Engine Company, of Providence, Rhode Island. The founder of the works is George H. Corliss, a native of Wash-
ington county, New York, and now about fifty-nine years of age. He received an academic education, and entered into business as a country storekeeper. While only a youth he had exhibited much mechanical genius. Circumstances led him to investigate mechanical problems, when his inventive faculties were developed. In 1841, Mr. Corliss became a resident of Rhode Island, and he has been a citizen of that State ever since.

In the year 1849, Mr. Corliss received letters-patent for important improvements in the steam-engine, consisting of a peculiar arrangement of valves by which much force is saved and a waste of the expansive force of steam is prevented; also an apparatus for a perfectly noiseless automatic regulation of steam in its passage into the cylinder, by which the entire expansive force of the steam is saved and applied. By means of this important contrivance, there is also at least thirty per cent. of fuel saved, making the value of the invention to users of this engine, in the United States, full $2,000,000 a year.

When it was seen that the invention had a commercial value, Mr. Corliss was subjected to a series of litigations, to secure his patents, that extended over fifteen or twenty years, involving him in a loss in the form of costs and otherwise, of full $200,000, besides an immense amount of labor as an expert, because he was compelled to teach his able counsel, such as ex-Governor Seward, Judge Blatchford, Judge Curtis, et cetera, the technicalities of the case. In all these suits Mr. Corliss came out victor; but not more than one-third of the twenty-one years from 1849 until 1870, when he applied for a renewal of his six patents (renewed in 1859), had he enjoyed the full and exclusive use of his inventions. When he made application for the last renewal, two hundred and sixty-seven firms, using his engines, joined in an earnest request that the prayer of his petition should be granted, and it was granted.

In all his business transactions, Mr. Corliss has steadily refused to encourage any demoralizing methods. It is known that it was a common practice for engine-builders to give a commission to engine-drivers and others for their influence in securing contracts. Mr. Corliss never gave a dollar for such a purpose, and contracts hundreds of thousands of dollars in amount went to other builders, when a mere pittance of such demoralizing appliances might have secured them for himself. He knew the superiority of his invention, and he had faith that users would soon discover the fact, and by their choice of his machine, would assert that superiority. Events have justified his faith.

Step by step Mr. Corliss has achieved his reputation as one of the leading mechanicians of our age. The testimonials of appreciation, under the peculiar circumstances of their bestowal, have been very gratifying. Engine-builders in other countries, have adopted his improvements; and at the
Vienna Exhibition, in 1873, where he had neither an engine, nor a machine, nor a man to represent him, he received from the international jurors, the highest award, namely, the Grand Diploma of Honor, a particular distinction given for "eminent merits in the domain of science, its application to the education of the people, and its conduction to the advancement of the intellectual, moral and material welfare of man." The attention of the jury was directed to Mr. Corliss, by engines that were on exhibition from European workshops, built on his system, the makers having placed his name on their exhibits so that they might be identified with his great improvements.

In 1870, the American Academy of Arts and Sciences, conferred upon Mr. Corliss the gold and silver Rumford medals, for his improvements in the steam-engine. In 1796, Count Rumford, a native of Massachusetts, left with the Academy of Arts and Sciences, in trust, $5,000, the interest to be applied to the presentation of two medals of the intrinsic value of $300, to the authors of the most important discoveries or useful improvements in any part of America, for the promotion of the good of mankind. This was the seventh occasion of such presentation, since the foundation of the trust.

The President of the Academy (Dr. Gray), in the course of his address on that occasion, quoted from the report of J. Scott Russell, (one of the most eminent of the British engineers), on the Exhibition at Paris in 1867, who bestowed the highest encomiums upon the invention of Mr. Corliss. Mr. Russell said: "The American engine of Corliss everywhere tells of wise forethought, judicious proportion, sound execution and exquisite contrivance." Dr. Gray said that within the twenty years since the machine was perfected, more than one thousand engines of the kind had been constructed in the United States, and several hundred in other countries, giving an aggregate of not less than 250,000 horse-power.

Mr. Corliss, who represented Rhode Island in the Centennial Commission, made the munificent offer to furnish power to drive the fourteen acres of machinery in Machinery Hall, during the Centennial Celebration. It was accepted, and a magnificent engine of fourteen hundred horse-power, represented in the accompanying engraving, was put up in the Hall. That engine is capable of furnishing the whole power for any manufacturing establishment in the world. Every part of the work on it, from the minutest pin or bolt to the moulding and casting of the massive frame, passed under the personal inspection of Mr. Corliss.

The extent and resources of the Corliss Steam Engine Company, may be estimated by the fact, that the giant engine, with the boilers and shafting, produced mainly from new designs, and made from crude material (scrap-iron and pig metal), was manufactured, transported about three hundred miles, and set-up ready for operation, in the space of ten months. Their
buildings cover a space of about five acres, and the establishment has a capacity for employing 1,000 men. They have made castings each of 72,000 pounds of molten metal, and have forged shafts weighing 22,000 pounds.

The steam-engine was first successfully applied to navigation, in the United States. The steam-boat is an American creation—a development of the first century of the Republic, now closed, although there seems to be a fair claim for a simultaneous production of science and the mechanic arts, in Scotland.

Immediately after the close of the war for independence, James Rumsey, a Bohemian, propelled a boat by steam on the Potomac river, which was seen, and the fact certified to by Washington. In 1788, an association was formed to aid him, called the Rumsey Society, of which Dr. Franklin was president. John Fitch, a native of Connecticut, exhibited a boat on the Delaware at Philadelphia, in 1786, propelled by steam; and in 1788, he applied to the Continental Congress for a patent, saying his boat could be propelled by the vapor eight miles an hour. A stock company was formed at Philadelphia, who built a steam-packet boat that ran until they failed in 1790. Fitch prosecuted his projects for steam navigation, in France, in 1793, but without success, and died in 1798 without seeing his clear dream become a reality, as it did a few years afterward.

In 1788, Patrick N. Miller and William Symington, Scotchmen, navigated waters in Scotland in a boat propelled by steam, which they had invented, and the next year they placed a larger one on the Forth and Clyde canal. In 1802, Symington built for Lord Dundas, a little steam-boat for the same waters, named the Charlotte Dundas. In 1804, John C. Stevens, of Hoboken, New Jersey, constructed a steam-boat on the Hudson, that was driven by a Watt's engine, with a tubular boiler of his own invention, and a screw propeller. The same year Oliver Evans put a steam-dredge on the Delaware and Schuylkill rivers, propelled by a steam paddle-wheel moved by a high-pressure engine, the first of its kind ever used. His machinery was so geared that it would rotate wheels for travelling with the vessel on land—the early locomotive. He called his vessel the Oructor Amphibolis—the Amphibious Digger. So early as 1787, he had conceived the idea of a steam land-carriage; and that year, and in 1794–5 he sent drawings and specifications for such a design to England.

Meanwhile Robert Fulton, of New York, had been perfecting a steam-boat that was the first really successful one. He had met Chancellor Livingston, of Livingston's Manor on the Hudson, in Paris in 1799, and interested that wealthy gentleman in his projects for steam navigation. He tried two experiments on the Seine, before the year 1804. Fulton visited Scotland where he saw Symington's boat, and received from that gentleman a description of its construction. With these facts in his possession he
planned, and on his return to New York in 1806, in conjunction with Chancellor Livingston he built a steam-boat which he named Clermont, the title of Livingston’s country seat on the Manor. She was one hundred and thirty feet in length, eighteen feet in width, and seven feet in depth, and was of one hundred and sixty tons burden. She was furnished with a steam-engine purchased of Watt and Boulton.

Fulton was regarded by most people as an unwise enthusiast; and when, on the morning of Friday, August 7, 1807, he left New York in the Clermont for a voyage to Albany, accompanied by half a dozen friends who believed in his theory, and had courage enough to stand by him, and she stopped a short time on account of a slight imperfection, he was greeted with jeers by a crowd on the shore. But she soon moved on, out of sight of the deriding multitude, and made her way to Albany and back, against wind and tide, frightening the inhabitants along the river shores, some of whom supposed she was a great monster of the deep, when they saw her belching fire and smoke as she went over the waters in the night. The great experiment became a demonstration; and on the first of September, 1807, the following advertisement appeared in New York newspapers:

“The North river steam-boat will leave Paulus Hook [Jersey City] on Friday the 4th of September, at 9 in the morning, and arrive at Albany on Saturday at 9 in the afternoon. Provisions, good berths and accommodations are provided.”

The round trip was made in seventy-two hours, for which each passenger was charged $14. In October one of the newspapers contained the following editorial article: “Mr. Fulton's new steamboat left New York on the 2d at 10 o'clock A. M., against a strong tide, very rough water, and a violent gale from the north. She made a headway against the most sanguine expectations, and without being rocked by the waves.” The Clermont, from the start, became a regular passenger boat on the Hudson river—the pioneer of those magnificent vessels four or five hundred feet long, which now move daily and nightly upon the bosom of that stream, at the rate of from twenty to twenty-five miles an hour, and which have been justly called “floating palaces.” They are fitted up in a style of luxuriousness that would be admired in the dwellings of royalty. Of this class are the steamboats of the People’s Line, which navigate the Hudson river—the magnificent successors of the Clermont and its cotemporaries.

Before the Clermont was built, Mr. Livingston procured for himself from the legislature of the State of New York, the grant of the exclusive privilege of navigating the waters of that commonwealth, by means of steam power. The conditions were that within one year after the passage of the act, he should construct a boat of not less than twenty tons burden, that should navigate the Hudson at a speed not less than four miles an hour; and that
such boat should not fail to run regularly between New York and Albany for the space of one year. The boat was built on a larger scale, and, fulfilling all the conditions, Mr. Livingston enjoyed the franchise. By an amendment of the act, Mr. Fulton was subsequently made a just participator with Mr. Livingston in the privilege.

Soon after the experiment with the Clermont proved to be a success, another boat called the Car of Neptune was built, and the generous franchise was enlarged, granting an extension of five years for each new boat that should be built. Before the breaking out of the war in 1812, Messrs. Fulton and Livingston had caused six boats of various sizes to be built, for navigating the Hudson and for ferrying at New York.

This monopoly ended in 1815, and for twenty years afterwards various persons engaged in the steamboat business, but without marked success. Finally, in 1835, Daniel Drew, A. P. St. John and others, established a steamboat line between New York and Albany, the vessels stopping at intermediate places. The first boats were the Westchester and Emerald, and were, respectively, about one hundred and forty and one hundred and sixty feet in length, with accommodations for about one hundred passengers each. Mr. Drew was the sole owner of one of these steamers, and is now the only survivor of those who were associated with him in one of the great enterprises of the day.

In the year 1840, the business of the line was increased by the organizing of an association comprising some of the wealthier men of our State. Larger and better boats were placed on the route, and in 1854, the association was chartered under the title of the New Jersey Steamboat Company, but more familiarly known as The People's Line. Isaac Newton was the first President of the Company, and Mr. Drew, the real founder of the line, was the Secretary. When Mr. Newton died, Mr. Drew became President of the Company, and arrangements were made for the running of the boats between New York and Albany without stopping at intermediate places.

The Company have built or purchased many steamboats, and have constantly placed larger ones on the line, until now they have three magnificent vessels that rank among the finest in the world for river navigation. These are the St. John, which began running in 1864; the Dean Richmond, that was launched the next year, and the Daniel Drew—the finest of them all—completed in 1867. The first two cost a little more than $500,000 each, and the Drew nearly $1,000,000. The hulls were built by John English and Sons, of New York, and the engines were constructed by T. Secor & Co., of the same city.

The Drew is 400 feet in length, and 48 feet beam—84 feet over the guards—depth of hold ten feet, and draws only six feet of water. Her engine has an eighty-two inch cylinder and fifteen feet stroke, and carries
twenty to twenty-five pounds of steam. She is of 2,500 tons burden, and has sleeping accommodations for about 1,000 persons. Besides the cabins there are 284 state-rooms, arranged in two tiers, the upper ones being reached by a broad and massive spiral stair-case. The state-rooms and other apartments are lighted by gas; and the "bridal rooms" are most sumptuously furnished with rich carpets, lace curtains, mirrors, and costly chairs, sofas, tables and bedsteads, and frescoed and gilded decorations.

The grand saloon of the *Drew* extends nearly the whole length of the vessel. It is crowned with an elliptical roof, and is elegantly furnished. It is brilliantly lighted, glitters with mirrors, and is adorned with bronzes and other works of art, presenting a beautiful picture of refinement. The whole vessel is heated by steam. She is thoroughly manned by experienced persons, and fully equipped. The boats of this line are remarkable for their speed, often making the voyage between New York and Albany, one hundred and sixty miles, in nine hours. Mr. Drew is still the president of the company; a hale man, more than eighty years of age, who, a farmer's boy, found employment on a North river steamboat in the earlier days of steam navigation. He became the owner of property worth millions, and made a liberal gift for the founding of the "Drew Theological [Methodist] Seminary," at Madison, New Jersey. Our illustration gives an excellent view of one of *The People's Line* of steamboats.

The most perfect and popular of the class of steamboats on the Hudson, that carry passengers from wharf to wharf of the rural villages and cities that skirt that stream, is the *Mary Powell*, owned by her commander, Captain Anderson, and plying between New York and Rondout. Her regular speed is unequalled, being sometimes twenty-five miles an hour; and there are occasions in the summer when a thousand passengers may be seen on her, when she leaves her dock at New York, a greater portion of them bound for picturesque resorts along the river. When the *Richmond* attained the speed of nine miles an hour, just before Fulton died, the great inventor declared it to be "the perfection of steamboating."

The *Clermont* may be considered as the sixteenth steamboat built, in chronological order, but she was the *first* that was used for practical purposes, permanently; and the popular verdict awarding to Fulton the honor of being, more than any other man, the pioneer in steam-navigation, seems to be a righteous one. So thought the committee at the World's Fair in London, in 1851, who said: "Many persons, in various countries, claim the honor of having first invented small boats propelled by steam; but it is to the undaunted perseverance of the American Fulton that is due the everlasting honor of having produced this revolution, both in naval architecture, and in navigation." In 1811, Fulton and Livingston caused a steamboat of one hundred tons burden to be built at Pittsburgh, Pennsylvania. It
was named Orleans, and made a few trips between Pittsburgh and New Orleans—the first vessel of the kind seen on the Ohio and Mississippi rivers—when it was taken to pieces, and the engine was set up in a cotton factory.

When Fulton and Livingston obtained the exclusive right to navigate the Hudson by steam, Robert L., a son of John C. Stevens, went with the Phoenix, a steamboat then lately launched at Hoboken, around to the Delaware. This was the first instance of navigation by steam, on the ocean, and was a bold exploit. It led the way to that vast intercourse between the nations now, by means of steamships, which first began by the voyage of the American ship Savannah, in 1818. That vessel with small engines aided by sails, crossed the Atlantic ocean, touched at Liverpool, and went on to St. Petersburg, making the voyage between New York and that city, in twenty-six days. In 1824, the steamboat Enterprise rounded the Cape of Good Hope, and went to India. These bold examples were not followed, and ocean steam navigation awaited a new birth almost twenty years longer. Philosophers like Dr. Lardner declared it to be impracticable to navigate the ocean profitably by steam, on account of the large quantity of fuel to be carried for the service of the engine. But this fallacy was dismissed in 1838, when the steamships Sirius and Great Western, (the latter over 1,300 tons burthen) began regular trips across the Atlantic between England and New York. The "Cunard Line" was started in 1840, and the "Collins Line" in 1850. Now the smoke of steamships is seen on every sea. Their prows part the waters of tropical rivers and penetrate the ice-fields of polar seas. It was the little top-sail schooner Midas, propelled by steam-working twin screws constructed under the direction of Captain John Ericsson, and of only 188 tons burthen, that was the first American steamboat that went around the Cape of Good Hope, and became a passenger vessel on the internal waters of China. She left New York in November, 1844, and arrived on the Chinese coast in May following. We shall notice steam ships-of-war, hereafter.
CHAPTER XVI.

The American coast steamships for passengers and traffic are the best in the world, considered as to beauty of form and furnishings, and their strength and fleetness. The passenger ships of this class belonging to the Old Colony steamboat line—the Bristol and Providence—are undoubtedly unrivalled. They ply between New York and Fall River, Rhode Island. Previous to 1845, the best route between New York and Boston, was by steamboats to Providence, and thence by railway. The boats at that time considered as models, would almost excite ridicule now, by comparison, not being larger than the first-class ferry-boats now passing between New York and Brooklyn.

In 1847, a new route between New York and Boston was established, by steamboat to Fall River, and thence by the Old Colony railway. The pioneer boat—the Bay State—on that route, was the most magnificent vessel of its kind then afloat, and attracted more attention than any that have been built since. But in size and appointments either the Bristol or Providence far surpass her. The first cost of these boats, which were built by William H. Webb, of New York, was $1,200,000 each; and they each require an annual expenditure of $150,000 to keep them in perfect condition for the season of travel. To re-decorate and give them a summer dress, requires about two tons of paint for each.

The Bristol is 375 feet in length, 83 feet beam over all, 16 feet depth of hold, and has a capacity of 3,000 tons. Her engine has a one hundred and ten inch cylinder, and twelve feet piston stroke, which develops a power of 2,800 horses. This mighty giant is fed with steam by three low-pressure boilers. For protection against fire the vessel is furnished with a profusion of extinguishers and fire-buckets, scattered everywhere, and three large pumps and nine hundred feet of hose are always ready for use. She also carries thirteen life-boats, and seven hundred cork life-belts and as many cork mattresses—one for every berth. It takes one hundred and sixteen persons to man her, from captain to deck-hand and fireman.

The furnishing of this vessel is in the most sumptuous manner. She has six decks with four tiers of state-rooms surrounding spacious saloons. One of these, reached by a grand stair-case, is two hundred and seventy-five feet
in length, twenty-eight feet in width, and twenty-one feet in height. The floors of the saloons are richly carpeted with velvet and Axminster fabrics; the seats are mahogany inlaid with satin and other costly woods, and upholstered in a sumptuous manner. Costly chandeliers, brilliant with gas-light, hang from the ceilings; costly mirrors reflect the gay scene on every side, and the windows are draped with rich curtains. The nine bridal state-rooms are still more richly furnished, if possible. The decorations of the dining-room are in excellent taste; and over each of the many tables hangs a chandelier as brilliant as those in the grand saloon. Such is a brief description of the principal features of one of the really “floating palaces” of the Fall River line, on which many thousands of men, women, and children are conveyed along the picturesque New England coast every season. They excite the wonder and admiration of every visitor from abroad.

It seems impossible to determine who was the inventor of the screw propeller for steam vessels, now almost universally used instead of the paddle-wheel. It was first brought into full public notice by Captain John Ericsson, in England, in 1836. He was a Swedish engineer, then residing in England; and has now been a resident of our country between thirty and forty years. He is the inventor of the steam fire-engine which he perfected in this country, and for which he received, in 1840, the great gold medal of the Mechanic’s Institute of the city of New York, the only one ever awarded by that society.

The English admiralty sneered at Ericsson’s screw as an innovation, but Captain Stockton, of the American navy, comprehended its utility, and recommended its use to our Navy Department. Ericsson came to New York in 1839, and in 1841, he was employed by our government in fitting his invention to the war steamship Princeton, launched at the Philadelphia navy-yard. This was the first use of the screw propeller, in this country.

The steam carriage dimly shadowed by the Oructor Amphibolis of Evans, has been a marvellous implement in promoting industrial and social progress, especially in this country of “magnificent distances.” From the year 1802, many attempts had been made among the collieries of Great Britain, to perfect a tractor engine to do the work of drawing coal on the tramways; but nothing approaching the locomotive of our day in construction and efficiency appeared until George Stephenson, an English coal miner, built the Manchester and Liverpool railway, for passenger travel, put on it a locomotive called the “Rocket,” and in October, 1829, ran with it on that road at the rate of more than thirty miles an hour. That was the first railway of much length, built for the conveyance of passengers. It was opened for traffic, at the middle of September, 1830. That was the beginning of railway travelling. Stephenson was the founder of the railway system.

Evans, the American, had suggested the locomotive. His drawings
and specifications sent to England in 1787 and 1794-5, were copied there, and became the basis of all subsequent inventions of the kind. His idea was to propel wagons on smooth turnpike roads only. In 1804, he uttered a remarkable prophecy, in these words: "The time will come when a steam carriage will set out from Washington in the morning—the passengers will breakfast at Baltimore—dine at Philadelphia and sup in New York the same day." Evans beheld, with the clear vision of a seer, the picture of the railway of to-day, in all its magnificence, glowing in the broad sunlight of the future.

The first railroad charter granted in America, was given by the legislature of the State of New York in 1825, to the Mohawk and Hudson Railroad Company, of which more will be said presently. The next charter was given by the legislature of Maryland, to the Baltimore and Ohio Railroad Company, to construct a railway across the Alleghany mountains from tidewater to the river beyond the great hills. That was in 1827, while Stephenson was building the Manchester and Liverpool railway. It was intended to move the carriages on the Baltimore and Ohio railroad by horse-power.

The same year (1827) the Delaware and Hudson Canal Company sent the eminent civil engineer, Horatio Allen (yet living), to England, to buy three locomotives, and irons for a railway which they built the next year from the terminus of their canal at Honesdale to their coal mines. One of these locomotives built by Stephenson, arrived at New York in the spring of 1829. Soon afterward another one, the "Lion," built by Foster, Rastick & Co., arrived, and at the latter part of the summer, Mr. Allen put it on the railway. This was the first locomotive put into use in this country.

The first locomotive built in the United States was made in 1830 by Peter Cooper, the philanthropist, at his iron works at Canton, near Baltimore, after his own designs. It drew an open car on the Baltimore and Ohio railway, filled with directors of that road, from Baltimore to Ellicott's Mills, at the rate of eighteen miles an hour. Up to that time relays of horses had moved the cars on that road, between Baltimore and Frederick (then the western terminus of the road), and from that circumstance, the "Relay House" at the junction of the main line and the Washington branch, derived its name. Mr. Cooper yet lives, in New York, at the age of eighty-five years, in vigor of body and mind, a witness of the vast increase in the business of railway construction, and of locomotive-building in our country, which he began forty-six years ago.

Satisfied that steam could be successfully used in propelling locomotives on railways, the directors of the Baltimore and Ohio Railroad Company offered a reward of $4,000 for the best American locomotive. Phineas Davis of York, Pennsylvania, won the prize, his engine being the only one of many that survived the trial. He used the upright tubular boiler, which Mr.
Cooper had patented (and which was used in his little locomotive), and purchased the right.

In January, 1828, the legislature of South Carolina chartered a company for building a railway between Charleston and the Savannah river. Its construction was begun in 1829, and it was completed in 1833. The Company sent Horatio Allen to England to examine the railways there. They had determined to work the road exclusively by locomotives, and offered a prize of $500 for the best plan of a horse locomotive. It was won by C. E. Detmold, civil engineer in New York, (yet living) who designed and built an engine run by a horse walking on an endless platform, which carried passengers at the rate of twelve miles an hour. This was upon the principle of the construction of the horse power for ferry-boats, which was used on the Hudson river until within the last twenty years. In the winter of 1829-30, Mr. Detmold made the drawings of the steam locomotive "Best Friend," which was designed by E. L. Miller, of Charleston, and it was built by the Kembles at the West Point Foundry at Cold Spring, on the Hudson, for the South Carolina railroad. It was tested there thirteen months after the "Rocket" achieved its triumph in England.

Such was the beginning of the passenger railway system in the United States. Already two short railways for freighting purposes, on which horsepower was used, had been constructed in our country. The first was built by Gridley Bryant and T. H. Perkins, for carrying heavy blocks of granite from the quarries in Quincy, Massachusetts, to the nearest tide-water, a distance of four miles. It was completed in 1826, at a cost of $50,000. The rails were wood plated with iron, and were laid on stone sleepers eight feet apart. Mr. Bryant invented the switch or turn-out; and on that road the first turn-table was used. He also constructed the first eight-wheeled car ever used, which Ross Winans of Baltimore perfected, in the eight-wheeled double bogie carriage now in use in this country, and largely in Europe for the Pullman carriages. The second railway built in the United States, was from the coal mines at Mauch Chunk, in Pennsylvania, to the Lehigh river, which, with its side-tracks, was eighteen miles in length. It was operated by gravity, and by mules for the return trip.

The Mohawk and Hudson railway between Albany and Schenectady, was begun in 1830, and in the fall of 1831, it was carrying an average of three hundred and eighty-seven passengers daily. On the crown of the steep slopes to each river there was a stationary engine. In 1832, a locomotive was upon it that drew a load of eight tons over the pine barrens at the rate of thirty miles an hour. Of this road mention will be made again, presently. In the coal regions of Pennsylvania short railways for freighting the mineral had rapidly multiplied, after the success at Mauch Chunk, and
in 1832, the number in that State, was sixty-seven. From that year may be dated the rapid expansion of the railway system in this country.

The multiplication of railways has fully kept pace with the marvellous increase in population and wealth, until now the mileage is far greater than that of all other railway systems in the world combined. In our country, in 1874, it was 72,623 miles against 52,424 miles of all other railways on the earth. In 1830, there were in this country, 23 miles of railway; in 1840, 2,818; in 1850, 9,021; in 1860, 9,021; in 1870, 30,635; in 1880, 52,898; and in 1874, the year when the great depression in trade and its disastrous effects upon the property of railways began to be fully felt, the number was 72,623. Since then the increase has been almost nothing. At that time the estimated population of our country was 42,219,000, occupying an area, exclusive of territory in which no railways existed, of 2,492,316 square miles, giving 581 inhabitants to every mile of railroad. The capital-stock of all the roads in 1874, was $1,991,000,000; the funded and other debt, $2,230,000,000; making a total capital account of about $4,222,000,000. The average cost of the railways were $60,425 a mile, and the total receipts that year were $520,466,016. Of that amount, $141,000,000 were from passengers. The operating expenses were about $331,000,000, and the net earnings were $189,500,000. The dividends paid amounted to over $67,000,000. Percentage of dividends to capital stock, 3.37.

The safety of travel on railways, in comparison with that of other methods, is quite remarkable. Mr. Charles Francis Adams Jr. has compiled statistics, after a series of investigations, which show that only one railroad passenger in 9,000,000 is killed, and only one in 1,500,000 is bruised. In the year 1874 only one person was killed on all the Massachusetts railroads, while seventy-six were killed in Boston, by accident. This seems to imply that it is safer to travel on railroads than to sit in one's own house.

These figures show at a glance the important character of this single industry—the railway interest—which has been created and grown up in our country, within the past forty-five years. Add to this the enormous increase in the value of lands which the railways have given market facilities to, and the stimulus to many other industries which they have created, such as rolling-mills in the manufacture of rails, locomotive-building and the making of cars, etc., and the total amount is almost incalculable.

The building of locomotives has become a large and lucrative industry in our country. In 1830 Colonel Stephen Long, of the United States Topographical Engineers, obtained a charter from the legislature of Pennsylvania for the "American Steam-Carriage Company," the first ever incorporated in this country. He built a locomotive at Philadelphia, and it was put on the first two miles of rails laid by the New Castle and Frenchtown Railroad Company, in Delaware. It was not successful, but led to important results.
Meanwhile Mathew W. Baldwin was, with the assistance of the late Franklin Peale, perfecting the model of a locomotive which was exhibited in motion at Peale's Museum, in Philadelphia. Mr. Baldwin became one of the most successful locomotive builders in America.

Colonel Long associated himself with William Norris, in Philadelphia, but soon retired. The latter, with his establishment at Bush Hill, became a very extensive and noted locomotive builder. His engine called the "George Washington" built in 1836, performed a feat which English and American engineers had pronounced an impossibility, and "took the engineering world by storm." It ran up an inclined plane on the (now) Pennsylvania Railroad, at Peter's Island, 2,800 feet in length, with a rise of one foot in fourteen, drawing a load of over 19,000 pounds above the weight of the engine, at a speed of fifteen miles an hour. This triumph, noised abroad, caused orders for locomotives to come in freely; and from that day to this there has been a spirited rivalry for the meed of excellence, between the improved engines of Norris and Baldwin. The Norris works ceased to exist about ten years ago, while the "Baldwin Locomotive Works," with which the late Joseph Harrison, of Philadelphia, was early associated, are still flourishing. Mr. Harrison made many important improvements in the construction of locomotives; and these works to-day form the leading manufactory in the world, in the quality and quantity of their products.

The second in age, and probably now the most extensive establishment in our country for making Railroad Cars, is that of the Wason Car Manufacturing Company at Brightwood, near Springfield, Massachusetts. It was founded in 1840, by Thomas Witheridge Wason, an excellent mechanic, who with his brother Charles, built on the banks of the Connecticut river, in Springfield, a small car-shop—so small that the body of the first car constructed had to stand partly out of doors, while he was putting it together. During the first year he built six single truck and two double truck box freight-cars and several platform cars for the Connecticut River railroad, the whole worth $7,000. As the business increased, more spacious buildings in Springfield, were occupied, until 1851, when the partnership of T. W. & C. Wason was dissolved, and the junior member went to Cleveland, to carry on the same business, and recently to Chattanooga, in Tennessee. Other partners afterward joined the elder Wason, and in 1863, the Wason Car Manufacturing Company was incorporated, when the works covered 155,000 square feet.

Up to 1868, all the iron casting was done outside, and for some years in Mr. Wason's own foundry; then the car factory and foundry were united, Mr. Wason soon afterward retired from active business, and died in August, 1870.

The present officers of the Company are George C. Fisk, president:
Wason All of Car Railway Car Builders
Springfield, Mass.
Henry S. Hyde, secretary and treasurer, and W. H. Page, superintendent and master mechanic. The business has continually grown from the beginning, and they have gone on improving the construction of passenger cars. They designed and built the first sleeping car, and although they were not the originators of the Drawing-Room car, they were the second builders in this country. They constructed the first drawing-room compartment car with elevated roofs, and entrances at the ends, in the manner now used; and they have built cars for almost every railroad in our country. Among their larger contracts have been the making of seventy-two passenger cars and the iron work of 2,600 freight cars for the Central Pacific railway in California; sixty-two passenger cars for the Canada Southern railway, and one hundred and fifty-six passenger cars for the Central Railroad of New Jersey. Their business which, in 1853, when the firm of T. W. Wason & Co. was formed, amounted to $100,000 a year, and at the time of the organization of the company to $250,000, it had increased, in 1874, to $1,400,000.

More commodious quarters were required, and a tract of land on the meadows bordering the Connecticut river, two miles from Springfield, was selected, where, on a sixteen-acre tract they have built a new establishment. They named the place Brightwood. A pleasant little village has grown up there, with a post-office, on the line of the Connecticut River railroad.

The buildings, arranged by Mr. Fisk, form a model establishment in plan, with perfect equipment in machinery and tools. Between two ranges of buildings is a transfer railway track terminating at one end in a long lumber yard; and the shops and yard are seamed, at regular distances, with lateral car tracks. On these tracks runs an immense transfer table of iron, forty-two feet long, which takes cars freighted with material from the railroad switch, and transfers them to the place where needed: also cars from the wood-work shops to the paint shops, and when completed, thence to the railroad for shipment. This table was devised by Superintendent Page, and cost $10,000. It is moved on three tracks by a twelve-horse power rotary engine.

The foundry in floor area, is 170 by 62 feet, and 35 feet in height. At one end stands an 80,000 pound track scale. The full capacity of the foundry, is one hundred car wheels and ten tons of castings each day. The Machine-shop is a two story building, 96 by 45, the lower story devoted to the heavier machinery, and the upper story to the lighter machinery. In this shop there is a hydraulic press for determining the exact pressure with which the wheels are set upon the axles. A smith shop near, 150 by 45 feet, and 35 feet in height to the deck roof, with a large wing, contains a twelve hundred pound drop and a full array of forges and trip-hammers.

The passenger car erecting shop is 175 feet in length, 75 feet in width, and the same height as the smith shop. It contains five parallel tracks, and
is used entirely for building the wood-work of passenger cars, the trucks on which they are mounted being set up in a two story building, 60 by 45, adjoining. Next to this is a building 200 by 62 feet, two stories in height, with two large wings, the lower floor of the whole filled with heavy machinery for heavy wood-work. The cabinet shop above occupies the whole area of the main building. In one wing are the upholstering, varnishing, and trimming rooms, each 25 by 42 feet. The other two story addition to this building, contains below, the engine (one hundred and fifty horse power), and boilers, of the best construction. All of these buildings are constructed of brick. Next to the wood-work building are two lumber sheds each 420 feet long, 40 feet wide and two stories high. The paint shop is a wooden building 500 feet long by 75 feet wide, and 35 feet high. In this thirty-two of the largest cars can be undergoing the decoration work at the same time.

Additional brick buildings are in course of construction, and when all shall be completed, the Company will employ 1,000 men, and turn out one passenger car and eight freight cars each day. They have invested in the land and buildings, $275,000; in stock, tools and machinery, $300,000, and in floating capital $325,000, making a total of $900,000.

There were in the United States in 1870, 171 railway car-building and repairing establishments, employing about 16,000 persons, and a capital of over $16,600,000. They paid annually in wages, $6,650,000, and the value of their yearly product, was $31,000,000.

The amazing growth of the American railway system was stimulated chiefly by the requirement of the various regions of our country which have been penetrated, explored, populated and developed within the last sixty years. The various roads were planned, constructed and fostered independently of each other in a great degree, without the least regard to any national system or mutual relations, until very recently. As a rule the charters were granted by the respective States in which the roads were constructed; and the great through lines connecting widely separated cities or railroad centres, have been formed by the consolidation of shorter roads into continuous lines, under one management, or by the longer and more prosperous roads leasing the shorter and poorer roads. Some roads made through lines in effect, by mutual agreements concerning the running of their respective trains. On account of the lack of a national system, there have been different gauges in the construction of the American roads, which have made consolidation, in some instances, difficult. The first great trunk-lines originated in a desire of the sea-board cities to secure a larger share of the business from the interior and Western States.

The first national recognition of our railway system was when, in the winter of 1849-50, Congress passed an act giving to the Mobile and Ohio Railroad Company, to enable them to connect Mobile with the mouth of
the Ohio river, 1,000,000 acres of the public lands lying contiguous to the route. This was followed by a grant of 2,595,000 acres to the State of Illinois, which conveyed it to the Illinois Central Railroad Company to enable them to construct a railway from Dunleith, on the Mississippi, to Cairo, four hundred and fifty-five miles, with a branch from Centralia to Chicago. This policy, pursued in other cases, gave a great impetus to railway building in the West and South.

The greatest American railway enterprise was the construction of a road over the lofty mountain ranges and the great plains between the Missouri river and the Pacific ocean. So early as 1846, such an enterprise was publicly advocated by Asa Whitney; and in 1849, after the discovery of gold in California promised a rapid accumulation of wealth and population on the Pacific coast, Senator Benton introduced a bill into Congress, providing for preliminary steps in such an undertaking. In 1853 Congress passed an act providing for surveys of various routes, by the corps of topographical engineers. These surveys cost about $1,000,000. Nothing further was done, owing to dissensions between the North and the South, until 1862 and 1864, when Congress, in the midst of the immense strain upon the resources of the government in carrying on the war for the preservation of the Union, passed acts granting subsidies for the work, from the treasury of the United States, in the form of six per cent. gold bonds, at the rate of $16,000 a mile from the Missouri to the eastern base of the Rocky mountains; $48,000 a mile, for three hundred miles through those mountains; $32,000 a mile between the Rocky mountains and the Sierra Nevada, and $16,000 a mile from the western slopes of the latter range to the sea. In addition to this subsidy, Congress granted about 25,000,000 acres of land along the line of the road. Some modifications were afterwards made in the first subsidy.

Work was begun on the great railway in 1863, and was completed in May, 1869, when a continuous railroad communication between the Atlantic and Pacific oceans was opened. The entire length of the road, exclusive of branches, is about two thousand miles. It crosses nine distinct mountain ranges, the highest elevation on the road being 7,123 feet at Rattle Snake Pass, west of the Laramie Plains. The route from New York to San Francisco, by way of Chicago and Omaha, is travelled in six and seven days. Another road, subsidized by the government, and called the Northern Pacific railroad, to extend from Lake Superior to Puget's Sound, on the Pacific, was begun in 1870, but on account of financial difficulties, the work was suspended in 1873.

Among the important improvements first made in the construction of railways in this country, was the adoption of the T rail, made in rolling-mills in place of the flat bar. Great improvements were also made in the construction of cars for comfort and safety. The old-fashioned method of coupling
by means of links and pins has been superseded by Miller's patent which guards against "telescoping" in case of accident. Sleeping cars were first seen on a few of the American railways in 1858, but they were rude and unsatisfactory. The invention of George Pullman, patented in 1864, seems to meet every requirement for comfort, convenience, and healthfulness, in sleeping cars. These are now used on more than thirty thousand miles of railroad in the United States, and are largely adopted abroad.

Undoubtedly the best built, most perfectly equipped and managed, and most successful of the railroads in our country, is that of the New York Central and Hudson River, the history of which fully illustrates the growth of the railroad system in the United States.

We have observed that the Mohawk and Hudson railway was completed in 1831. The projectors of that road, in their most fanciful and extravagant dreams, never had a glimpse of the magnificent trunk line railroad, made up of a series of which that road was the initial. It was on the 9th of August, 1831, that the Mohawk and Hudson railroad was fully opened for passenger traffic between Albany and Schenectady. On that day the first passenger train went over the road from the head of the Albany inclined plane, to that at Schenectady, in an hour. The cars, which consisted of ordinary stage-coach bodies on four-wheeled trucks, with each a seating capacity inside and on the top, for twelve persons, were drawn by the infant locomotive "De Witt Clinton," which was built at Kemble's West Point Foundry. It had two cylinders five and one-half inches in diameter and sixteen inches stroke, on an incline; four wheels four and one-half feet in diameter, all drivers, with outside connecting rods and spokes turned and finished, the hubs of cast and the spokes and tires of wrought-iron. It had inside cranks and a tubular boiler with drop furnace and two fire-doors one above the other; copper tubes two and one-half inches in diameter and about six feet in length, and pumps worked vertically by a bell-crank.

This locomotive and the train of cars attached, presented a strong contrast to the powerful tractor engines and magnificent passenger cars of the present time. The cars were connected by three-linked chains, which made a considerable distance between them. They were without brakes, and entirely under the control of the engineer. The passengers were much disturbed at starting and stopping by reason of this peculiar attachment, and ludicrous scenes sometimes occurred when the train was suddenly brought to a full stop. Passengers seated on the outside of the cars, would often seek protection from the sun and flying sparks from the engine, by means of umbrellas, which often came out skeletons at the end of the journey, and the clothes of the traveller frequently had holes burnt in them. These annoyances were remedied in time, until now the palace car presents the features of comfort found in the drawing-room of a mansion.
Railroads were afterwards built between Schenectady and Utica; Utica and Syracuse; Syracuse and Rochester and Buffalo, and Rochester, Lockport and Niagara Falls. This chain of railways between the Hudson river and Lake Erie was completed in 1845, and passengers who, before, were compelled to make a tedious journey of several days by stages and canal between Albany and Buffalo, could then travel that distance in about fifteen hours. The stage time was from eight to ten days, and the cost was thirty dollars, including meals and sleeping. The canal packet time was more. Now the fast postal train travels from New York to Buffalo, one hundred and forty-three miles further than from Albany to Buffalo, in ten hours and forty-five minutes, including all stops, and carrying thirty tons of mail matter, and sometimes more.

In 1853, by an act of the New York legislature, the following railways were consolidated under the corporate name of "The New York Central Railroad Company," namely: the "Albany and Schenectady" (the old Mohawk and Hudson); "Schenectady and Troy"; "Utica and Schenectady"; "Syracuse and Utica"; "Rochester and Syracuse"; "Buffalo and Rochester"; "Rochester, Lockport and Niagara Falls"; and "Buffalo and Lockport"; comprising five hundred and thirty-four miles of road in operation, two hundred and forty and one-half of which was double tracked. The first board of directors were elected July 6, 1853, with the Hon. Erastus Corning, president, and Dean Richmond, vice-president.

At the period of its organization, the New York Central Railroad Company had 147 locomotives, 156 first class passenger coaches or cars, 55 second class and emigrant cars, 55 baggage, mail, and express cars, and 1,084 freight cars. The total number of passengers carried in the year ending with September, 1854, was 2,536,874, and total tons of freight were 549,805. The receipts from passengers was $3,151,513, and from freights, $2,479,820. Ten years later, the number of locomotives had increased to 241, first class passenger cars to 188, emigrant and second class to 68, baggage, mail, and express to 78, and freight to 4,596 cars. Total number of passengers that year, was 3,554,254, and 1,557,148 tons of freight. The receipts for passengers were $3,923,151, and freight earnings, $8,543,370. The increase was steady until 1869, when "The New York Central" and "Hudson River" railroads were consolidated.

The Hudson River railroad, extending along the eastern shore of the Hudson from New York to Albany, was completed in September, 1851. It was a very expensive undertaking, as there was a vast amount of rock-cutting and tunneling. It was regarded as a wild scheme, and a fruitless competition with the cheaper river transportation lines. The managers persevered against many obstacles, but for ten years it was unremunerative to the shareholders. In 1803, Cornelius Vanderbilt, then one of the largest steamship owners in the world, perceiving the probable ultimate value of
the stock of that road as an investment, determined to devote a large portion of his wealth to railroad enterprises. He secured the control of a majority of the shares, and in 1864, a board of directors, in his interest, were elected. The next year he was made president of the Hudson River Railroad Company, and his eldest son, Wm. H. Vanderbilt, vice-president. Under sagacious management, the value of the road was soon greatly enhanced.

Soon after this, Mr. Vanderbilt obtained a like control of the "New York Central." The two roads were operated separately until the first of November, 1869, when they were consolidated with the title above named, and a capital of §90,000,000.

The report of the fiscal year ending with September, 1874, shows that at that time, in the midst of the great depression in business of all kinds, the receipts were much larger than in 1867. At that time the equipment of the road comprised 364 locomotives, 8 dummy engines, 436 first class passenger cars, exclusive of palace or drawing-room cars owned by a separate interest, 76 second class and emigrant cars, 217 baggage, mail, and express cars, and 14,736 freight cars. The number of passengers carried in 1874, was 9,878,352; also 6,114,678 tons of freight. The receipts from passengers were $7,497,356, and the freight earnings were $20,348,725; total receipts from all sources, $31,650,386. The total receipts from all sources in 1867, were $19,246,614, an increase of more than $12,000,000, or nearly sixty-four and one half per cent. in seven years, while the percentage of cost of operating had, by sagacious management, been actually reduced fully ten per cent. in 1874. Such management makes the line a great financial success.

The traffic of the road had increased to such an extent that its managers felt the necessity of providing greater facilities, and it was decided to lay two other tracks between Albany and Buffalo, making four independent tracks, two of them devoted exclusively to passenger traffic, and two to freight trains. This would not only obviate the frequent delays to which passenger trains were liable, but would enable freight trains to move constantly upon the line without having to be laid off at sidings for the passing of passenger trains. By this arrangement the safety of passengers would be greatly increased, and the almost certainty of trains reaching their destination at the time appointed would be assured. The construction of the additional tracks was begun in May, 1873, and in December the next year, four tracks were in operation between Albany and Rochester, a distance of two hundred and twenty-nine miles. These were laid with the best English steel rails.

The "New York and Harlem Railroad" was leased by the corporation; and branches have been constructed, until now this great trunk line extends, with its own and leased roads, 1,000 miles. Reducing the miles of quadruple, triple, and double tracks to single track mileage, we have an equivalent of 2,359\frac{1}{2} miles of single track. The main line, from New York to
View of the interior of Car House, Grand Central Depot, New York City.
Four track viaduct over Harlem Flats
between 28th and 30th Streets
New York City
NEW YORK CENTRAL AND HUDSON RIVER RAILROAD.

Buffalo, is laid entirely with steel rails, and also a considerable portion of its branches. The bridges are mostly built of iron and hewn stone, in the most substantial manner, each one between Albany and Rochester being laid with four tracks. The road-bed is made of the best materials and approved methods of construction, and the grades are such that a high rate of speed may be kept up with safety.

The New York Central and Hudson River Railroad was the first in this country to adopt the use of track-tanks from which water is supplied to locomotives of passenger trains, while under a comparatively high rate of speed—a great advantage in the saving of time. The facilities of this road for making very fast time are such, that the General Government selected it, in connection with the “Lake Shore and Michigan Southern Railway,” for the New York and Chicago “Fast Mail,” a train composed entirely of postal cars, carrying, as we have observed, thirty tons or more of mail matter each trip. It runs between New York and Chicago in twenty-seven hours. The centre train seen in the accompanying engraving of the viaduct, approaching the tunnel at Ninety-eighth street, New York city, gives a good illustration of this Fast Mail train.

The principal shops of the company for building and repairing locomotives and cars, are at West Albany, and are very extensive and complete. Smaller ones are at New York, Syracuse, Rochester and Buffalo. Within five years great improvements have been made at the New York terminus of the road. The Grand Central Depot, completed in 1871, is a structure unexcelled by any in the world in point of architectural beauty and solidity, it being constructed almost exclusively of brick, iron and glass. Its length is 696 feet, and its width is 240 feet. The offices in it are elegantly constructed and furnished. The car-house is 650 feet in length and 200 feet in width, surmounted by a roof of iron and glass, supported by thirty-one heavy and highly ornamented iron trusses measuring over one hundred feet from the track to the apex of the arch, and presenting a most pleasing appearance to the eye during the day. At night it is brilliantly lighted by twelve large reflectors, of fifty-eight burners each, suspended from the roof, and lighted by electricity. This interior is finely represented in the accompanying engraving.

The “Fourth Avenue Improvement,” as it is called, commences at the north end of the depot, and extends to the Harlem river, a distance of about four and one-half miles. This improvement was effected at a cost of nearly $6,500,000. For a portion of the distance the road, four tracks in width, is carried entirely under the ground, and a portion of the way over a viaduct of solid masonry, as seen in the engraving. The difficulty of executing so gigantic an undertaking may be partially realized when the fact is taken into consideration, that transit for more than one hundred and twenty trains a
day through the avenue had to be provided for while the work was in progress. It was done thoroughly and successfully.

The immense freight depot of this Company, covers the entire site of what was formerly St. John's Park, a plot of ground nearly five acres in extent, bordered by Hudson, Beach, Varick and Laight streets, in the south-western part of the city. It is constructed of brick, with heavy stone facings, and is absolutely fire-proof. It is composed of three stories having an aggregate height of fifty-three feet. In the first story freight is received and delivered; and in the two upper stories are ware-houses and offices. It is furnished with steam elevators for hoisting and lowering merchandise. Alternate tracks for cars and drive-ways for trucks run through the vast building from Hudson to Varick streets, and afford complete facilities for handling the immense quantities of merchandise that pass in and out.

Besides this depot, there are extensive ones in other sections of the city, and a large fleet of steam-tugs and barges are continually employed in transferring freight to and from points on the North and East rivers. At Sixty-fifth street and North river they have an elevator 350 by 100 feet in ground area, and 160 feet in height, with a capacity for 150,000 bushels of grain. Extensive docks, will soon supply a want long felt, and greatly expedite the loading of steamers and sailing vessels for foreign ports.
CHAPTER XVII.

IN connection with these great lines of railways, bridge building has become an important industry in our country, in which a large amount of capital is invested. These bridges, spanning large rivers and deep and broad ravines, are built mostly of stone and iron.

Thomas Paine, the author of “Common Sense” and “The Rights of Man,” was the inventor of the iron bridge, for which invention he obtained letters patent in England in 1788. The following year, in connection with Walker Brothers, of Yorkshire, he constructed an iron bridge at New Castle-upon-Tyne. It was an arch of 110 feet span, and 5 feet in height from the chord line. It was so portable in construction, that it might be taken down and put up with very little labor. When George Stephenson remodeled it, it was found to be as perfect as when it was first built. Paine made a model for an iron bridge over the Schuylkill at Philadelphia, with a single arch of iron of 400 feet. It was laid before the Academy of Sciences at Paris, and was approved by that body. “I took the idea,” Paine wrote, “from a spider’s web, of which it resembles a section, and I naturally supposed that when nature enabled that insect to make a web, she taught it the best method of putting it together.” Paine sold his model and drawings to a man named Burden, in England, who, after the inventor returned to America, procured a patent there in his (Burden’s) name.

The history of bridge-building in ancient times is a very attractive one, but we may not indulge in the pursuit of it here. I will only remark that there seems to be no evidence that the more ancient historic people, such as the Chinese, the inhabitants of Central Asia, and the Egyptians, ever used the arch in bridge building. It is believed that the Romans first used that form of strength, and also stone, for the purpose, at a very early period in their history. At Rome may still be seen the ruins of the first bridge of stone—the Pons Senatorius—with arches, that was built over the Tiber. I will also mention that, in the 12th century, a religious society was formed in France, called The Brethren of the Bridge, for the purpose of spanning frequently crossed rivers with these structures, and founding ferries, and houses of entertainment on the river banks, as security for travellers against the exactions and rapacity of banditti. This association built many noble
structures, among them the bridge at Lyons, composed of twenty arches. The first stone bridge over the Thames, and known as the old London bridge, was commenced in 1176 by Peter of Cole-church, supposed to have been one of The Brethren of the Bridge.

There are two forms of bridges generally used in the United States, namely, the suspension and the truss; and the methods of structure employed by American engineers, who are using steel and iron more than timber, are generally followed in bridge building throughout the world.

Suspension bridges were first built, on a small scale, in the United States, between the years 1795 and 1810, by Mr. Finley. The first wire suspension bridge erected in the United States was placed across the Schuylkill River, at Philadelphia by Charles Ellet, Jr. The most eminent of these structures in our country, and perhaps in the world, is the Roebling suspension railway bridge over the Niagara River, completed in 1855. It is supported by iron wire cables, in the construction of which 14,560 wires were used. The span is 821 feet, deflection 59 feet, and height of the railway track above the water, 245 feet. Its capacity to bear is estimated at 12,000 tons; and so stiff is the bridge, that the passage of an ordinary train of cars depresses it only three or four inches. The same engineer built a great suspension bridge over the Ohio river at Cincinnati, the entire length of which is 2,220 feet, with a single span of 1,057 feet. Mr. Roebling also planned the great suspension bridge over the East River, to connect the cities of New York and Brooklyn, now in course of erection under the charge of his son, A. Roebling, which is to be 3,475 feet in length between the anchorages, and a clear span over the river of 1,595 feet, the bottom of the chord line 135 feet above the water.

The truss bridge, in which the structure rests upon piers, is now the favorite kind for railways, wherever they may be constructed, and they are generally built wholly of wrought iron and stone. The railway bridge over the Susquehanna river, at Havre de Grace, is a remarkable wooden structure, resting on granite piers. The entire work is 3,271 feet in length, divided into twelve spans. Since 1860, railway bridges have been mostly built of wrought iron, with parts of steel. Several of them now span the Mississippi and Missouri rivers, the most notable and costly of which is that at St. Louis, recently completed. It lies upon four piers composed of granite and limestone resting on the rock-bed of the river, sunk through sand, in one instance to the depth of 120 feet, by the use of wrought iron caissons and atmospheric pressure. The arches of flat vault are 60 feet in height. It was designed by James B. Eads, and with the tunnel under the city of St. Louis by which access is gained to its western end, it cost about $10,000,000. Great iron railway bridges have also been built over the Mis-
souri river. Every where their great superiority to ferries, as a way of passing rivers, is certified; and such structures will hereafter rise in every part of our land. In their wildest dreams of the future, our fathers, a hundred years ago, never had a glimpse of such magnificent engineering as the railroads and railroad bridges of our day.

One of the most remarkable of these structures in our country, and in the world, will be the great railway bridge over the Hudson river at Poughkeepsie, half-way between the cities of New York and Albany, a contract for the building of which was made with the American Bridge Company of Chicago, in January, 1876. The total length of the bridge and its approaches will be 4,500 feet. The bridge proper will be composed of five spans, 580 feet each, from centre to centre of the stone piers, on which the structure will rest, each span having a clear width, at water-line, of 500 feet. The bridge is to be built of iron and steel. The height of the roadway will be 135 feet above the water, to be constructed for two tracks, and side-walks with iron railings; the cost, according to the contract, to be $3,500,000.

George Stephenson built two tubular iron bridges in England, the Britannia and Conway, the former crossing the Menai Strait 103 feet above the water. The tubes in which the road-beds were made, were of wrought-iron. Only one structure of the kind has appeared in America—the Victoria railway bridge that spans the St. Lawrence river at Montreal. This bridge is two miles in length, and cost over $5,000,000. It contains 10,500 tons of iron and 3,000,000 cubic feet of masonry, the iron being laid on stone piers.

In 1876, there were, in our country, 64 establishments engaged in bridge-building, employing about 2,000 persons, to whom $1,123,000 were paid in wages. They employed capital to the amount of about $3,000,000, and the value of their product that year was about $5,500,000.

There have been great changes wrought, and marvellous improvements made in the methods of constructing machines for use in the arts and industries of our country, within a comparatively few years. We have already observed that implements of labor, before the close of the last century, were each generally made wholly by the work of one man, a division of labor not then being in vogue here. Now every part of a machine or implement is made by a separate machine invented and constructed for the purpose. For example: to make a single sewing machine of the Wheeler and Wilson pattern, nearly one hundred other machines, made for the purpose, are employed, thus superseding manual labor and skill, and exceeding it greatly in perfection of performance. All machines devised for turning, planing, shaping, drilling or boring wood or metal, in which the tool or cutting edge is guided in its fixed path by mechanical means are called, in contradistinction to hand tools, machine tools. This term comprehends all machines that work or shape metal, such as steam-hammers and hydraulic
forging machines; riveting, punching, and shearing machines, as well as turning-lathes and drill-presses.

Machine tool-making is a distinct branch of industry, and is of very recent date in our country. Formerly makers of steam-engines and other kinds of machinery, made each for himself such machine tools as he required. Thus special tools for special purposes, were mostly make-shifts, imperfectly designed and rudely executed. The present perfection of machinery of all kinds would be an impossibility without the improved machine tools now in use; and their perfection underlies the perfection of their own and other machine making. What can now be done in the mechanic arts is rendered possible by the thought and skill brought to bear on this branch of industry by those who have made this class of machinery their life-work. Machine tool-making has, as we have observed, become a distinct branch of industry, and many skillful engineers devote their best talents to the designing and construction of new tools for special purposes, as well as perfecting standard tools for more general use.

Joseph Whitworth, in England, was one of the first to attempt the construction of machine tools with special reference to quality and quantity of work they could do. Soon afterward the house of Bancroft and Sellers (now William Sellers and Company) of Philadelphia, undertook the same thing in America. This firm began the manufacture of machine tools in the year 1848, with which they connected the business of manufacturing shafting and mill-gearing. They had a difficult task before them, for they not only had to construct their own labor-saving devices, but, in many instances, to educate workmen to their rigid standard of excellence in the use of them. The superior quality of their products soon became widely known, and their business so increased, that their shops in Kensington district became too small. In 1853 they removed to new buildings occupying a square bounded by Sixteenth and Seventeenth streets, and Pennsylvania avenue and Hamilton streets, where they have facilities for shipping large machines. Their establishment attracted the engineers of our country and of Europe. It was then in the suburbs of the city, on what was known as Bush Hill, the estate of the Pennsylvania Hamilton family, whose old mansion yet stands near the works we are considering. There, too, were the shops of Rush and Muhlenberg, successors to Oliver Evans. There, too, were the shops of Long and Norris, already alluded to, for building locomotives; and near by were those of Matthew Baldwin, spoken of before, now the extensive buildings of the Baldwin Locomotive Works. Twenty years ago green fields were near; now these works are in the bosom of a great city.

In 1855, Mr. Bancroft died, and the brothers William and John Sellers Jr. assumed the business, with the present firm name of William Sellers & Co. They alone constituted the firm until 1873, when Coleman Sellers,
Sellers Bancroft, and James C. Brooks entered it. The shops on Bush Hill became, in time, too limited for the business. The closing of the Norris Locomotive Works enabled the firm to purchase the square of land adjoining their establishment; and the space now occupied by their works is about five acres. The buildings are of the most substantial kind, and the establishment is perfectly equipped with the best machinery.

William Sellers & Co. manufacture every kind of machine tools, in the broadest sense of the term as applied to machines to fashion metals. Many of these machines are of their own invention, or improved by them, by which the mechanic arts are greatly facilitated in manipulation and benefited by the perfection of results. For example—a dozen years ago the time required to bore a single locomotive cylinder was seldom less than two days. A few years ago this firm were asked to construct a machine for that work exclusively. They did so, and produced a machine that not only does the boring but all the turning, making the cylinder ready for the planing machine in three hours and twenty minutes.

Besides their legitimate business of machine tool-making, they have for many years made shafting, bearings, and couplings and pulleys of improved construction and pattern. They also manufacture many things for the equipment of railways, such as turn-tables for locomotives, sliding or transfer tables, and turn-tables for pivot bridges. They have control of Giffard's patent injector for supplying steam boilers with water, to which they have made improvements almost equal in value to that of the original invention. They made their first formal display of goods in Europe at the Paris Exhibition in 1867, and a greater display at Vienna in 1873. At both of these exhibitions they received the most flattering testimonials of approbation. At Paris they were awarded the gold medal; at Vienna, the great diploma of honor, a prize given not for excellence in workmanship alone, but for eminent merit in scientific achievements.

Dr. J. Anderson, civil engineer, in his report to the British parliament on machine tools, et cetera, at the Vienna exhibition, after commenting on a mechanical puddling machine, the invention of Mr. Sellers, and built by his firm, remarked: "From the foregoing short description, it will be seen how rich this house is in mechanical resources; to do them full justice would occupy more space than is occupied by the entire report. This is a pattern house for machine tool-makers to study; at every exhibition it brings forth tools new and old, and, as a rule, all thoroughly well considered in the most minute detail so far as mechanism is concerned—more so than many firms which adhere to the most hackneyed description of the ordinary sorts of tools, and continue to make them from year to year without regard to improvement; and it is a source of satisfaction to observe the extreme interest with which our young men lingered around the exhibit of Sellers &
Co., admiring the good points, and keenly discussing the merits of the puddling machine from the iron maker's point of view." It may be remarked, in reference to the effect of this studied improvement in one branch of industry by even one house only, that students see something more than the mere possible cheapening of products to the users of improved labor-saving implements; they also see a moral influence brought to bear on the world at large to change the bias of technical education and widen the field of thought.

Similar encomiums have been bestowed at other great exhibitions. Professor Releux, Director of the Industrial Academy at Berlin, in his report on Motors, Machines, and Machine Apparatus, at the Paris Exposition in 1867, declared that the Americans held the first rank "in the field of inventions and inventive genius;" that her "machine exhibitions have almost exclusively the character of originality, and, although the execution was not generally superior, it contained examples of the highest order of constructive ability and perfect workmanship."

Professor Releux compliments American genius and enterprise, in a manner most gratifying to us as a nation, saying: "The healthy young trans-Atlantic industry, which continually withdraws from us energetic and intelligent heads and robust hands, makes, with the aid of her peculiar genius, the most sweeping progress, so that we shall soon have to turn our front from England westward.

"The constructions of Sellers, some of which have very rapidly made their way through Germany, bear, in regard to inventions, the peculiar, unique stamp of American genius. They are distinguished from us by more direct and rapid conception. The American aims straightway for the needed construction, using the means that appear to him the simplest and most effective, whether new or old. Our historically heaped-up material, and the cautious character of the German are so inseparably interwoven, that among the number of known means, we often forget to ask whether they are the simplest, or whether new ones ought not to be better. The American really constructs in accordance with the severest theoretical abstraction, observing on the one side a distinctly worked-out aim, weighing on the other the already available means of creating new ones, and then proceeding, regardless of precedents, as straight as possible for the object. This spirit is manifested in Sellers' lathes, shafting and bearings; in his planing machine with diagonal screw shaft; in his screw-cutting machine; and it is strikingly prominent in his system of screw threads, which he has boldly placed alongside of the old venerated Whitworth system, in spite of the terror of its numerous adherents after he had discovered actual defects. A proper valuation of this proceeding contains the most instructive hints for our higher technical instruction."
Mr. Edward Bancroft, one of the founders of the house of William Sellers & Co., designed a hanger for shafts known as the “ball-and-socket hanger,” with a self-adjusting principle, which is now universally used in this country and extensively in foreign lands. This led to the perfecting of shafting by the same house, and they contrived machines for its more perfect manufacture. Some years later William Sellers & Co. invented a new form of coupling for connecting the separate pieces of round iron that make up a line of shafts. This coupling does away with much required skill in workmen, and expensive fittings, and has so cheapened and improved the product, that it is attracting universal attention and adoption. Many hundred miles of their improved shafting now drive cotton and woolen mills in our country. The new system was first brought to the notice of Europe at the exhibition in Paris, in 1867. It was more fully illustrated at Vienna in 1873; and samples of hangers, couplings, et cetera, have been purchased by many technical schools in Europe, and placed in their museums.

The beneficent achievements of an establishment like that of William Sellers & Co., win far more solid renown, respect and veneration for our country, than the most brilliant military or naval victories have ever accomplished.

The manufacture of iron pipes for conveying water, gas, et cetera, has become a very large industry in this country within a few years. Their extensive use as conduits is of recent date. The now prevailing and excellent sanitary custom in our country of supplying cities and large villages with pure water in abundance, has made a very great demand for iron pipes of two kinds, namely, cast and wrought-iron, for the distribution of the water. The efficient performance of the great water-works now seen in our country, and the extensive use of illuminating gas, would not be possible without iron pipes.

The great aqueducts of antiquity were made of masonry, in which hydraulic cement was used. Such was the character of the conduits that connected the three “pools of Solomon” near Bethlehem, and the conduit that conveyed the water six miles into Jerusalem. Of such materials were the magnificent aqueducts of Carthage and Rome, but these waters were not distributed through dwellings as they are now, but were collected in open pools or reservoirs.

Of masonry is the great Croton aqueduct chiefly constructed—a work that surpasses all modern constructions of the kind in extent and magnificence—for supplying the city of New York with pure water. But when it approaches the city, and for the distribution of water in the city, iron pipes are used. The water is carried across the Harlem river in two cast-iron pipes three feet in diameter, and a wrought-iron pipe seven feet six inches in diameter. The work is forty miles in length. It took five years to build
it, and the whole expense was $12,500,000. A dam across the little Croton river produces a lake that covers four hundred acres, and holds about 500,000,000 gallons of water. This is the collecting reservoir. The aqueduct can convey about 115,000,000 gallons daily into the two receiving reservoirs in Central Park, New York, one covering an area of thirty-five acres, and has a capacity of 500,000 gallons, and the other covers one hundred acres, with a capacity of 1,170,000 gallons. Other great aqueducts are in contemplation—one for the supply of San Francisco, from lofty Lake Tahoe, on a mountain one hundred and fifty miles from that city. It is also proposed to construct an aqueduct from Lake George to New York city, a distance of two hundred miles.

For larger conduits, cast-iron pipes are used. The chief establishment for the manufacture of this kind, is the National Foundry and Pipe Works, at Pittsburgh, Pennsylvania. It is an immense establishment, occupying over six acres of ground, where pipes of all sizes, from two inches to six feet in diameter are cast; and the capacity of the works is such, that two hundred tons of iron may be made into pipes each day. This establishment has grown up from a small foundry for the production of bolts or hinges, wagon boxes and smoothing-irons, established in 1843, by John and William Smith, and called the "Carron Foundry."

The most extensive and complete works on the American continent for the manufacture of wrought-iron pipes of every description, is that of Morris, Tasker and Company, Philadelphia and New Castle, Delaware. It is known as the Pascal Iron Works. The origin of these works may be traced to the year 1821, when Stephen P. Morris began the manufacture of stoves and grates in the city of Philadelphia. In 1835, he was associated with Henry Morris and Thomas T. Tasker, sr., in the same business, then extended to making ranges. Their establishment was on the corner of Third and Walnut streets, where the principal offices now are. The business is conducted by the sons of Thomas T. Tasker, under the old firm name of Morris, Tasker and Company.

It was in the year 1835 that the use of illuminating gas was first introduced into the city of Philadelphia. Attempts to apply coal gas for illumination had been made in Cornwall, England, as early as 1792; and the engine works of Boulton & Watt, at Soho, were illuminated by gas at the celebration of peace in Europe in 1802. It was made by an apparatus constructed by Mr. Murdock, the first experimenter in Cornwall. It grew rapidly in public favor, until, in 1813, the streets of London were lighted by gas. The year before, Walter Scott wrote from that capital to a friend, and said: "There is a crazy man here trying to light the city with smoke."

The first attempts to introduce gas into the United States were made in Baltimore between 1816 and 1820. They failed. It was successfully intro-
INTRODUCTION OF GAS-LIGHT.

duced into Boston in 1822. The next year, the first gas company was formed in New York city, with the title of the New York Gas-light Company. They began operations with a capital of $1,000,000. But the people were so slow to accept the new illuminator, that the company were not in full and active operation before 1827. Three years afterward, when success was assured, the Manhattan Gas-light Company (still in existence) was formed in New York, with a capital of $500,000, and which has been increased to $4,000,000. Both companies used rosin and oil for the manufacture of gas, until 1849. Now, almost every city, and many villages, in our country, have one or more gas companies. There are about 400 of these establishments in the United States, with an aggregate capital of about $72,000,000. They employ full 9,000 persons; use annually $11,000,000 worth of material; and the yearly product is about $33,000,000.

In the year when gas was introduced into Philadelphia (1835), William Griffiths, an experienced and expert workman, lately from England, proposed to Morris, Tasker & Co. to enter into the manufacture of gas pipes. The proposition was favorably considered, and gas pipes were added to the products of the establishment. It was a new industry, and has been pursued with great success by that firm, whose workshops cover acres of ground, and give employment to thousands of persons, whose products may be valued by millions.

The Pascal Iron Works comprise twelve acres, covering two entire squares in Philadelphia, bounded by Third and Fifth streets in one direction, and by Morris and Tasker streets in another. They have also a large edifice on the opposite side of Morris street.

Satisfied that the methods then employed in England for making gas pipes were defective, the firm at once introduced contrivances to facilitate processes. At that time, the screws for coupling the pipes were wrought by turning the pipes in the dies by hand; now, all that is done by machinery.

Very soon the production of other and related articles, such as gas-fittings and gas-fitters' tools, were added to the manufactures of the establishment. From these naturally followed the construction of the machinery for generating, washing, purifying, and storing illuminating gas. Then followed the manufacture of pipes for other purposes; tubes for conveying water; lap-welded boiler tubes, and boilers themselves; water fittings; hot water apparatus of various kinds, for dwellings public and private, and for the most varied uses, together with the tools necessary for the erection of the same, and apparatus for effecting the ventilation of buildings, et cetera. The establishment at present manufactures every variety of apparatus required to light, heat, ventilate, or supply with gas or water buildings of every description.

The works, in 1872, constantly employed twelve boilers and seven steam
engines, representing an aggregate of 1,000 horse-power. In the pipe mills might be seen a great number of furnaces for heating bent pipes preparatory to welding them in the smiths' shops; and in the machine shops were an almost endless variety of machine-tools for special purposes, representing the best makers.

All the machinery of the establishment was in duplicate, to meet any emergency which might arise from breakage or other causes; so that it was hardly possible that any disaster could occur to cause the suspension of the work in the establishment for more than twenty-four hours. Most of the buildings were thoroughly fire-proof, and connected with the machinery was apparatus for the quick extinguishment of fire in any part of the buildings.

The establishment afforded employment to about 1,600 persons. Only two-thirds of these were engaged during the day, and they were relieved by fresh relays at evening, the pipe-mills being kept constantly in operation day and night.

The arrangement of the machinery and apparatus of the establishment was most complete. For the purpose of heating the strips of iron plate, and of bending and welding them into tubes, there were arranged on one side of a stone building more than a dozen reverberatory furnaces. Directly in front of each of these were the hardening or welding tables. Each of these was furnished with a tool having movable jaws, which can be set to any suitable width, to accommodate itself to the size of pipe required. These are worked so as to gradually bend the flat sheet of iron into a tubular form, after being properly heated in the furnaces. Then, after being properly heated again, the tube is operated by another kind of jaws, by which a great pressure is brought upon the tube as its parted sides are brought together, and is so firmly welded. This is called "butt welding." "Lap-welding" is performed by the use of a mandrel and more powerful pressure without and within.

After the welding, the pipes are subjected to a simple rolling process to render them perfectly straight and round; and after cooling they are taken to the finishing rooms to be cut to proper lengths, supplied with screw-threads at the ends and sockets for connections, tested by hydraulic pressure to ascertain their freedom from flaws, and then put in proper condition for transportation. The screw-cutting machines, of which there were twenty in that department, could turn out over six hundred finished pipes a day, each of them requiring the attendance of but one workman. The sockets are made with equal facility, by machinery.

Boiler tubes were manufactured in large quantities, and every species of iron pipe and tubing was turned out from that establishment. With the machinery then in operation, the factory made tubes of all sizes up to eight and five-eighth inches—a feat which can not be accomplished by any other
establishment in this country. They have since introduced machinery for
the construction of twelve inch tubes, for which articles the best American
charcoal iron is used.

But pipe and tube-making is not the only manufacture carried on in the
Pascal Iron Works. Allotted space will not allow an enumeration of the
almost infinite variety of products in those branches of industry which are
closely related to the employment of gas and water, steam and air, in every
conceivable form of public and domestic use. The establishment possesses
the most ample facilities for erecting gas-works complete from the very
beginning, the retorts and buildings involved, to the gas-holders for storing
the gas; for the pipes for supplying and distributing it from the works to
the house of the consumer, with all the variety of fittings of cast or wrought-
iron which can be imagined, with the tools for the gas-fitter's trade.

In all of their operations at that time (1872) the proprietors of the Pascal
Iron Works employed 3,876 men. Of this number, 1,000 were employed in
handling the 150,000 tons of coal consumed in the establishment annually.
These men each represent four (women and children), dependent on them
for support, so that this great establishment actually affords support for
15,500 persons.

Since 1872, the Pascal Iron Works have been removed from Philadelphia
to New Castle, Delaware, where the proprietors have opened business on a
larger scale than before. The site of their establishment in Philadelphia
had become ineligible owing chiefly to the immense cost of drayage. The
Councils of Philadelphia hesitated for eight years to accord to the proprietors
the privilege of laying a railway track in the streets for their accommodation,
and after waiting that length of time, Morris, Tasker & Co. purchased 1,000
acres of land near New Castle, with a water front of a mile. They removed
their works from Philadelphia to the new location, in 1873, where they have
erected a large wharf, and over two hundred dwellings for their workmen
and their families. So Philadelphia lost one of the most important sup-
porters of its name and prosperity.

The manufacture of apparatus for heating houses and cooking, in the
form of stoves, furnaces, and ranges, has become one of the marvels of the
growth of our national industry. The use of these contrivances has become
general only since the use of anthracite coal as fuel, or within the past fifty
years. Previous to that time their introduction was a very slow process, for
so long as wood was abundant and cheap, people preferred the cheerfulness
and genial warmth of the open fire-place. But as cities and large villages
grew, and surrounding tracts of country became denuded of trees by the
tillers of the soil, wood began to be scarce and dear, and there was a general
willingness to adopt some fuel-saving contrivance.

The first of these was a cast-iron fire-place, invented by Dr. Franklin
about the year 1740, and was known as the Franklin Stove. It is mentioned on page 50. It became very popular, for it was elegant in appearance, gave greater heat to a room, and yet exhibited the cheerfulness of an open wood fire. It stood a little way into the room so that the radiated heat of all the iron was kept there, while it was an effectual preventive of the nuisance, so common, of smoking chimneys. It saved a great amount of fuel in giving out as much heat as the common fire-place with its large-throated flue.

Franklin, always laboring for the public, made this invention for economy and comfort in the use of fuel, and published a pamphlet in which its advantages were set forth. The governor of Pennsylvania offered to give him letters-patent for it, but he refused, saying: "As we enjoy great advantages from the invention of others, we should be glad of an opportunity to serve others by any invention of ours, and this we should do freely and generously." He gave his models to Robert Grace, one of his early friends, who had an iron foundry, and made much money by casting these stoves. An ironmonger in London made a slight alteration in its construction, got a patent for it, and made a small fortune by the sale of these stoves. They were the only stoves in use in our country for about sixty years, and one may be seen here and there, gracing the "spare room" of an old-fashioned farmer's house.

The Franklin stove was succeeded by a great variety of others made of cast and sheet-iron, for burning wood in a close chamber, the drafts regulated by valves. The last-mentioned contrivance Dr. Franklin introduced for burning the bituminous coal of England; and Count Rumford (Benjamin Thomson) another American inventor, paid much attention to this subject.

The introduction of the use of anthracite coal required other contrivances, and the grate, to take the place of the open Franklin stove, was substituted. Finally Dr. Eliphalet Nott, president of Union College, who devoted much thought to the subject of heat, and obtained thirty patents for inventions connected with this department of physical science, invented a stove for burning the anthracite in a close, upright chamber. This was the first invention of the kind, and was long and widely popular. Its exterior was made very elegant by ornamental castings in pleasing forms.

The Nott Stove was succeeded by a great variety of others for burning wood and coal; and in our day these varieties may be counted by scores. The same remark will apply to cooking stoves and ranges, in the manufacture of which the United States far exceeds any other country in the world, in their number and quality. The great points sought to be solved are how to get rid of the vitiating effects upon the air by its contact with red-hot iron, and how to cause the production of the greatest quantity of heat with the least amount of fuel. This is the problem worked upon in the construction of
hot-air furnaces for heating houses, which have been properly called “the demons of the cellar.” The difficulty in obtaining these objects have caused a widely extended use of steam as a heater and cooker. For heating, coils of iron pipes connected with a steam-boiler, are placed in rooms, and from these proceed a gentle, pleasant heat. The manufacture of iron pipes, in establishments like that of the Pascal Iron Works, has made the extensive use of steam as a heater and cooker, a possibility. Gas is sometimes used for the same purpose, in simply constructed apparatus.

The use of stoves and ranges is now universal in the settled portions of our country, as wood has become scarce and dear. The cheerful “fire-side” has become a poetical dream, and the “hearth-stone” a myth. Every city of much size in the Union, has a manufactory of stoves, but the larger foundries may be seen in Albany, Troy, Boston, New York and Philadelphia. There were in 1870, in our country, 326 establishments for the production of stoves, ranges, heaters, and hollow-ware, employing 13,325 persons, and capital to the amount of about $20,000,000. The amount of wages paid to the workmen in the business is about $8,000,000 annually, and the product of their labor in a year is valued at $23,390,000. In 1870, there were 580 establishments in the United States engaged in the production of hardware of every kind, employing 14,326 persons at an aggregate amount of wages annually of $6,845,000. Capital to the amount of nearly $13,900,000 was employed in the business, and the annual product was valued at more than $22,237,000.

Nail-making was a slow and tedious hand-process, in our country, a hundred years ago. It was an art practiced probably by Tubal-Cain and his fellow-antediluvians, for the use of the nail, suggested by the thorn, seems to have been coeval with historic man.

While such is the great antiquity of the art of nail-making, and their use has been from time immemorial common among barbarous and civilized nations, it was not until within the century just closed, that nails were made by machinery.

To supply the demand in England, vast numbers of nail-makers were employed. It is estimated that at one time no less than 60,000 of them were busy in the neighborhood of Birmingham, less than a hundred years ago. In our country, where houses were mostly made of wood, there was a large demand, but up to the time of the Revolution, nails were all imported from England, for it was, as we have observed, the policy of the British government to discourage all iron manufactures in the American colonies. But after that war, nail-making rapidly grew into an important industry; and Alexander Hamilton, in his report as Secretary of the Treasury, in 1791, was able to declare, when alluding to the consumption of iron here, that our domestic nail-makers already supplied, in a great measure, the de-
mand for nails and spikes, and were able to do so entirely. The business was begun in Rhode Island, by Jeremiah Wilkinson, in 1775.

So early as near the beginning of the seventeenth century, a patent was granted in England, for a machine to slit iron for nail-rods, that was moved by water-power; but nails continued to be made by hand in that country, until about the year 1790. In 1786, Ezekiel Reed of Bridgewater, Massachusetts, invented a machine for cutting tacks and nails which, being improved, made 150,000,000 tacks in the year 1815. His son obtained a patent in 1807, for a machine for making and heading tacks at one operation, at the rate of 60,000 a day. In 1789, Samuel Briggs of Philadelphia, invented a machine which was patented in 1791, for making nails, screws and gimlets. This was the first patent issued in the United States for a nail-making machine.

In 1794, a patent was issued to J. G. Pearson, of New York, for a nail-making machine; and the following year, Jacob Perkins, of Newburyport, obtained a patent for one which he had invented in 1790. It was first used at Amesbury, Massachusetts, and could turn out many thousand nails each day. The first patent for a heading and cutting machine combined, was granted in 1796 to Isaac Garrettson, of Pennsylvania.
Pawtucket Iron Works.

Froy, N. Y.
THE representative American establishment for making small nails and tacks in 1872, was that of A. Field and Son, at Taunton, Massachusetts, in which over three hundred workmen were then employed. Their buildings, beautiful in the style of architecture, and very substantial, are handsomely decorated inside, and are more than 700 feet in length. They employed 225 machines known as the Blanchard and Reed patterns, with an important improvement by William H. Field. This machinery is mostly manufactured on the premises.

This establishment made, in 1872, about a thousand varieties of small nails and tacks of iron, copper, brass, zinc and steel; and the number then made daily was about 35,000,000. Each machine cuts and heads 15,000 nails or tacks an hour; and shoe-nails are cut at the rate of between 2,000 and 3,000 a minute. There was a department exclusively devoted to the preparation of leather-headed tacks for putting down carpets. A girl, operating a machine for this purpose, could leather 120,000 tacks in a day. They made also the famous chisel-pointed nails used in boat-building, and which were not then made by any other manufacturer. Between nine and ten tons of their product, packed and boxed for market, were sent out from that factory daily. The establishment was founded by Albert Field, who died in 1869, at the age of seventy-three years. Other patents followed, and the manufacture of nails and tacks by machinery, was soon established in New England, New York, New Jersey, Pennsylvania and Maryland.

In 1810, Joseph C. Dyer, of Boston, then a merchant in London, took out patents in England for nail machines invented in Massachusetts, and large factories with these machines soon sprang up. Some nail factories in the neighborhood of Birmingham, (England), now make 40,000,000 nails a week. The business is now carried on extensively in this country, especially in the Schuylkill iron region.

Henry Burden, a native of Scotland, and educated there in engineering and drawing, and who came to the United States in 1819, was the first inventor of a machine for making spikes. He settled in Troy, New York, where iron-works in which he became interested, had been established as early as 1813. Mr. Burden became connected with them in 1822, when they
were owned and worked by an incorporated company under the name of the
"Troy Iron and Nail Factory." The works were then small, but through
the energy, industry and inventive genius of Henry Burden, they rapidly
increased in importance. He was successively superintendent and agent of
the works, and president of the Company. After many additions had been
made to the establishment, the works were entirely re-built on a much
larger scale.

Before his settlement in Troy, Mr. Burden had invented a plow and a
cultivator. In 1825, he patented a machine for making ship-spikes which,
up to that time, had been made by hand. On the same machines counter-
sunk railroad spikes for flat rails were afterward made. About 1830, he
invented a machine for making horse nails. In 1834, he was granted a
patent for an improvement in the method of constructing steamboats and
other vessels. The year before, he built at the Troy Iron Works a steam-
boat 300 feet in length with paddle-wheels 30 feet in diameter, which, on
account of its shape, was called the "cigar boat." He anticipated the
younger Brunel in advocating the construction of ocean steamships. In
January, 1846, a prospectus of "Burden's Atlantic Steam Ferry Company"
was issued at Glasgow, Scotland, in which it was declared that the present
Atlantic steamers [of the Cunard line,] magnificent though they be, are as
inferior in their results to what they may become, as a well appointed stage
couch is to a railway train.

In 1840, Mr. Burden obtained a patent for a process of his invention for
making "hook-headed" railroad spikes. He had used the process several
years before the patent was granted. The same year he obtained a patent
for a machine for rolling puddled iron balls, called the "Burden Rotary
Squeezer," which caused important changes in the process of manufacturing
iron throughout the world. At one time about three-fourths of all the pud-
dled iron made on the earth, passed through these machines.

Mr. Burden's greatest invention was the machine for making horse-shoes,
which was first patented in 1835. An improvement was patented in 1833;
and in 1837 he obtained a patent for another horse-shoe machine, which was
again improved and patented in 1862. As fast as Mr. Burden's inventions
were perfected, they were put into operation in the works at Troy. In those
works ship-spikes, hook-headed railroad spikes, and horse-shoe nails were
first made by machinery. There Burden's Rotary Squeezer was first put in
operation: and there horse-shoes were first successfully made by machinery.

From time to time Mr. Burden purchased stock in the Troy Iron and
Nail factory, until the entire interest was finally acquired by him. His
three sons, William F., James A. and I. Townsend Burden, whom he had
educated to the business, were associated with him as partners. The business
was largely increased. They purchased ore mines and lime-stone quarries—
lime-stone quarries—acquired property in coal mines, and built on the river bank in the southern suburbs of Troy, new works far surpassing the old ones in magnitude and appointments. The name of the establishment was changed to Burden Iron Works, and the firm name became “Henry Burden and Sons.” Mr. Burden died in January, 1871; his eldest son, William F. Burden, had died December 7, 1867. The works are now owned by the two surviving brothers, who retain the firm name of Henry Burden and Sons.

The old establishment called the “Upper Works,” or “Water Mill” are in the valley of the Wynantekill, a short distance from the Hudson river. They consist of the following buildings: a rolling-mill and puddling forge under one roof in a brick building 358 by 136 feet; a horse-shoe factory in two buildings, which are 125 by 34 feet, and 120 by 50 feet respectively; a rivet factory 120 by 80 feet; a semi-circular horse-shoe ware-house 168 by 120 feet, divided into sixteen large bins capable of holding 7,000 tons of horse-shoes; scrap-house and shops 175 by 50 feet; the general office, supply store, ware-house for rivets and spikes, stables, et cetera. In these works is a celebrated overshot water-wheel, designed and built by Henry Burden, in 1851. It is 60 feet in diameter, and 22 feet in width. It has 36 buckets each six feet deep, and has a horse-power of 1200. It is believed to be the largest water-wheel in the world.

The “Lower Works,” or “Steam Mills” are on the bank of the Hudson river, a short distance from the other works. There the Messrs. Burden own an extensive tract of land, with a river front of nearly a mile, affording ample room for receiving materials and shipping the products.

The Lower Works were built in 1862, and consist of two blast-furnaces each 60 feet in height, and 16 feet in diameter at the base, with two casting houses each 92 by 47 feet, two stock houses each 114 by 65 feet, and one engine-room 85 by 50 feet. There is a puddling forge in a building 492 by 83 feet; rolling-mill 421 by 96 feet; a square building containing blowing-room, offices, et cetera, 96 by 96 feet; machine-shop 140 by 57 feet; blacksmith-shop 130 by 55 feet; foundry 250 by 57 feet; pattern-shop 85 by 55 feet; tin and plumbing-shop 64 by 55 feet; a building 165 by 55 feet, containing supply store, draughting-room, “duplicates” room, et cetera, and an iron ware-house 167 by 55 feet.

Adjoining the rolling-mill building, is a horse-shoe factory consisting of two buildings respectively 130 and 150 feet in length, and a horse-shoe ware-house 200 by 60 feet. This portion of the works is devoted to the manufacture of the new swaged horse-shoe on machines invented by James A. Burden, for which he obtained a patent in January, 1876. The different departments of these works are connected with each other by railroad tracks over which the material to and from each is hauled by a locomotive owned by the firm, who also own many freight cars. Shipments from the works
are made by boats from their wharf, or by railway cars placed on their
switch by the railway companies.

In the Upper and Lower Burden Iron Works combined, are sixty
puddling furnaces; twenty heating furnaces; fourteen trains of rolls; three
rotary squeezers; nine horse-shoe machines, each of which can make sixty
horse-shoes a minute; twelve rivet machines, each of which can make eighty
boiler rivets a minute; ten large and fifteen small steam-engines; seventy
boilers; hook-headed railway spike machinery; and the great water-wheel
just described.

The Messrs. Burden own a hematite ore mine in Vermont, and a charcoal
blast-furnace in the same State; also an interest in the magnetic ore mine
of the Port Henry Iron Ore Company on Lake Champlain, and coal inter-
est in Pennsylvania. The products of their works at Troy, are pig-iron;
"H. B. & S." and "Burden's Best" merchant iron; horse and mule-shoes;
boiler rivets and railroad spikes.

The capacity of the Burden Iron Works is 40,000 tons of iron annually,
not including pig. The bulk of this is converted into horse and mule-shoes,
the works having a capacity for making 600,000 cases of 100 pounds each,
of horse-shoes a year. They employ 1,400 persons in the establishment.

The manufacture of screws has become an important industry in the
United States. Their uses are various in nearly every department of the
mechanic arts, and they vary in size from the great jack-screw that lifts
enormous weights, to the minute screw used in the manufacture of watches,
which require 150,000 to make a pound.

Until a very recent period, screws were made tediously by hand, and
their cost was so great as to prevent their general use. Now they are all
made cheaply by machinery, and their use has become almost universal.

The first machine for screw-making of which we have any record, was
invented by David Wilkinson, of Rhode Island, for which he applied for a
patent in 1794. In 1809, Abel Stowell, of Worcester, Massachusetts, ob-
tained a patent for a screw-cutting machine; and the same year Ezra l'Hom-
medieu, of Saybrook, Connecticut, said in a communication to the Secretary
of the Treasury, that he could, by the labor of a man and two boys, produce
by a process of his own invention, three hundred pounds of assorted screws
a day, better than imported ones.

From that time various patents were issued for inventions, or improve-
ments of machines for screw-making; and companies for the manufacture
of screws by machinery were formed in New England. The first screws
made in Providence, Rhode Island, by machinery (now the seat of the
monopoly in one branch of that business), was in 1834, when a company
was formed there with a capital of $200,000, and made daily 2,000 gross
of brass and iron screws. In 1846, four patents were granted to Thomas
W. Harvey, of New York, for a machine for threading and heading wood-screws (the name given to those intended to penetrate wood), and he constructed a factory in Poughkeepsie, New York, for their manufacture.

The most important of the inventions in screw-making, is the gimlet-pointed wood screw. The manufacture of these is carried on principally by the American Screw Company of Providence, Rhode Island, which is a consolidation of other New England screw companies. It controls the best machines for screw-making, having purchased about fifty patents. This company employs, a large number of persons one-half of whom are feminine.

In 1870, there were 18 establishments in the United States engaged in the manufacture of screws. They employed about 1,600 persons, and gave an annual product valued at about $3,500,000.

Iron is now used very extensively in the United States in the construction of buildings, making fire-arms and heavy ordnance, the manufacture of cutlery, and every variety of ornamentation. The latter industry makes a conspicuous item in our national statistics, and the art of ornamental iron manufacture has attained an excellence in our country, not surpassed in Europe. It is seen in the forms of beautiful columns with richly wrought capitals of all the orders; elegant cornices, balconies and verandahs, and, indeed, in entire fronts of magnificent buildings in every style of architecture; in complete summer-houses; elegant railings; light or massive staircases; in perfect copies of statuary and other works of art; in fountains, vases, alcoves, garden chairs and settees, fences, roof cresteings, gates, lamp-posts, wire-work and scores of other works of elegance. By the use of this cheap material in skilled hands, forms of beauty have been multiplied, and made familiar to the common eye, and a wide-spread cultivation of artistic taste has been the consequence. It is said that there is now more ornamental iron-work made and distributed in our country, than in all the world besides.

In this industry the most successful establishment in this country—successful in excellence of workmanship, and extent and profit of its operations—is that of Robert Wood and Company, of Ridge avenue, Philadelphia. Mr. Wood, the founder of the house, has been in business between thirty and forty years, beginning life as an ordinary blacksmith, in a little shop on Ridge avenue, on a part of the site of the present extensive works. Then a greater part of the scroll and other metal ornamentation was made by hand, chiefly of spelter. Mr. Wood conceived the idea of casting such ornamental work in iron. He put his idea into practical operation, and so founded a new industry. Step by step he has made improvements, until now his is one of the leading establishments of the world in the perfection of its work, not only in iron castings, but in that of Bronze statuary and other works of
The manufacture of cutlery is an industry of our country, of not ancient date in its beginnings. Until within the present century, England supplied the world with a greater portion of its cutlery for the table, and swords for the armies. The Sheffield (England) manufacturers controlled the markets of the world, until a very recent date; and Americans were supplied from English workshops almost wholly, until within the last thirty years. Now there are between eighty and ninety establishments in the United States, engaged in the manufacture of cutlery, in which are employed 2,200 persons (150 of them feminine), and capital to the amount of $2,300,000. To these work people $1,000,000 are annually paid in wages, and materials of the value of $763,000 are used. The yearly product is valued at about $3,000,000.

Rude knives and forks were made by blacksmiths for the “common people” here a hundred years ago, but there was occasionally found a skilled mechanic who could make finished work. Of this character appears to have been T. Bailey, of Fishkill, Duchess county, New York, who made the war-sword of Washington, preserved among other relics of the great patriot, in the Smithsonian Institute, in Washington city. It is very neatly made, and bears the name of the maker. The handle is of ivory colored a pale green, and wound spirally with silver wire at wide intervals.

At Chicopee, Massachusetts, the extensive establishment of the Ames Manufacturing Company, have made swords since 1831, when a contract was concluded with the United States government for that company to furnish this weapon. It has since then manufactured nearly all the government swords; and during the late Civil War a large number of swords and sabres were made there, besides bronze cannon.

About fifty years ago table cutlery and pocket knives, began to be manufactured in connection with other things, in the United States. Broadmeadow and Company made pocket knives of a good quality, at Pittsburgh, Pennsylvania, in 1829, and excellent table knives and forks were then made at Philadelphia; but one of the first, if not the first establishments for the exclusive manufacture of cutlery, was set up at Worcester, Massachusetts, by Moses L. Morse and Company, in 1829. Mr. Morse was an ingenious mechanic, and had invented a machine for making pins, several years before; now he and his partner began the manufacture of cutlery quite extensively on the English plan of division of labor. They used machinery, some of which was invented by Mr. Morse. For making each part of the knife a separate machine was employed, with an appropriate set of workmen. Within two years afterward, two other cutlery factories were set up in the neighborhood of Worcester.

The leading establishment for making cutlery, in our country, in 1872,
was the Russell Manufacturing Company, at Greenfield, Massachusetts. John Russell, the founder, began the making of table cutlery, in 1834, in connection with edge tools, and he was one of the early manufacturers who attempted to introduce this branch of industry, as a separate one, into our country. It appeared to be a failure, at first, for there was a lack of skilled workmen. But Mr. Russell persevered against all obstacles, among the most powerful of which was the prejudice in favor of the Sheffield cutlery. His only machinery, for a long time were grind-stones and emery-wheels. Then he introduced a trip-hammer for forging the blades—a purely American improvement. He made other improvements at the "Green River Works" at Turner's Falls, Massachusetts—works that are now the most extensive of the kind in the United States, and where cutlery of every kind, and especially for the table, is made, equal to the best in the world. They heavily silver plate all table cutlery; turn out pocket knives of the most elegant patterns, and manufacture largely hunters', bread, carving and butchers' knives. In 1871, this company produced goods valued at about $1,500,000, or one-half of the entire product of the business in our country. They paid over $25,000 a month to their workmen. They used two tons of steel every day; and in the course of the year they consumed 2,000 tons of anthracite and 25,000 bushels of charcoal; 400,000 pounds of grindstones, 44,000 pounds of emery, 3,000 pounds of bees-wax, 36,000 pounds of ivory, 112,000 pounds of ebony wood, 57,000 pounds of rose-wood and 305,000 pounds of cocoanut wood.

The business of wire-making began in this country, early in the present century; and in 1870, there were 175 establishments in the United States engaged in drawing wire, and making insulated-wire and wire-work. These establishments employed 4,370 persons, to whom over $1,800,000 were paid in wages; and they produced goods valued at over $8,000,000 annually. The insulated wire establishments, of which there were two, included in their product of about $28,000, telegraphic supplies, mainly of wire. There were, in 1870, thirty-two establishments engaged in wire drawing, and one hundred and forty-one in making wire-work. The total value of the annual product of the wire drawers was a little more than $5,000,000.

Wire is made of iron, copper, brass, steel, gold and silver, and sometimes of platinum. It was first made, in ancient times, by cutting thin plates of metal into thin strips, and rounding them by the hammer and file. Then "wiresmiths" made wire for centuries from ductile materials by hammering; and there seems to be no record extant of wire drawing earlier than the middle of the fourteenth century. Very soon after that, mention is made of a machine at Nuremberg, impelled by water-power, for wire-drawing. Down to 1505, wire was drawn by hand in England. A hundred years later, machines were used in that country for the purpose.
Fifty years ago, the use of wire in England and in this country, was insignificant in extent compared to its use now in both countries. Great Britain was then mainly supplied with the iron wire consumed there by one factory, the product of which was drawn to market in a two-horse wagon, making two trips a week; now there is manufactured in that island alone not less than three hundred tons of iron a day.

The combined utilization of iron and coal in Great Britain, and the ingenuity and industry of her people from the revival of the mechanic arts, soon placed her in advance of any nation in the manufacture of iron in its manifold forms. Among the later of these, appeared superior wire. The natural demand which seems to exist for any moderately cheap material appearing in textile form, stimulated this industry, and wire-work grew rapidly in favor for various uses, until the production is now marvellous in excellence and extent, as compared with the product twenty-five years ago.

The Americans, not behind the English in ingenuity and industry, also began the manufacture of iron and other wire, in various forms, after the Revolution; but it is only twenty-five years ago when this industry began to assume great importance in our country. Then only three wire mills existed in the United States, turning out, in the aggregate, about fifteen tons of product a day. At the present time of unprecedented dullness in business, sixteen wire mills turn out an aggregate daily production of one hundred and fifty tons. The progress of this branch of manufacture can not be better illustrated than in the history of the Washburn and Moen Manufacturing Company, of Worcester, Massachusetts.

This Company was founded by the late Ichabod Washburn, in 1831. At that time, (as now), the neighboring town of Leicester was largely engaged in making “card clothing,” which is fine, light, tough iron wire stuck in regular rows close together in long strips of thick leather, for carding sheep’s and cotton wool. The consumption of wire at that time for this purpose, was greater than for all other purposes combined, in our country.

Mr. Washburn was a young blacksmith, in Leicester, and soon after his apprenticeship was finished, he was employed in lead-pipe drawing in Worcester. Why not draw wire for the card-makers? was a question that met him. He pondered it, and then acted. He had but little capital, and no precedent, in machines or their appliances. With infinite pains the earnest young mechanic made one. It was unlike anything ever made before or since. His drawing-frame was planned to hold a die at one end, and at the other a spindle, upon which was wound a chain. This chain, with strong nippers at its end, was pulled out the length of the frame; the nippers firmly bit the end of the wire-rod projecting from the die; the power was applied to the spindle, and the utter demolition of the whole machine without moving the wire-rod through the die a particle, was the result! Every fragment
of the structure lying at the feet of the inventor, seemed to him like a gauntlet of defiance, and right manfully did he answer back.

Three years after the disastrous ending of his invention, Mr. Washburn, by his genius and industry, was enabled to supply all the card-cloth makers of Leicester with wire, by the help of his life-long friend, the Hon. Stephen Salisbury, who, by the construction of a dam across the Mill brook, had formed what is yet known as Salisbury Pond. There he built a brick factory for Mr. Washburn, and in it, that persevering mechanic won his triumph. From that time his business of wire-making steadily increased with the increasing demands of the country, until it has assumed the grand proportions of the operations of the Washburn and Moen Manufacturing Company of to-day, which was incorporated in 1853.

From 1831 to 1834, Benjamin Goddard was associated with Mr. Washburn. From 1836 to 1849, his brother Charles was a partner; and from 1849 until the present time, Philip L. Moen, has been a member of the firm. The present title of the establishment was given when it was incorporated a joint-stock company, with a capital of $1,500,000. Mr. Ichabod Washburn was the first president. Mr. Moen now holds that position and also of treasurer, with Mr. Charles F. Washburn as secretary.

The product of the establishment from the commencement to 1850, was mainly card-wire, but from that time forward, additions were rapidly made to the variety and grades of wire produced, until at the present time the different kinds number fully one hundred, classified as follows:

- Annealed market, fence, cleaned, stone, bailing (iron and steel), and twisted wire; Bright market, stone, screw, bail, heddle, hook-and-eye, broom, and bonnet wire; Card wire, round and angular; Coppered market, bail, furniture, spring, stone and horse-card wire; Tinned market, stone, furniture, spring, heddle, broom, covering, mattress, quilling, bail, hook and eye, twisted and patent wire; Steel market, spring, brush, corset, needle and music wire; Machinery spring wire; tempered and covered crinoline, dull steel, charcoal flat iron, staple, tack, plain telegraph, hair-pin, round iron, umbrella, fagotting, spindle, straightened and cut wire; Galvanized telegraph, clothes-line and twisted wire; belt hook, gun screw, flat harness, reed, pin, piano pin, loom, flyer, rake-tooth, buckle and rivet wire; wire rods, odd shaped steel and iron wire, and fence staples.

Only one-third of the factory built for Mr. Washburn by Mr. Salisbury, say 3,000 square feet of flooring, was occupied by him; the flooring now actually occupied by the establishment measures 479,366 square feet, or eleven square acres—one hundred and fifty times the space first in use. There were five men employed at the start; now the monthly pay-roll indicates 900 names, mostly heads of families, representing a population of 4,500 souls. The machinery requisite to carry on the various parts of this
great establishment—the largest of the kind in the world—would easily produce 150 tons of railroad iron a day. During the last ten years, the daily product has averaged 60,000 pounds; for the first five years it was only 700 pounds a day. The portion of the establishment represented in the accompanying picture, is known as the Grove Street Works; the other portion, where nearly one-half the product of the Company, in weight, is manufactured, is about three miles distant, in the southern part of the city, and known as the Quinsigamund Iron Works.

"Card-Clothing" just mentioned, is a term applied to the species of comb used in the manufacture of cotton and woollen cloths, for the purpose of carding out and arranging the fibres, preparatory to spinning. It consists of stout leather filled with wire teeth. Hand-cards were made of this clothing in the general form now used where carding is done by machinery, but the process was tedious. These cards were seen in every family where a spinning-wheel was used, a hundred years ago. This card-clothing is now made in strips long enough to cover the large cylinders with which the machine carding is done.

The manufacture of cards by hand was a quite important industry in our country before the Revolution. So early as 1775, a factory for making card-teeth was set up at Norwich, Connecticut, by Nathaniel Niles, who obtained a loan of £300 from the General Assembly to enable him to prosecute the business. It was carried on successfully during the war that ensued. Two years afterward, Oliver Evans, the pioneer American inventor, then only twenty-two years of age, and who was engaged in making card-teeth by hand, invented a machine for doing that work, which produced three hundred a minute. He asked State aid from Pennsylvania, to enable him to establish a factory for drawing the wire and making it into card-teeth with his machine, but his prayer was denied. In 1784, Mr. Crittenden, of New Haven, Connecticut, invented a machine which produced 86,000 card-teeth, cut and bent, in one hour.

These inventions were approaches to a more important result, in the construction of a machine for making card clothing, that proved to be one of the most valuable aids in the establishment of the cotton and woollen manufacture as a permanent and profitable industry, in the United States. Before that invention, the card-teeth were put up in bags, and distributed among the residents in the vicinity of a card-making establishment, who stuck them in the leather, and returned the card-cloth completed. At that time, Leicester (Massachusetts), was the chief seat of this industry. Within a radius of twenty miles of a factory, men, women and children were engaged in sticking teeth. They received two dollars and a half for sticking a fillet of leather forty feet in length by an inch and a half in width.

Early in January, 1790, Samuel Slater a young English cotton-spinner
who had acquired experience in the art with Arkwright and his associates, and who with quickness of observation was possessed of a most remarkable memory, appeared at Providence, Rhode Island, where he engaged in constructing a spinning machine, after Arkwright's pattern. The British government, at that time, guarded its manufacturing interests so rigidly, that young Slater brought with him neither a drawing nor a written description of Arkwright's machinery, yet, by his amazing memory of technicalities and his mechanical skill, he was enabled to make and set up at Pawtucket, Rhode Island, one of those English spinning machines that did work as well as its predecessors. He also constructed machinery for doing other parts of the work connected with the spinning.

A serious obstacle to success now appeared. It was difficult to procure card-clothing for the carding machines. Mr. Slater was informed that Pliny Earle, of Leicester, was an expert hand-card maker, and he made a journey of forty miles on horseback to see him. He told Mr. Earle what he wanted, but not being a carder he could not give him directions for manufacturing the fillets. Mr. Earle set at work punching holes in the leather with two needles in the end of a stick, and in a week he had made 100,000 perforations. Then he sent the leather and the teeth to be put together by the expert fingers in the neighborhood. The fillets were sent to Mr. Slater, but they would not work.

Disappointed, and afraid of failure in his great undertaking, Slater again journeyed to the house of Earle. It was found that the card-teeth were not at the proper angle, and were not properly ground. Mr. Earle re-adjusted the teeth, went to Pawtucket with Mr. Slater, and placed the cards in good working order. That set of cards were used during eighteen years—six years longer than any English cards Mr. Slater had ever seen in good working order. He said they were the best he had ever seen. This triumph gave Samuel Slater the great honor of being the pioneer—the "father"—of the cotton manufacturing interest in our country.

The pricking of the holes in the leather was so tedious, that Mr. Earle soon afterward invented a machine for doing that work; also another for making the card-teeth. A few years afterward Eleazer Smith, of Walpole, a man of wonderful ingenuity, conceived the idea of combining the two, in a machine that would make the teeth, furnish the holes, and set the wires far more expertly than human fingers could do. His inventive genius began to plan, and he communicated his ideas to Amos Whittemore, a hand-card maker, who loaned Mr. Smith a small sum of money to enable him to construct a machine.

While Smith was engaged in carrying out his invention, he was visited several times by a stranger, to whom, without suspicion, he explained all his plans. The stranger did not appear to take any special interest in the matter.
At about the period when Smith completed his machine, the stranger came again for the last time, and soon afterward (1796), Mr. Whittemore received letters-patent for a machine like that invented by Mr. Smith.

Mr. Whittemore who claimed the invention as his own, related that after studying and constructing for three months, there was a want in his invention, that caused success to evade him. He was despondent, and in that frame of mind he was instructed, in a "vision," how to win success, and he did so, by overcoming the difficulty by a new contrivance, before breakfast the next morning. He was careful, however, in his specification and oath to add to the assertion of his belief that he was the original inventor, the words "or improper." The fact seems to be that the stranger who visited Smith, was an ingenious mechanic sent as a spy by Whittemore; and undoubtedly the "vision" seen by the latter, was this stranger after his last visit to the inventor. No doubt to Eleazer Smith and not to Amos Whittemore belongs the honor of being the first inventor of the machine for making card-clothing.

This invention failed to make good machine card-clothing, but about forty years ago, William B. Earle, a son of Pliny Earle, made improvements which, with modifications in 1843, produced a machine for the purpose, yet superior to all others in use. His machines built between 1843 and 1849, are now in the exclusive possession and use of T. K. Earle and Company, of Worcester, Massachusetts, (T. K. Earle and Edward Earle), whose establishment for the manufacture of machine card-clothing is a leading one of its kind in this country, and in the world. They have lately introduced into their factory the making of cards set in India rubber, Walton's patent; also set in a combination of cotton and woollen cloth, Horsfall's patent.

Messrs. Earle are nephews of Pliny Earle, and the successors in the business of their uncle and his three sons. The house was really founded in 1786, when Pliny Earle began the manufacture of hand-cards, and used only a dozen calf-skins the first year. Afterward cow-hides were used, and in 1843, (when the establishment was transferred from Leicester to Worcester), the consumption was about 2,000 hides a year; now about 30,000 are consumed annually in the establishment. These hides are tanned expressly for the factory of T. K. Earle and Company, and are finished on their premises; and so careful are they to employ the best stock, that from a side of leather weighing thirteen pounds, only about four pounds are selected.

The buildings of this establishment are of brick, the main one 185 feet by 43 feet in size, with a tower for stairs. In the basement they re-tan and curry their leather, and finish it on other floors. The works are propelled by steam-power. At the beginning (1786), the capacity of the establishment was for a product of $1,000 a year. The capital was $500, and the actual product was $200. In 1843, the capacity was $10,000; the capital $8,000
Card Clothing Factory.
J. H. Earle & Co.

Established, 1789.

and the product $10,000. From the latter year until the breaking out of the late Civil War, the increase in business was rapid; during that war it was enormous, obliging them to increase the number of their machines from sixty-one to one hundred and fifty, and to run them day and night, producing $400,000 worth of goods a year. Their capacity is now $180,000, and the capital $150,000. It took five men to run thirty-five machines before Mr. Earle's improvements in 1843; now five men, in T. K. Earle & Co.'s factory, run one hundred and forty-three machines.

The great amount of water-power in Worcester county, (the largest shire in Massachusetts), has given it manufacturing facilities of which its citizens have wisely availed themselves. The water-wheel, like a beneficent magician, has opened the way to vast riches in that region, as it has done in many other portions of our Union, for those who have judiciously employed it.

It is said that Worcester county, in proportion to its population, is the wealthiest shire in all New England. In 1860—sixteen years ago—that county with about 150,000 inhabitants, contained 1,357 manufacturing establishments, with $13,335,000 invested capital. These establishments used annually over $18,000,000 worth of raw material, and employed in the manufactories, (which were chiefly in Worcester, Fitchburg and Clinton), about 29,000 persons. Of this number, 13,000 were women and girls. These operatives gave an annual aggregate product valued at $37,000,000. Then the city of Worcester contained about 25,000 inhabitants, Fitchburg nearly 8,000, and Clinton was only a small village, but rapidly increasing. Now the city of Worcester contains, probably, about 45,000 inhabitants, Fitchburg, 15,000, and Clinton 7,000. The increase in the manufacturing industries of Worcester county, seems to have kept pace with the growth of its population.

The city of Worcester, whose Indian name was Quinsigamund, is a very important railroad as well as manufacturing centre. Six or seven lines of railroads meet there. The town was settled in 1713, and the village was incorporated a city in 1848. It is delightfully situated, partly in a valley, and partly on the slope of a hill which rises toward the west. The streets are wide, regularly laid out, and adorned with fine shade trees. There is a spacious Common or public square, near which are several churches; and the city is noted for its excellent public schools and higher seminaries of learning, and other social institutions.

Worcester is the dwelling-place of the eminent American Antiquarian Society, which was founded in 1812, by Isaiah Thomas, LL.D., a patriotic printer and journalist during the old war for independence and afterwards; and who, a few days after the skirmishes at Lexington and Concord, removed his printing house from Boston to Worcester, where he established a successful publishing house. When Mr. Thomas founded the Antiquarian
Society, he presented it with almost eight thousand volumes, besides a great many tracts, and the most valuable collection of newspapers in the country. Mr. Thomas erected a building for the use of the Society, and bequeathed it and the land to the association. He also made provision for its maintenance equal to the sum of $24,000. The library is now extensive, and is filled with rare books; and its museum is a valuable collection of curious things.
CHAPTER XIX.

The manufacture of fire-arms, great and small—cannon, muskets, rifles and pistols—is carried on extensively and expertly in the United States. These weapons have been brought to great perfection here, by American inventions and improvements. A hundred years ago, they were all imported; and the chief weapons with which the soldiers of the Revolution fought for liberty and independence, were heavy flint-lock muskets. Some rifles and pistols were used, but of a greatly inferior quality to those now manufactured.

The musket is a smooth-bored gun, and until lately, has been the chief weapon for the infantry of all nations who use gunpowder, since the beginning of the last century. It was first seen, it is believed, in the rude and ponderous shape called the bombard, at the battle of Crecy, in 1346, when it was discharged by a match. The wheel or flint gun-lock was invented at Nuremberg in 1517, when the weapon had assumed a more portable form. The ignition was produced by the striking of a piece of flint against steel over the priming powder. The principle then used in making the wheel-lock was maintained until flint-locks went out of use within the last thirty years.

The bayonet was first used as an appendage to the musket in war, in 1640. It derives its name from Bayonne, where it was first made. Until about 1730, wooden ramrods were used, when the father of Frederick the Great introduced iron ones into the Prussian army; and much of the superior efficiency of the musketeers of that army was attributed to this improvement.

The percussion-lock, now invariably used instead of the flint-lock, was invented about the year 1818. Already the wars of the French Republic and of the Empire had caused an immense extension in the use of the musket, and of its manufacture in England and France. From 1803 to 1814, the latter manufactured 4,000,000 muskets; and from 1814 to 1816, England made for herself and her allies, 3,000,000 muskets.

During the French and Indian War, many European muskets were distributed among the American colonists; and when the struggle for independence was about to commence, and while it lasted, a few muskets were made
here by ingenious mechanics. I have an American-made musket bearing the date of 1774; but the armorers were chiefly engaged in repairing weapons.

The manufacture of muskets in the United States began at Springfield, Massachusetts, in 1795, after the French model. This kind was used, with slight modifications, until the adoption of the Springfield rifle model of 1855. Other models had been introduced from France. That country gave the model for the musket to all civilized nations, until the introduction of the needle-gun in Prussia, a few years ago.

Our government was slow to adopt the percussion-locks for the muskets of the infantry of the United States army. They were not introduced until 1842. In 1846, when the war with Mexico broke out, there were enough in our armories to supply our troops; but General Scott preferred the flint-lock musket, considering it dangerous to campaign in an enemy's country with a weapon so untried as a percussion musket.

The whole number of muskets manufactured at the United States Armory, at Springfield, from 1795 to 1865, when the making of muzzle-loading arms was stopped, was 1,517,464. The expenditure during that period, was over $25,000,000. Of this amount must be reckoned the cost of lands, buildings, et cetera, belonging to the Armory, valued at $2,000,000, and parts of arms on hand when the work stopped, valued at $5,000,000. Our government established an armory and arsenal at Harper's Ferry, on the Potomac, with a capacity about equal to that at Springfield. It was destroyed by fire at the beginning of the late civil war, and the Confederates carried its records to Richmond.

Rifle is the name of a small arm spirally grooved to increase the accuracy of its fire. It is supposed to have been invented at Vienna, late in the fifteenth century. It was used in target-shooting at Leipsic, in 1498. As muskets became lighter in construction, and more generally used in armies, there was a necessity for one of long and accurate range for light troops, and the rifle was adopted. It was used in Germany during the Thirty Years' War, and soon afterward in other countries.

Before our war for independence, the American hunters had become familiar with the rifle, and expert in its use; and the rifle-corps that figured in that war, such as Morgan's, were the first American sharp-shooters; a class that were conspicuous in our late Civil War. They became a terror to the British and Hessians; and the former, learning from that experience, the vigor of the rifle, adopted it as a part of their armament, in 1794. The French adopted it about the same time for their infantry and cavalry armaments.

The invention of Captain Minié, of the French service, of the Minié conical bullet, in 1849, caused the rifle to be adopted as the infantry weapon
in all the armies of Europe as early as 1855, and smooth-bore muskets were rifled to use the Minie bullet. About the year 1811, a breech-loading rifle was invented by John Hall, an American citizen, and after trial, an order was issued for their manufacture at Harper's Ferry, under Hall's supervision. He may be considered as the originator of the breech-loading system. Carbines were made after the same invention, and were used by the United States mounted troops until about the time of the war with Mexico. The Hall rifle was made to use both the flint and percussion-lock.

Napoleon ordered an improvement in the musket in 1812, and Pauly of Paris produced a breech-loader, but it was not used. In 1836, Dreyse, one of Pauly's workmen, made the first breech-loading needle-gun; and in 1841, Prussia decided to arm her troops with this weapon. It was brought into actual service in 1848.

The sudden outbreak of the Civil War in America, in 1861, compelled our government to bring into use every kind of small arms, smooth-bore as well as rifles; but so general has become the use of breech-loaders, that since that time, no improvements in muzzle-loaders have been attempted. The attention of American inventors has been turned wholly to the breech-loading plan. Many new inventions have appeared, and many have been discarded. The government has adopted the Springfield breech-loading rifle for the armies of the Republic.

One of the most popular of the breech-loading rifles, is the Martini-Henry, the breech action of which is based upon the American invention of Peabody, with the modification of Martini. The rifling of the barrel used in the English model is known as the Henry rifling. Hence the English name of the gun "Martini-Henry." It is called, however, in this country the "Peabody-Martini." This gun has been adopted for military service by the British government; also by the Turkish. It is manufactured by the Providence Tool Company.

This Company began its work in 1845, with a capital of $50,000, and was incorporated in 1847. They inaugurated a new branch of manufacture in this country, namely, that of heavy hardware, and ship-chandler's hardware. They pursued the business of making carpenters' bench tools for several years, until the competition of imported articles compelled them to abandon it.

Formerly hooks and thimbles, marline-spikes, clinch-rings, nuts and bolts, heavy hinges, et cetera, were made by hand in the common blacksmith shops of the country. The Providence Tool Company produced these and other articles of a similar kind, by machine processes. The business has since spread itself through different sections, and has grown to large proportions.

In 1853, Richard Borden, of Fall River, became president of the Company, and John B. Anthony, its treasurer and general manager. On the death of Mr. Borden, in 1874, Mr. Anthony became president, and William B. Dart was appointed treasurer. Meanwhile, (in 1861), the Company had
commenced the manufacture of muskets of the Springfield pattern, for the United States government. Their preparations for the task, and the character of their work was of so high an order, that the guns made by this establishment were second to none. They made about 80,000 muskets for our government.

During the Civil War, several new breech-loading plans were submitted to the public, and many governments introduced trials of the various systems. The Providence Tool Company having purchased the "Peabody" patent, just mentioned, prepared samples for a competitor's trial by a board of army officers, appointed to test the various inventions at Springfield, in 1865. From one hundred and five guns presented, the "Peabody" bore the palm of victory; and at many subsequent trials in this country and in Europe, it maintained its superiority. The manufacture of the "Peabody" gun was soon afterward begun, and before the close of 1875, full 150,000 of them had been furnished by the Company to Canada, Cuba, and various European governments.

As we have observed, the Martini-Henry system adopted by Great Britain in 1871, was based upon the "Peabody" principle, and was known as the "Improved Peabody." The Tool Company, under this patent, are able to control the manufacture of that gun in this country, as well as secure royalties in England. That weapon is now being made by several private companies in England as well as at our Government Armory. The Tool Company have been turning out 800 rifles a day, having large contracts with foreign governments. The daily product will soon reach 1,000. Probably no government has ever awarded so large a contract to any private factory, as that of the Imperial Ottoman (Turkish) government, given to the Tool Company, in 1875. The contract is for 600,000 rifles, amounting in value to over $10,000,000.

The early branch of the Tool Company's business has been continued, and many articles have been added from time to time. In 1871, the manufacture of sewing machines became an important branch of their business, and they have made more than 150,000 of these machines. Besides machine and forging-shops, rolling-mill, and an iron and brass foundry, the Company have extensive annealing, case-hardening and galvanizing-shops; also a wood-working shop, and a box factory. In all these the best machinery and appliances are used.

The buildings of the Company (which are in Providence, Rhode Island), are numerous, and cover more than six acres of ground. They are mostly of brick, and the main buildings are three and four stories in height. These are four in number, and there is telegraphic communication between them. Five steam-engines, with an aggregate of one thousand horse-power, propel the machinery of the works. There are twenty-seven boilers used in making
EARLY USE OF CANNON.

steam; and ten thousand tons of coal are annually used in the establishment. The sales of the Company in 1847, amounted to $70,000, and forty men were employed. The monthly pay-roll was then about $1,200. The total sales in 1875, reached about $4,000,000. The number of persons then employed was more than 1,800, and the monthly pay-roll was $100,000.

Iron cannon have been largely manufactured in the United States, and great improvements have been made here. We are doubtless indebted to the Chinese for the idea of sending projectiles by the application of gunpowder, for, as early as A.D. 969, they tied rockets to their arrows to send them further, and set buildings on fire. How these rockets were made, we have no definite knowledge, but they were in use in India before gunpowder was known in Europe. The Chinese had other military contrivances which were made known to Europeans by the Mongols, who conquered China. No doubt the Arabians known as Moors, in Northern Africa, first applied gunpowder to projectiles, for we find them using cannon at Cordova, as early as 1280. It is said that Greek ships used artillery against the Pisans, as early as 1098; that Damietta was defended against St. Louis with bombs, in 1249, and that there is a cannon now in the arsenal at Arnberg, in Bavaria, bearing the date of 1303. From the Moors a knowledge of artillery soon extended through Europe, and cannon were used by the French as early as 1338. At the battle of Crecy, in 1346, the English had three small cannon called bombards.

The cannon in the earlier stages of the manufacture, were constructed of longitudinal bars of iron, bound together with strong hoops. They were flaring from the breech, and were shaped like an apothecary's mortar. Shorter ones of this form, were called "mortars." Early in the fifteenth century some of the great guns were made very large, in France. One is spoken of as weighing 36,000 pounds, with a projectile of 900 pounds. Mortars differed from the bombards only in length. These guns sent forth their projectiles at a considerable elevation, so that the earth might receive the recoil; but late in the fifteenth century, the French invented trunnions strong enough to withstand the recoil. Gun-carriages soon followed, and in time, the "field-piece" as we know it, crude and strong; appeared as a most efficient weapon in the moving armies of Europe. Improvements went on, until in the last century, the elegant brass or bronze cannon of the French bearing the significant words on the breech—"The last argument of Kings"—appeared. In our day the Whitworth, Armstrong, Rodman, Dahlgren, Parrott, Gatling and Krupp guns have been invented. The latter is made of cast-steel; and at the siege of Paris in 1870, it cast fifty-five and sixty pound projectiles.

Cast-iron cannon have been made in great perfection in the United States within the last twenty years. The gun contrived by General Rodman after
many experiments, was adopted by our government, in 1860, for all the sea-
coast defenses. Some of these were made very large. One of them cast in
1863, of twenty-inch bore, weighed 115,000 pounds, and fired a solid 1080-
pound shot. These were at first smooth-bored; now they are rifled.

In 1860, Robert P. Parrott, proprietor of the West Point Foundry at
Cold Spring, on the Hudson, introduced the well-known “Parrott gun,”
of small size—a ten-pounder. It was made upon the same principle as the
larger ones that soon followed—a cast-iron body strengthened by spiking a
wrought-iron hoop or barrel over that portion of the re-enforce which sur-
rounds the charge at the breech. In the larger ones the cast-iron bodies are
hollow-cast, like those of Rodman. They were rifled, from the beginning.
That kind of cannon was used, though not very successfully, in the Crimean
war in 1854.

Mr. Parrott’s invention was so well-approved, that he at once made rifled
cannon of larger calibre—twenty and thirty-pounders; also the “Parrott
projectile,” made cylindrical with a flat base and pointed end, and fitted to
take the grooves of the cannon by the expansion of a brass ring cast upon
the projectile near the base. Some of these were made weighing 600 pounds.

Late in 1861, Mr. Parrott made one-hundred-pounders, and in 1863, he
produced a three-hundred-pounder, all rifled. These guns were used very
extensively during the late Civil War, in our army and navy, about 3,000 of
them being made for our government. More than one-half of these were
thirty-pounders and of larger calibre. They gained a brilliant success in the
destructive assault on Fort Sumter from Morris Island, after the attack on
Fort Wagner; and were chiefly used in long range. One of them was the
famous “Swamp Angel” that hurled a ball into Charleston, a distance of
five miles. Although some of these cannon were bursted in our naval
service, they have generally shown remarkable endurance, their life being at
least a thousand rounds. Some difficulties which caused the bursting in the
navy, have since been remedied by the inventor.

In the West Point Foundry, Mr. Parrott largely manufactured projectiles,
gun-carriages for fortifications, and every thing necessary for the use of rifled
ordnance. That foundry was established by the late Gouverneur Kemble,
soon after the war of 1812-15, and was designed for casting and boring
cannon for the government, it being thought desirable to have such works in
the interior of the country, not exposed to the navy of an enemy. After
the expiration of the agreement with the government, it was conducted as a
private establishment. Its capacity being much larger than the demand for
cannon, attention was directed to general iron casting, for steam-engines and
all heavy machinery; and, as we have seen, the castings for the earlier loco-
motives used in our country, were made there. Mr. Parrott has been sole
proprietor of the establishment since 1851, and still conducts it, assisted by
Mr. Gouverneur K. Paulding. Mr. Parrott was a graduate of the West Point Military Academy, and captain in the Ordnance Department of the army.

In 1850, Admiral Dahlgren of our navy, invented the cast-iron "Dahlgren gun," which was adopted by the government in 1855, for use in the navy.

The "Gatling gun" for light artillery purposes—a mitrailleuse or machine gun, was adopted by our government too late to be used in the Civil War. It was invented as early as 1861, by Richard J. Gatling, a native of North Carolina, and an ingenious contriver of other machines. He made his first gun at Indianapolis, Indiana, in 1862, and twelve of them were used by General Butler, in the Army of the James. He improved it in 1865, and it was soon afterward adopted by the United States government. For two years the inventor has been engaged in perfecting it, and it has already been adopted by England, Russia, Austria, Turkey and Egypt. It is composed of six barrels, revolving by means of a crank about a central axis parallel to their bore. As each barrel comes opposite a certain point, a self-primed metal-cased cartridge, falling from a hopper, is pushed into the breech by a plunger, when it is exploded by a firing-pin. The machinery is simple and not easily put out of order; and the gun can fire two hundred shots a minute with great range and precision. It weighs one thousand pounds, and therefore the recoil is almost nothing; and when once pointed, it requires hardly any adjustment. It will sweep lines of troops on bridges, in streets, and on the flanks of fortifications, with terrible effect.

Pistol-making has become an extensive business in our country. It is a small arm, intended to be used with one hand. Late in the fifteenth century the Spanish cavalry had a match-lock pistol, heavy, and rude in construction. When the flint-lock was invented for the musket, it was soon applied to the pistol, and its use was extensive among the French and German cavalry at about the middle of the sixteenth century. Pistols were introduced into England, from Holland, at the beginning of the seventeenth century. Shakespeare, who wrote then, mentions them. Their improvement kept pace with that of the musket. Double barreled pistols were used by the German cavalry as early as 1607. About 1830, a percussion-cap pistol, rifled, and single barreled, was invented by Devigne, and it was more accurate at two hundred yards range than the French musket of that day.

Samuel Colt, born in Hartford, Connecticut, in 1814, ran away from home when he was fourteen years of age, and shipped as a boy before the mast for an East India voyage. He had shown traits of inventive genius, and while at sea he made a wooden model of a revolving pistol, with a knife, which was the germ of the weapon that bears his name. Having acquired a knowledge of chemistry, he gave lectures on the subject, in the United States and Canada, and in the course of two years he acquired from the proceeds of
these, sufficient money to prosecute his invention. In 1835, he visited France and England, where he secured patents for revolving fire-arms. The following year he took out patents in this country, and then the famous "Colt's revolver" first made its appearance here. With the aid of New York capitalists he established a company for the manufacture of revolving fire-arms, at Paterson, New Jersey, with a capital of $300,000.

Our government was slow in adopting the revolvers. A few were successfully used in the war with the Seminole Indians, in 1837. The Company failed in 1842, and the manufacture was abandoned. When, at the request of General Taylor, in Mexico, the government ordered 1,000 of the revolvers to be made, Mr. Colt tried in vain to find a model of one, and he made a new one with improvements. In his native city he established the manufacture of revolving arms; and in 1852, he purchased two hundred and fifty acres of low meadow land in the southern part of that city; diked out the annual overflow of the river; and there now stands one of the most extensive manufactories of the kind, in the world, in buildings for the work and for the workmen, that cost more than $2,500,000. A part of the establishment is devoted to the manufacture of machinery for making the revolving fire-arms. In it were made the machines used for that purpose, in the British armory, at Enfield, and the Russian armory at Tula. Every accessory of the weapon is manufactured there. From almost every European government, Mr. Colt (who died in 1862), received substantial tokens of appreciation, and the same from several Asiatic sovereigns.

A Frenchman named Lefaucheux, invented a revolving pistol about 1845, which was adapted to the use of a metallic cartridge. After the expiration of Colt's patent in 1857, this invention was introduced generally. Now the metallic cartridge is used for all revolving pistols. Three establishments, namely, Colt's, Smith and Wesson's, and Remington's are now the principal manufactories of revolving fire-arms, and there is very little difference of principle, in the products of these firms. The United States cavalry and the navy are armed with the Colt pistol. During ten years ending with our Civil War, more than 550,000 pistols were sold by Colt's armory. The annual production now, in the United States, is about 250,000 of all sizes.

In 1870, there were forty-six establishments for the manufacture of fire-arms of various kinds, in the United States, employing 3,300 persons, to whom $2,500,000 were paid annually in wages. They also employed a capital of $4,000,000, and the annual product was valued at $5,500,000.

Gunpowder, intimately related to fire-arms, is made of the best quality in our country. It is a mixture of nitre, charcoal and sulphur. Something like it seems to have been known in ancient times; and there are notices of events which seem to clearly point to the use of gunpowder or a substance of similar power. The Chinese appear to have learned its use from India as
early as A.D. 80. "Greek Fire" used at Constantinople in the year 668, was employed in "projecting stone balls from pipes." It is supposed to have been made of a composition like gunpowder, with resin and petroleum. In 690, the Arabs employed fire-arms against Mecca, the use of which they had learned in India. A Greek manuscript said to be at Oxford, England, dated 846, describes an explosive mixture composed of one pound of sulphur, two pounds of charcoal, and six pounds of saltpetre—the composition of gunpowder. Belgrade was bombarded with cannon in 1073. In 1085, ships of Tunis "shot fiery thunder;" and in 1232, the Tartars used "fire-pipes" against the Chinese. Bombshells—"fiery balls that burst"—were thrown into Valencia, in 1238. Roger Bacon, who died in 1294, described the destructive qualities of saltpetre, and "the production of thunder and lightning from its compounds." There is a record of a powder-mill at Augsburg, in 1380. From that time such mills sprang up in various countries in Europe.

The earliest English settlers in America brought with them a knowledge of gunpowder-making, and a mill was set up in Massachusetts as early as 1640. Others appeared, but finally the restrictive laws of England suppressed the manufacture in the colonies; and when, in 1774, the Americans began to prepare for the inevitable conflict, there was not a powder-mill in the country. In 1775, two appeared almost simultaneously, one at Hartford, Connecticut, and the other at Rhinebeck, Duchess county, New York. Necessity compelled the erection of others in the various colonies, during the war, and much powder was obtained opportunely by captures of British vessels.

Everything was done by the authorities in every colony to promote the manufacture of gunpowder. The Provincial Congress of New York, in 1776, offered a premium of £100, £75, and £50, for the first three powder-mills making 1,000 pounds a week, erected in that province. Maryland authorized a loan of £1,000 toward the erection of one or more saltpetre works, and half a dollar a pound for the product. A like sum was appropriated for building a provincial powder-mill. There was "prospecting" for sulphur mines, and some were discovered. Virginia, North Carolina, South Carolina and Georgia offered bounties for promoting the manufacture of gunpowder. The business was carried on quite extensively after the war. In 1790, there were twenty-one powder-works in Pennsylvania alone.

Probably the oldest gunpowder manufactory in this country, yet in existence, is that of the Du Ponts near Wilmington, Delaware, which was established in 1802 by Eleuthere Irenee Du Pont, a French citizen, who arrived in this country in the year 1800. Observing the inferior quality of gunpowder made here, and having learned the art in France, Mr. Du Pont resolved to begin its manufacture. He carried on the business successfully until his death in 1834, when his was the largest manufactory of the kind in this
country. During the war of 1812-15, the British strove to reach his mills to destroy them. His sons and grandsons have since carried on the business. During the Crimean war, the allies, to enable them to prosecute the siege of Sebastopol, were compelled to procure a large quantity of powder from the United States, of which the Du Ponts furnished about one-half.

There are extensive gunpowder-works at Hazardville, near Hartford, owned by the Hazard Powder Company, who also have mills at other places. This company supplied the Allies in the Crimean war, with 10,000 barrels of gunpowder.

The Oriental Powder Mills on the Presumpscot river, in the towns of Windham and Gorham, Maine, present a model establishment. They were founded in 1818, by William Fowler, who was succeeded by Oliver M. Whipple. The latter carried on the business about thirty years, when he was succeeded by G. G. Newhall and Company. This firm formed the Oriental Powder Company in 1859, which was succeeded in 1872, by the present corporation. Charles O. Foster is the president of the Company, and Arthur Williams is the treasurer. With the exception of Du Pont's, it is the oldest gunpowder manufactory in the United States.

These mills were started in a small way, with little capital, and a capacity of about 80,000 pounds a year. Their growth has steadily increased up to the present time, when they have a capacity of 6,250,000 pounds a year, and a capital of $500,000. At the beginning the machinery was of the most primitive character, the incorporation being done by what was known as pounding-mills, which consisted of a series of large wooden mortars operated with pestles driven by machinery, and let fall in rotation, similar to the action of a pile-driver. About twenty pounds of powder were sufficient for a charge, which, after being worked in this manner for several hours, was considered ready for the pressing process. Frequent explosions of these pounding-mills, attended with great loss of life, led to the establishment of cylinder mills, which consisted of hard, tough hides stretched on a frame of wood, and forming a cylinder in which the ingredients were placed together with several hundred pounds of composition balls. These cylinders were revolved for a number of hours, the balls striking and grinding together, and in this manner the incorporation was effected. This system, after being in use a short time, gave way to the present one of incorporation under wheels.

The company tried and abandoned several methods of incorporation under wheels, such as the use of large, heavy wooden rollers in wooden troughs; marble wheels on wooden beds; and iron wheels on wooden beds, the method now in general use throughout the country. This method, also, they abandoned, and adopted the present method in use in their establishment, namely, a system of iron wheels on a properly constructed wooden bed, which produce a more perfect incorporation, greater uniformity in the
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product, and greater safety from explosion than any other method now in use.

The mode of pressing rifle and blasting powder has undergone very little change. Hydraulic presses have taken the place of screw-presses, and fibre-plates those of copper.

The subject of granulation has received great attention at these mills. The granulation of rifle and blasting powder has altered but little, in the methods used, but that of powder for large guns, has undergone a radical change. Previous to about the year 1859, what was known as cannon-powder was used for guns of large calibre. At about that time, General Rodman, of the Ordnance Corps, United States army, began a series of experiments to ascertain the granulation best suited for the large guns made then by Admiral Dahlgren and himself, the objection to cannon-powder being that the grains having so little bulk, they were consumed before the shot had time to move but little in the gun; consequently an enormous pressure was exerted on the gun, without a corresponding velocity to the shot. Samples of the same quality, but varying in size from one-tenth to four-tenths of an inch in diameter, were made, and the firing proved so satisfactory that still larger samples were made, some up to three inches in diameter. The results were less favorable than from those of smaller size.

The conclusion arrived at was, that the proper size for the fifteen-inch gun, was of a granulation between six-tenths and nine-tenths of an inch, which is known as "Mammoth Powder." The charge for the fifteen-inch gun was, at that time, from thirty to fifty pounds of powder, but with the improvements made since then, the service charge has been increased to one hundred, and even to one hundred and fifty pounds, in experimental firing.

As an illustration of the immense power developed by the use of a regular granulation, it may be stated that recently fifteen inches of iron and thirteen feet nine inches of hard frozen gravel, have been penetrated by a 531 pound shot, propelled by seventy pounds of what is known as the "Oriental Hexagonal" powder. With the same gun, shot, and quantity and quality of powder, twelve inches of iron and the same thickness of gravel have been penetrated at a distance of one mile.

By increasing the size, and properly regulating the density of the grains while increasing the charge, artillerists have retained control of the energy of gunpowder, and at the same time have actually increased the velocities of even the largest projectiles. For example: in 1864, the American fifteen-inch gun, when using fifty pounds of powder, and a shot of 450 pounds, showed a pressure of about 15,000 pounds, and an initial velocity of 1,100 feet a second. Ten years later, when the larger and geometrically formed grains, like the Oriental Hexagonal were used, the same gun, charged with 120 pounds of powder, gave about 22,000 pounds pressure, and 1,730 feet initial velocity.
The study of the effect of a charge of powder was greatly aided by the invention of General Rodman, of a pressure piston for determining the pressure upon the gun; also by the invention of the mercury densimeter by Colonel Mallet, of the French army, and M. Bianchi, which rendered the accurate determination of the specific gravity practicable. These, in connection with the ballistic instruments of Le Boulengé and Schultz, enabled the student to reach satisfactory results.

To obtain the maximum effect of which a given gun is capable, suggested the necessity for having an exact knowledge of the surface and volume of each granule of which the charge of powder is composed. There were no means for determining the form, when supplying the irregular masses which composed the grains of large cannon-powder, and the importance of moulding it into some geometrical form by which an easy comparison of both surface and volume might be had, was naturally suggested. It was desirable to ascertain the best form of shaping the powder so as to practically prevent decrease of consumption with increase of time. An internal or enlarging surface as well as an external and diminishing surface may be given to each granule.

Starting with the improved results obtained by increasing the size of the grain, General Rodman studied the best form to be given to the granules, a problem which engrosses the minds of powder-makers and ordnance officers to-day. The first trials in that direction were in the manufacture of what was known as Perforated Cake Powder, consisting of masses the size of the bore of the gun, perforated with holes of different sizes and number. The press for the manufacture of these cakes for the fifteen-inch gun, not having the means of extracting the teeth from a compressed cake of so large a diameter, the cakes were made on the hexagonal plan of such diameter that seven of them would form one tier in the cartridge. The results obtained were highly satisfactory, but the experiments made with it were comparatively limited in this country until after the late Civil War.

Experiments meanwhile, had been going on in Europe. A Russian officer who had witnessed the experiments of General Rodman, at Fortress Monroe, was favorably impressed with the idea of a perforated cake, and upon his return home he produced what is known as the Prismatic powder —hexagonal prisms about an inch in length and diameter, each perforated with seven holes a tenth of an inch in diameter parallel to the axis. They are symmetrically packed into a cartridge of very small bulk in proportion to its weight. This is the standard grain for large guns in Russia and Germany. It is almost an exact reproduction of the hexagonal perforated cakes used for General Rodman's fifteen-inch gun.

After the death of Rodman, the Ordnance Department of the United States continued experiments in accordance with the plans and views of
that officer. In 1871, samples of hexagonal powder were manufactured. It consists of the composition from the wheel-mills pressed into cakes which, upon being broken up forms grains of hexagonal shape. This powder has given the best results of any obtained.

Besides the improvements in the manufacture of gunpowder at the Oriental Works, just mentioned, they have introduced steam in drying and refining, also machinery in many places for hand-labor, which allows them to make a larger and better product, with less labor. The works are furnished with the very best machinery, and are capable of turning out powder in quality second to none in our country.

The mills of the Oriental Powder Works are forty in number, scattered over a large tract of land. These, with store-houses for raw material; magazines for the powder; mills for kegs; tenement houses for workmen, and other buildings, form a considerable village. The product of the mills is found in all parts of our country, for the Company have agents in nearly every city and large town in the Union.

Previous to the late Civil War, these mills had an almost exclusive monopoly of the gunpowder export business, because of the acknowledged superiority of their product for enduring the dampness of foreign climates. They were successfully competing in foreign markets with the English, Dutch, German and French manufacturers; but with the outbreak of that war, and the prohibition by our government, of the export of gunpowder, that business was swept away, and has never been regained. During the war the mills were worked to their utmost capacity upon orders from the National Government; and they furnished more than one-fourth of all the powder used here, within that time. Our government was fully supplied with gunpowder from domestic establishments. Not a pound was imported during the war—a circumstance that never before occurred in the history of any nation.

The Oriental Powder Mills own a large tract of land stretching along both sides of the Presumpscot river for over a mile. This river is the outlet of a chain of lakes, and furnishes one of the finest and most efficient specimens of water-power in this country. Knowing the hazardous character of the business, and the unwillingness of many to engage in it, this Company, as well as others in our country, have studied not only how to improve the manufacture of gunpowder, but how to do it with the greatest safety. In these practices, the United States is second to no country in the world.

There were, in 1870, thirty-three establishments in the United States for the manufacture of gunpowder, employing about 1,000 persons, and a capital of over $4,000,000. Their annual product was a little more than $4,000,000.
The manufacture of stone and earthen-ware, such as common pottery and porcelain, is quite an extensive industry in our country. In 1870, we had 777 establishments engaged in the business, in which 6,115 persons were employed, and who received, that year, $2,247,000 in wages. The capital employed was $5,294,000, and the yearly product was over $6,000,000.

The manufacture of pottery is a very ancient art; and it is a curious fact that the potter's wheel, used now, is precisely the same in its simplicity of arrangement, as those seen delineated on the temple walls of Egypt, in hieroglyphic records. The art was so old in Egypt, in the time of Herodotus, 500 years before Christ, that its origin was forgotten, and it was ascribed to the teachings of one of the gods. All over Asia, and, for that matter, all over the world, the art of making earthen vessels, sun-dried or fire-dried, seems to have been practiced.

The Chinese and their island neighbors manufactured porcelain before the Christian era. It is a kind of earthen-ware made of a mixture of fusible feldspar with infusible kaolin or porcelain clay, combined by heat, and producing a half translucent substance.

The ancient Greeks, and the Etruscans who inhabited Italy before the Romans, and who learned the art from the Greeks, were the most eminent potters of ancient times, in the beauty and taste of their productions. The art was disused in Europe during the Dark Ages, but was introduced into Spain, by the Arabs in the fifteenth century. The Peruvians and Mexicans made good pottery when Europeans came, and the tribes of North America, especially those of the Gulf region, were expert potters.

The art was early practiced in Virginia. The Dutch, who had learned it in the East, made excellent Delft-ware, in New Netherland. Earthen-ware was made in the other colonies before the Revolution; and at the formation of our national government, in 1789, the American potters came nearer than any other tradesmen, in supplying the home demand.

Porcelain clay was discovered in Vermont, in 1810. In 1825, Mr. Tucker made porcelain-ware in Philadelphia, from kaolin found in Chester county, Pennsylvania. There is said to be a rich bed of kaolin not far from Iuka Springs, in Mississippi.

The manufacture of porcelain-ware is now carried on successfully at Greenpoint, Long Island, by Thomas C. Smith and Sons, where entire table sets and other articles of excellent hard porcelain are made and decorated.
CHAPTER XX.

LOCKS of superior construction have been made in our country for many years. The use of the lock seems to have been a very ancient custom. In the Book of Judges, the unlocking of the door is mentioned; and Homer tells us that Penelope unlocked her wardrobe door with a brass key that had an ivory handle. The unearthing of Pompeii and Herculaneum has led to the discovery of Roman locks of intricate construction. They were used in Egypt and China in very ancient times, the people of the last-named country making them of wood, upon a principle very much like that of the Bramah lock patented in England in 1784. In the collections of the Pennsylvania Historical Society is the lock and key of the famous Bank of St. George, of Genoa, in which Christopher Columbus, according to a letter of his published in fac-simile in Harper's Magazine for February, 1871, had an interest. A picture of the key of that lock may be seen on page 122, of the second volume of the American Historical Record, which shows that the lock had no less than twenty wards.

The manufacturers of the Bramah lock were the first to abandon the use of wards, and for many years it had the reputation of a lock that could not be picked. The successors of the inventor had, for years, displayed one of these locks in the windows of their office in London, with the offer of a reward of £200 to any one who should pick it. That reward was won in 1851, by A. C. Hobbs, an American, who invented a lock called the "Protector." This lock defied the English locksmiths, but was opened by Linus Yale Jr., of Philadelphia, who afterward invented the famous "Yale," or "Magic" lock.

The Chubb lock, invented in England in 1818, held a conspicuous place for a long time, but was finally superseded by American improvements.

A lock invented by Dr. Andrews, of Perth Amboy, New Jersey, was generally used by banks in this country, without a rival, until that of Day and Newell appeared. Since then many locks for safes and bank-vaults have been invented, but all have the same general principle as a basis. These have been known as "permutation" and "combination dial" locks, and were supposed by their inventors and purchasers to afford absolute security against burglars. Many have failed, and others have succeeded as far as it
was possible to afford such security; but no ingenuity could foil those bold masked bank-burglars that have appeared in our country within a few years, who have secured the cashiers of banks and their families, while compelling the former, with a menace of a pistol at his brain, to unlock the bank-vaults, and hand over the funds and securities to the robbers.

An invention first crudely developed about forty years ago, called the Chronometer or Time Lock, promises, in its improved condition, to afford absolute protection to such cashiers and their institutions, against these bold burglars, in the future. It is furnished with clock-work which may be set to run until any fixed hour. For example, when the banking-house is closed at night, the Chronometer Lock may be set to run until nine o'clock the next morning. In the intermediate time, no person, not even the inventor himself, can unlock the safe or vault. If a burglar demands of a cashier in his power, the opening of the bank-vault before nine o'clock in the morning, he will perceive the impossibility of compliance, and so it affords security not only to the funds of the institution, but to the bank officers.

The Chronometer or Time locks have come into favor and general use, only within the past two years. One of the most perfect of these is the invention of Emory Stockwell, the superintendent of the bank-lock department of the Yale Lock Manufacturing Company, at Stamford, Connecticut, by whom this great instrument of security is made and very extensively sold, with locks of every other description. The Company also manufacture lock boxes, and everything else for the equipment of post-offices.

Safes, or strong boxes or chests, for the safe-keeping of precious things, are now largely manufactured in the United States. These have been in use for centuries in various forms, especially before banks became the depositories of jewelry, plate and other valuable articles of small bulk. But the art of making these things strong and fire-proof, has been developed only within the present century. The manufacture of these and of locks to secure them, has become a very great industry in our country. There were, sixty-five establishments in the United States, in 1870, for the manufacture of safes, and safety doors, vaults, et cetera, of iron, employing 1,640 persons, and a capital of over $2,000,000. The annual product of the industry was about $2,356,000.

Chests for keeping valuable things safe from thieves, were in common use in the Middle Ages. They were generally made of strong oak wood elaborately wrought, and strengthened with iron-work of various kinds; and they were furnished with locks which were sometimes highly ornamented. The burglar’s cunning in those days, and the thief’s adroitness, had not reached their modern perfection. At the same time more dependence was then placed, by the wealthy, on the impregnable character of their houses than upon these strong boxes, for the safe-keeping of their smaller treasures.
The coffer or chest, in which the crown jewels of Scotland were deposited in 1707, was made of strong oak bound with iron, and furnished with staples; and the whole was beautifully ornamented. There were three locks, all of which could be opened now in as many minutes with a bit of crooked steel wire.

The chest in which Mrs. Custis' certificates of deposits in the Bank of England, and other evidences of property in her possession, were kept, when she was married to Washington, was a small iron box with hasp and staples, a lock in the lid at the top, and two rings on the ends for handles. This chest was preserved at Arlington House, the seat of her grandson, the late G. W. P. Custis, until the breaking out of the Civil War.

It was not until about the beginning of the present century, that cast-iron chests for this purpose were made. At about the same time the idea of making them fire-proof, as well as burglar-proof, occurred to manufacturers, by the introduction of substances that were non-conductors of heat. The first English patent for such a safe was issued to Richard Scott, in 1801. The favorite non-conducting substance was gypsum, or plaster of Paris, which was first used in Paris for making fire-proof houses. The same substance was applied to the manufacture of fire-proof safes there, and these were imported into New York as early as 1820. There was an outer and inner box, with a few inches space between them that was filled with plaster of Paris. The first of these portable safes, offered for sale in America, was imported in 1820, by Joseph Bouchcaud, and were constructed of wood and iron. James Conner, the type-founder, seems to have been the first to apply plaster of Paris to the construction of fire-proof safes, in this country. Asbestos was also used.

In 1826, Jesse Delano, of New York, patented an improvement on the Paris safes; but the first that gained much celebrity was one patented by J. C. Gayler, in 1833. It stood some tests so well that it received the name of "Salamander." About sixty of these safes did excellent service in the great fire in New York, in 1835. That fire stimulated others to make better safes.

One of the best and most successful of safes afterward patented, was that of B. G. Wilder, invented in 1840, which, with improvements, is yet largely manufactured in our country. Silas C. Herring's and A. S. Marvin and Company's have gained great and deserved popularity as protectors against fire.

In 1851, Lewis Lillie, of Troy, obtained a patent for a burglar-proof chilled iron safe, that became popular with bankers. Improvements have since been made, until now large safes or vaults are made for banks and other places of deposit for valuables, which seem to triumphantly defy the manipulations of burglars. It is now almost impossible for a burglar to
introduce gunpowder for the purpose of blowing off a door or a lock, without a long and tedious boring; and a contrivance has lately been made in England, to foil him in the latter operation, which consists in placing in front and on each side of the lock, a set of movable cylindrical steel bars, so that when the burglar's drill has penetrated through the outer plate, it can not get a bearing upon the rotary bars.

The manufacture of iron and steel axles, and axle springs, has become a large and thriving industry in our country, as well as the making of complete carriages and wagons of every kind, such as the pleasure-coach, phaeton, clarence, or cab; and the stage-coach, omnibus, and light spring and lumber-wagon.

The use of wheeled vehicles, chiefly for war or the race, is a very ancient custom. They are mentioned as in use in Egypt and the East in the time of the early Israelites. In the Bible we read (2 Kings): "So Naaman came with his horses and with his chariot, and stood at the door of the house of Elisha." And in the voluptuous Oriental love "Song" of Solomon, is the following fanciful description of a chariot which that king "made" for himself: "He made the pillars thereof of silver, the bottom thereof of gold, the covering of it of purple, and the midst thereof being paved with love for the daughters of Jerusalem."

We read that chariots "went out of Egypt," probably for the use of the luxurious Solomon, valued at "six hundred shekels," or about $360 each, and horses at "one hundred and fifty," or $90. These chariots were springless; and, though "paved with love for the daughters of Jerusalem," were more uncomfortable to ride in, than our rudest lumber-wagons.

We also read that Boadicea, Queen of the Britons, rode in a war-chariot provided with sharp knives at the extremity of the axles, which did great execution among the Roman legions. These chariots showed considerable mechanical skill in their construction, by these half-barbarous people.

So late as the middle of the sixteenth century, carriages for pleasure, in cities, or for travel through the country, were very little used, because there were no suitable roads. The horse was the common carrier for men and women. A Dutchman introduced a coach into England for the use of Queen Elizabeth, in 1554, when some of the great ladies ordered carriages or coaches to be made for themselves to "ride up and down the country in." This excited the jealousy of the Queen, and the admiration of the people. So the art of coach-making was introduced into England.

The early coaches and pleasure carriages were heavy, springless affairs, as uncomfortable to ride in as the chariots of Solomon, or those of the Greek race-course. Finally ease was given by hanging the bodies on stout leather straps, by which a rocking motion was obtained. These were used in constructing our old style coaches until within about thirty or forty years.
The first mention of a steel spring is made in 1785, in describing a stage coach that ran between London and Edinburgh. It had "steel springs, exceeding light and easy," says a chronicler.

Carriages were made in New York in 1768, by two Irishmen named Deane, and in Philadelphia by George Bringhurst, before 1790. Mr. White, of Dorchester, Massachusetts, appears to have been the first carriage manufacturer in New England. In 1805, he made a carriage after the English fashion, for a private gentleman in Boston. Up to the close of the last century, the few carriages seen in this country were mostly imported; and before the revolution, only crown officers and very opulent citizens possessed one.

The first great improvement made in the construction of coaches and pleasure carriages was the introduction of iron axles and steel springs, by which great lightness in appearance was acquired. But until a very recent period—not more than forty or fifty years ago—a spring wagon in a rural district was regarded as an extravagant luxury. Now no other is used for pleasure riding, and these have attained to an elegance in construction in this country, nowhere else to be seen in the world. At the international exhibitions in Europe, they have been objects of great admiration.

The pleasure carriages built in our country have assumed a very great variety of shapes and perfection in lightness, strength and real elegance, which our generally well-made highways have rendered possible. Their names and styles are too numerous to record here. These light carriages with our good roads, have given us, as we have observed on page 105 the breed of American trotting-horses, so much sought after for their speed in travelling.

The elliptical spring was introduced in 1825, and is now universally used. In 1830, an American blacksmith first made a tire for a carriage wheel, a complete hoop. Before that time the tires on all wheeled vehicles had been put on in sections, breaking joints with the felloes. That blacksmith drove his whole tire on to the wheel while the former was hot, and the shrinkage in cooling made it perfectly tight. That invention is now universally used. The wheels of our carriages and light wagons are all of the toughest of our native timber, and every part is wrought by machinery with great precision. The delicate iron and steel work now freely used in their construction, give them unrivaled strength and lightness. Newark, in New Jersey, has long been a leader in the prosecution of this industry. Albany in New York, took the lead fifty years ago.

The long public coach for cities, called omnibus, originated in Paris, in 1827, and was first seen in London about the year 1831, where the hackney coach has since given place largely to the cab. The first omnibus seen in the city of New York was in 1830, and ran upon Broadway. Large numbers
were employed there, but the introduction of street railways has greatly reduced them. There were 429 in 1858; in 1873 there were only about 200.

Within a few years the demand for express wagons has been great, in cities, and the manufacture of them, in which strength and lightness are combined, is an extensive industry, while that of common wagon-making is a large item in our national statistics. In 1870 there were 11,847 establishments in the United States, engaged in making wagons and carts. They employed about 55,000 persons, to whom over $21,000,000 were paid, in wages, that year. They employed capital to the amount of $36,500,000, and their annual product was $65,363,000. In the manufacture of children's carriages and sleds, fifty-three establishments were then engaged, employing nearly 1,000 persons and giving an annual product of about $1,500,000.

The Americans have, by new inventions, greatly perfected the manufacture of carriage springs and axles. These improvements were begun by Samuel Mowry, of Greenville, Connecticut, in 1845, where, in 1849, the Mowry Axle and Machine Company was incorporated, and where some of the most perfect axles and springs have been manufactured. Jonathan B. West made a most wonderful invention for the manufacture of wheeled vehicles, known as the West Tire Setter, with which the tires on four carriage wheels may be perfectly set in twenty minutes by the labor of a single man.

Scales, or weighing apparatus for determining, by comparison, the mass or quality of matter of a ponderable body, as shown by the effect of gravity upon it, have been in use from the earliest times in the form of the simple scale or balance. In the old Levitical law of the Hebrews, "just balances, just weights," et cetera, are spoken of; and cheating in weighing is thus denounced in Proverbs: "A false balance is an abomination to the Lord. Diverse weights, and diverse measures, both of them are alike abomination to the Lord."

No doubt the early "balance" was a very crude affair, and there does not seem to have been any fixed standard for international use, each nation adopting a standard for itself. The earliest shape of the balance was probably the simple beam with arms of equal length from the centre, to which pans of equal capacity were suspended. When scientific investigators like Archimedes discovered the law of the lever, the "steel-yard" probably appeared, with its long and short arm and suspended fulcrum; but it was not until about the time of Galileo, in the seventeenth century, that investigation into the laws of force and motion resulted in giving a scientific character to the study of mechanics. By the results of such scientific study only, the strides made in modern philosophy and in the perfection of mechanism, have been attainable by nice mechanical work. Now, scales have been constructed which have been affected by the seven millionth of their load. Even the warmth of the body, expanding their metals, will sensibly affect
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them. The torsion balance invented by Coulomb, in which the minutest forces of electricity are measured, is still more accurate; and to-day astronomers, by the same methods of investigation and mechanical contrivances may accurately weigh the earth and its sister planets, as well as the Father of Lights in our system, the sun itself.

The American colonists as a rule, adopted the weights and measures of England, and these remained in use after the provinces became independent States. Carelessness created discrepancies in the weights and measures in the different States, and in 1817, our national Congress appointed John Quincy Adams a commissioner to examine and report upon the subject, and the question of the desirability of adopting the French metric system, now again under discussion here and in Europe. In his report, long and elaborate, published in 1821, Mr. Adams spoke unfavorably of the French system, and recommended that the existing weights and measures of England should be adopted as the standard for the United States.

By an act of Congress, in 1828, the English troy pound was declared to be the standard pound of the mint of the United States, that pound being seven thousand troy grains. Under the supervision of the late Professor Hassler, accurate and authentic copies of the received standards of weights and measures were prepared, and supplied to all our custom-houses in 1830 or 1831. He found that they very nearly corresponded with the English standard in 1776. The subject of one uniform system of weights and measures for the use of all civilized nations, so as to simplify the present tedious calculations required in international commercial transactions, is now occupying the serious attention of statesmen and statisticians in this country and in Europe.

The ancient even balance and the Roman steel-yard, were in common and almost universal use in this country, previous to 1830. A few platform-scales had been constructed for weighing heavy objects like a load of hay, but these were comparatively rude and inaccurate. So early as 1822, Thomas Ellicott, a mill-wright, made a platform-scale for the Lehigh Navigation Company, and he was the founder of the Philadelphia Scale Works, now carried on by Riehle Brothers.

The requirement of such scales for use in weighing heavy objects on railroad trucks, engaged the attention of inventors, and great improvements were soon made; and the platform-scale now constructed with an arrangement of levers, by which the greatest accuracy in weight-measurement may be obtained, are universally used in the United States. Among the inventors and improvers of the platform-scale, Thaddeus Fairbanks, of St. Johnsbury, Vermont, stands pre-eminent. The Fairbanks scale, in its present perfection, is one of the wonders of the mechanical and commercial world. The history of its origin is interesting.
About the year 1829, the "hemp-fever" broke out in Vermont, and the farmers all engaged in raising hemp. Heavy loads of this product went into St. Johnsbury, in Caledonia county, Vermont, where Erastus and Thaddeus Fairbanks were engaged in making agricultural implements in a moderate way. These loads of hemp required to be weighed, and the only contrivance there for the purpose was a huge steel-yard arrangement composed of a suspended beam of wood provided with chains to fasten it to the load of hemp. It was ponderous and inaccurate. No man would warrant it to give the true weight within fifty pounds.

Perceiving a great want, the inventive genius of Thaddeus Fairbanks began to ponder and contrive, and he soon produced a platform-scale, simple and rude in construction, that weighed the hemp far more accurately than the great steel-yard contrivance. Supposing the demand would be limited and temporary, for such scales (for these "fevers" soon abate), Mr. Fairbanks set very little value upon his invention. But order after order came in for his scales, and his brother Erastus (who was afterward governor of Vermont), thought he saw a wide field for the use of the new invention. It was immediately improved and perfected; and early in 1832, a patent was granted to E. & T. Fairbanks, for a balance for weighing heavy bodies; and the same year they received two other patents for balance steel-yards, the most essential improvement claimed, being the employment of two levers only in the construction of the scale, (the most simple combination in a compound scale), and the use of knife edge bearings resting upon plain polished steel surfaces.

The firm of E. & T. Fairbanks and Company, which included another brother, was formed. At first they confined their business to the manufacture of hay-scales, but they finally extended it, as the demand rapidly increased, to every kind of weighing apparatus of their pattern, until now they manufacture almost three hundred varieties, adapted to all the various departments of business and domestic economy, in the civilized world. A recent writer on the subject says:

"The Fairbanks Standard Scale is used by the private family to weigh the goods coming from the butcher, grocer and baker; it is used by the retailer himself; it is in the wholesale store, in the cotton, silk and woollen mill, in the coal-yard and at the metal forge; all along our railroads, at the weigh-locks of our canals, in all our post-offices. It is found in our Indian territories to weigh Government supplies; in the towns and villages of the British American dominion; in the cities of Central and South America; all through California; across the Pacific with the Asiatics. Silk and tea in China, spices in Java, precious stones and ivory in India, wool in Australia, and the productions of the Hawaiian Isles are sold by Fairbanks' Standard Balances. Crossing the Atlantic we find a Fairbanks scale in the farm-yard
THE FAIRBANKS SCALE MANUFACTORY.

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of the British peer, at the mill of the British manufacturer, and in the stores or shops of the British metropolis."

To this it is proper to add, that these scales are adapted to the standards of all nations where they are used. Fourteen different European governments have adopted them, including the leading powers on the Continent. The highest prizes were awarded them at the Paris Exhibition in 1867, and at Vienna in 1873, as well as at the greater fairs in our country; and the Emperor of Austria conferred upon the yet surviving and venerable inventor, Thaddeus Fairbanks, the honor of knighthood, by sending him the Imperial Order of Francis Joseph—a beautiful and costly cross. So he is now really Sir Thaddeus Fairbanks.

In the year 1874, Fairbanks and Company manufactured at St. Johnsbury, 47,207 scales of all sizes, from those which weigh the fraction of a grain, to those that weigh five hundred tons. This product represented the use of 5,000 tons of iron and steel, 3,500 tons of coal, 500 tons of foundry sand, and 4,000,000 feet of lumber. The aggregate tonnage handled in the establishment, including inward and outward freights, was 13,551 tons. The Portland and Ogdensburg railway passes near their works, and a branch runs into their yard, where the raw material is taken off the trucks, and the completed product is put on.

The present number of men employed in the factory averages about 550, and the monthly pay-roll is from $25,000 to $27,000. The number of clerks, agents, and others employed in the business, is about 350 more. The aggregate annual product of the establishment is now valued at a little more than $2,000,000. They have the contract for furnishing the Post-office and other departments of our government with scales of various sizes; and during the last year they sold for that purpose, about 4,000 scales.

The general depression in business throughout our country seems not to have affected the Fairbanks' establishment. The aggregate materials used there and of the products sold, in 1875, was considerably in excess of that of 1874. This is a singular fact, for it is almost literally true, that a Fairbanks' scale never wears out. There is one in New York that has been in use over forty years, and seems as accurate and sensitive as ever. They make railway track-scales that weigh a train of cars without their stopping; and of their hopper-scales, of which there are more than two hundred in the grain elevators in Chicago, alone, will weigh between six and seven thousand bushels of wheat or other cereal, in an hour. In the space of seven years, these scales have weighed in the stock-yards of Chicago, 6,282,000,000 pounds of hogs, alone.

St. Johnsbury, where the Fairbanks' establishment is located, is a picturesque village, the capital of Caledonia county, on the Passumpsic river.
There are about ten acres of shops that compose the Fairbanks' establishment, and several millions of capital are invested in the works.

The present firm of Fairbanks and Company, consists of the original inventor, a remarkable man, eighty years of age, slow and terse in speech, who probably never spoke an idle word in his life, and his two nephews, Horace and Franklin Fairbanks, sons of the governor. These men have always displayed the most generous and judicious spirit of liberality and kindness towards those whom they employ, providing means for their mental, moral, religious and esthetic culture, in a way that makes their establishment a model one. They have provided for scientific lectures; created a lyceum; established free schools, a free library and reading-room, the former containing about nine thousand volumes of useful books; and a free art gallery, with suitable buildings for all. They have freely aided in building churches in the village.

The high moral tone of the firm is reflected by the workmen and their families. Many of these men have been in the employ of Messrs. Fairbanks full thirty years. A large number of them own the dwellings they live in. There is not, probably, on the face of the earth, a community of working people who enjoy so much solid comfort as these. They are industrious, temperate, and educated. They enjoy a high political, educational, moral and social position in the place. The proprietors and the workmen regard each other as mutual friends. There may be seen the happiest example of the true relations between labor and capital.

In 1870, there were forty-nine establishments in our country engaged in the manufacture of scales and balances, employing about 1,000 men, and yielding an annual product of nearly $3,000,000. It will be perceived that the establishment of the Messrs. Fairbanks represents more than one-half of the entire business of scale and balance-making in the United States.

The extensive use of files and saws in all civilized countries make their manufacture an extensive industry. These implements appear to have been used in very remote times; and there seems to be evidence that files were employed in the sharpening of implements probably before the grind-stone was made. We read in the 13th chapter of the 1st book of Samuel: "Yet they had a file for the mattocks, and for the coulters, and for the forks, and to sharpen their goads." Among the hieroglyphic paintings in the tombs of the Libyan mountain in Egypt, was found a picture of a butcher sharpening his knife upon what, from the blue color, is supposed to have been a steel sharpener, and it must have been of hardened steel.

The file was doubtless brought into Europe by the emigrants from Aryan homes in India. The Greeks and Romans used it in making smooth their various metallic products in the fine and useful arts. Our ancestors brought the knowledge of file-making with them from Europe, and these tools were
made in small quantities by the common blacksmiths of the provinces. Until the Revolution, files were mostly imported from England; during and after that war, they were manufactured here to a limited extent, yet down to a very recent period, a larger portion of these implements used in the United States, were made in foreign countries.

Files were made to some extent in Philadelphia and other places, at the beginning of this century; and in 1812, William T. James, of Washington county, New York, obtained a patent for file-cutting, and manufactured them of cast-steel, at Union Village.

In 1829, excellent files were made at Pittsburgh, Pennsylvania, by Broadmeadow and Company. But file-making could not be classed among our national industries before the year 1840. In 1845, John Rothery, an Englishman, made file-making his business at Matteawan, Duchess county, New York, where all the operations were conducted by hand.

Various machines have been invented in the United States, for file-cutting. One of them contrived by Captain John Ericsson, which would do the work of ten men, was adopted by Sheffield (England) file-makers. The American File Company, of Pawtucket, Rhode Island, using a superior machine invented by Stephen Bemot, a Frenchman, soon controlled the file-making business in this country, and effectually competed, in the excellence of their work, with the best English manufacturers, or of those of any other country. They soon established American file-making among our national industries. There were one hundred and twenty-one establishments for the manufacture of files, in the United States in 1870, employing about 1,600 persons, and nearly $1,700,000 of capital. Their aggregate annual product was nearly $1,700,000 in value.

Saws are also manufactured quite extensively in our country. There were seventy-two establishments devoted to that industry, in 1870, which employed about 1,600 men, to whom nearly $1,000,000 were paid in a year. They employed about $2,900,000 capital, and gave an annual product, valued at more than $3,175,000.

Saws, like files, were used in very ancient times. The Greeks deified Perdix, nephew of Dædalus, as the inventor of the saw, to whom it is said the implement was suggested by the back-bone of a fish. Mythologists tell us that his mechanical genius inflamed the jealousy of Dædalus, who cast him down from the Acropolis, and killed him; and the poets assure us that he was changed into the bird perdix, or partridge, whose cry resembles the sound of a saw in cutting wood.

The Egyptians used saws made of bronze; so, also, were those of the Grecian carpenters at first, but in later times they were finally made of iron. Their form was that of the wooden straight frame saw, the teeth perpendicular to its plane, and the blade set across the middle of the frame. In the
account given in the 2d book of Samuel, of the house which Solomon built for his Egyptian wife, we read: "All these were of costly stones, according to the measures of hewed stones, sawed with saws, within and without, even from the foundation unto the coping."

The teeth of the Egyptian saw, like that of the Asiatic countries now, inclined toward the handle instead of from it as those of our saws do; and the one-hand saw seems to have been in use at a period coeval with the saw worked by two men, as in the "cross-cut" saw of our day.

It is difficult to determine when first other power than that of human muscle was employed in working saws. On a manuscript in Paris, of the thirteenth century, is a representation of a saw-mill worked by a water-wheel; and there seems to be evidence that there was one at Augsburg, Germany, as early as 1322. Some were built in Norway early in the sixteenth century; and there was one at Saardam in 1596. They were not seen in England until about 1633, when a Dutchman set up one near London to be worked by wind. The sawyers were then a numerous class in England, and regarding this mill as a formidable rival, they demolished it.

For more than a century afterward sawing was done by hand in Great Britain. In the year 1700, another saw-mill was built at Limestone, in England, which was demolished by infuriated sawyers and their friends. It was more than sixty years later when a wind-power saw-mill was built at the same place and shared the fate of its successor. It was soon afterwards rebuilt by the same architect, who had learned the art in Holland and Norway, and it was allowed to stand. Meanwhile Holland had, for centuries, furnished England with lumber.

The common large and small saws were, of course, implements brought to America by the early settlers; and the "Pilgrim Fathers" had learned the value of saw-mills in this wooded country, during their sojourn in Holland. So early as 1634 or 1638, the New England Puritans had set up a saw-mill at the falls of the Piscataqua, on the borders of the great lumber region of Maine. That was about 135 years before the people of Old England possessed one in peace. There were no navigation laws then to restrict the use of saw-mills, nor were there indignant sawyers here to interfere with the rights of others. The Dutch erected a saw-mill on Governor's Island, in New York harbor, as early as 1633.

Mill-saws have been made in this country since early in the present century. In 1814, citizens of Worcester county, in Massachusetts, prayed Congress to impose a duty on scythes and mill-saws, to protect that industry in our country, it then having assumed considerable proportions in that region. At about the same time works were in operation at Amsterdam, New York, for the manufacture of mill-saws, mill-irons and scythes, the annual sales from which amounted to about $10,000.
Be. Hoe & Company.
Manufacturers of Printing Machinery & Cast Steel Tows, New York.
The circular-saw, as we know it, is a modern invention, of great importance. The first one noticed was in operation in England in 1790. A contrivance similar in its operation appears to have been used by Dr. Hooke, a hundred years before, for cutting the teeth of clocks and watches. They were used at the beginning of this century by Mr. Brunel, in a machine which he invented for cutting ships’ blocks, and they were adopted by the British admiralty board in 1804. Since that time the circular-saw has been in constant use.

Great improvements have been made in this implement, in our country, within the last fifty or sixty years. So early as 1820, Eastman and Jaquith, of Brunswick, Maine, obtained a patent for a circular-saw for clap-boards. This “improved rotary sawing machine” — an American invention — was the first application of the circular-saw to the dressing of timber of large size, and the manufacture, therefrom, of staves, headings, clap-boards, et cetera. One of those machines was capable of cutting 2,000 feet of pine lumber a day; and within two years it was in general use throughout eastern New England.

Probably the oldest factory in the United States for making saws of every kind, is that of William Rowland, in Philadelphia, established in 1802. For about fifty years the great printing-press manufacturers, R. Hoe and Company, of New York, have been engaged in the making of saws. They were the first who made cast-steel saws in this country, and they have an almost interrupted series of patents for improvements in the method of making them. Their establishment for this purpose is now the most complete and extensive in this country. They make enormous saws for the lumbermen of California, for use among the gigantic trees of that region. They manufacture circular-saws eighty inches in diameter and a fourth of an inch in thickness; mill and cross-cut saws more than ten feet in length, and every variety, from circulars four inches in diameter up to the largest size also chain saws made of solid links with serrated edges for the use of surgeons, and every form of saw for making scrolls, et cetera.

There were 189 mill-wrighting establishments in the United States in 1870, which employed an aggregate of 507 persons, and gave an annual product valued at about $900,000. There were, at the same time, 22,573 grist and flouring-mills in our country, employing 168,736 horse-power in steam engines, and 407,950 horse-power in water-wheels. They had an aggregate of 48,051 run of stone; ground daily 3,271,128 bushels of grain, and employed 58,448 persons, to whom $14,577,000 in wages were paid that year. They employed an aggregate capital of more than $151,000,000, and consumed 366,349,000 bushels of grain annually, valued at $362,315,000. The total amount of their product annually was $444,000,000. The largest number of these establishments in one state, was in Pennsylvania, where
there were 2,985. New York had the next largest number—1,640. Arizona
and Dacota had the smallest number—only two each.

In connection with mill-wrighting and all other work in which boards and
plank are used, the planing machine performs a most important part. It is
a valuable labor-saving implement, and has been brought to great perfection
by American inventors. A very simple one which drove a slightly modified
hand plane, was invented in England by General Bentham in 1791. Mr.
Bramah, the lock-maker, patented a machine in 1802, which performed its
work by means of a vertical spindle, carrying at its lower end a horizontal
wheel, the rim of which was furnished with twenty-eight cutters or gouges.
These were followed by a plane, also attached to the wheel.

From 1800 until 1828, several patents were obtained by Americans for
planing machines, but they were all superseded by one patented in the latter
year by William Woodworth, of New York. It does its work by the use of
cylindrical cutters, or cutters attached to a horizontal shaft moving with
great velocity, while the board is borne along under it, and in contact with
the cutters, by means of two or more horizontal rollers which clamp the
board on each side, the rollers being driven by machinery. Other Americans
have since obtained patents; but for ordinary purposes, the Woodworth
machine seems to be equal to any. The patent expired in 1854.
CHAPTER XXI.

THE manufacture of clocks and watches has become an important and increasing industry in the United States; that of watches within a very few years. Time-measurers, whether in the form of sun-dials, clepsydra or water-clocks, hour-glasses, or wheeled clocks, had the general name of horologe up to a late period in history. Dante, late in the thirteenth century wrote: "as wheels, that wind their circles in the horologe."

The earliest mention of a sun-dial is in 2 Kings: "And Isaiah the prophet cried unto the Lord; and brought the shadow ten degrees backward, by which it had gone down in the dial of Ahaz." That was about 700 years before Christ. One was set up at Rome about 300 years before Christ. The first form of the horologe that measured time by means of machinery, was the clepsydra, a simple contrivance composed of a transparent vase filled with water, graduated, and having a small opening in the bottom. As the water gradually escaped, its height in the vase marked the hour. It was the principle of the hour glass, in which sand is used instead of water. Improvements were made at Alexandria, in Egypt, a little more than 200 before Christ, in which the water was made to drop on wheels, and thereby they were turned. The motion was communicated to a small statue which gradually rose and pointed with a rod toward the hours marked on an indicator or scale.

When wheel-clocks were first made can not be determined. It is believed that Pope Sylvester Third, while he was archbishop at Magdeburg, constructed a wheel time-measurer in the year 996. It is certain that clocks driven by weights were in use in Europe in the eleventh century. The Roman Catholic clergy undoubtedly introduced them into England. The first Westminster clock was erected in the year 1290, and that of Exeter Cathedral (a part of which is still in use) was made early in the fourteenth century. The first of these machines that approached the time-keepers of the present day in accuracy, of which we have any record, was that made by Henry Vick, a German, for the palace of Charles the Fifth of France, in 1370. It had a crown-wheel escapement, a form that was used for 300 years afterward.

To Christian Huygens, a Dutch philosopher, is undoubtedly due the honor of applying the pendulum (known to Galileo and others as a limited
time-measurer) to the wheeled clock in the year 1658. His English contemporary, Dr. Hooke, invented the escapement with anchor-shape pallets acting upon a ratchet-tooth wheel, now in common use in clocks. It did away with the crown-wheel, and was a great improvement on Huygens' pendulum clock. From that time until now, many improvements have been made in the construction of clocks and watches moved by weights or springs. The delicate electrical clock invented by Professor Wheatstone, of London, about the year 1840, and the accurate chronometer clock or watch, with its balance of two metals, invented by Harrison of the same city about one hundred and fifty years ago, now constitute the most accurate time-measurers.

The first watches were ponderous pocket clocks, inaccurate, moved by weights, and requiring to be wound two or three times in the course of twenty-four hours. The spring was introduced in 1555, and the watch became more portable; yet the case, which was formed like those of the "hunting watches" of our day, was six inches in diameter. These watches were costly affairs, their value being about $1,500 of our money. Diminution in their bulk gradually followed, and at length the means for accuracy was obtained by the invention of the balance and the balance-spring to serve the offices of a pendulum in a clock. The escapement was formed of a verge and crown wheel. Now chronometer watches have become as correct timekeepers as chronometer clocks, not varying, sometimes, a second a day.

One of the earliest, if not the earliest clock-maker in America, was William Terry, who made many brass clocks at "Nine Partners," in the present town of Washington, Duchess county, New York. They were set up in tall mahogany frames, ran eight days without re-winding, and were stately in appearance and accurate as time-keepers. They are now cherished heirlooms in families in that region.

To the skill and enterprise of Connecticut clock-makers, we are indebted for the wooden clocks, made so good and so cheaply that every family may possess one. Eli Terry began the manufacture of wooden clocks (entirely by hand), toward the close of the last century; and in 1802, he began making them by machinery propelled by water-power, at Plymouth, Connecticut. The same year Simon Willard obtained a patent for his celebrated timekeepers.

Riley Whitney, a man of science, became one of the most extensive clock-makers in our country, at Winchester (now Winsted), in Connecticut, and conducted the business there until his death in 1835. Great competition soon afterward appeared; and Chauncy Jerome made an entire revolution in the business, by producing one-day brass clocks, by machinery, so cheaply that they sold at prices varying from one to two dollars each. In their manufacture, three men can take a sheet of brass for the wheels, press and level it under a drop, then cut the teeth and make all the wheels for 500
clocks, in a day. The cases may be made (also by machinery), for twenty cents each, such as a cabinet-maker would charge four or five dollars for. Since 1840, millions of these clocks have been made and sold in our country. There were, in the United States, in 1870, twenty-six establishments for the manufacture of clocks, employing over 1,300 persons, and giving an annual product of the value of more than $2,500,000.

Until a very recent period, the Americans were supplied with watches from the work-shops of England, France and Switzerland. It was supposed that the high price of labor here, and want of skill and experience in the business, formed an effectual bar to competition in that industry, by Americans with foreign manufacturers. That fallacy was exploded by the skill and courage of two Bostonians exercised about twenty-five years ago. These citizens were Aaron Dennison and Edward Howard, the former an expert watch-repairer, and the latter as expert a clock-maker. Both had learned the business from the Willards.

In 1848, Mr. Dennison suggested to Mr. Howard the feasibility of competing with foreign watch-makers, by manufacturing watches with machinery. This is the American's advantage in competing with the low wages in Europe. They joined in the undertaking, first at Roxbury, in a small way, in 1850, in company with Samuel Curtis, of Boston. After they had made the first thousand watches, they assumed the name of the "Boston Watch Company." They removed their establishment to Waltham, Massachusetts, ten miles from Boston, and there in 1854, was formed an incorporated company. They built a small factory on the site of the works of the present American Watch Company. Three years afterward the Company became bankrupt, and the property was disposed of at assignee's sale. It was purchased by R. E. Robbins, of New York, for the firm of Appleton, Tracy and Company.

The property finally passed into the possession of the Waltham Improvement Company, and by an act of the legislature of Massachusetts the American Watch Company was incorporated, with a capital of $200,000. By subscriptions, it was soon advanced to $300,000. By other subscriptions the capital was finally increased to its present amount, namely, $1,500,000. The factory has kept pace with the increase and growth of its machinery and business, which has been gradual but with almost unvarying success from its re-organization in 1858, until the present time.

The buildings of the American Watch Company, represented in the engraving, cover about two acres of ground. They are substantial and elegant in structure, and are surrounded by a thriving village created by the Company, in the midst of picturesque scenery. Some of the buildings inclose court yards, which are laid out in gardens and adorned with shrubbery, plants and fountains. The rest of the factory plat, about four acres, is kept as a green lawn. On the landed property, which was originally a farm of one
hundred acres, cottages and other dwellings have been erected by the workmen or the Company, for the use of the former.

The factory consists of twenty-four different departments, each under the proper foreman and his assistants; the whole in charge of A. T. Bacon as general superintendent and C. Vanderwood as mechanical superintendent. The number of persons employed in the establishment averages about 850, one half of whom are feminine. A greater portion of the operatives are well-educated, and the moral and intellectual tone of the establishment is of a high order. Cleanliness and neatness everywhere appear. Nearly all of the persons employed there are New Englanders.

A portion of the establishment is devoted to the manufacture of silver watch-cases. The gold cases are made by Messrs. Robinson and Appleton, in New York. Machinery does nearly all the work, and there is a separate machine for making each part of a watch. There are more than a score of screws, some of them not much larger than a grain of sand. Of these 150,000 are required to make a pound in weight. The various machines that make the different kinds of screws, are managed chiefly by active girls, who change the fine steel wire into these tiny forms, adjust and "slot" the heads and deliver them to the polishers in a few seconds of time.

The total annual product of the American Watch Company, is about 100,000 watch movements and 50,000 silver watch cases, exclusive of those manufactured in New York. The value of the product for the year 1875, was nearly $2,000,000. The principal market for this product is within the United States, but the Company are maturing plans to introduce them into the markets of the world. A house has been established in London. Success has rewarded the enterprise, for the British public and the inhabitants of all European countries, are taking great interest in machine-made watches. The French and Swiss begin to see that this method of manufacture, invented in America, is the best for producing perfection, and cheapness in price. The American Watch Company are making constant improvements in their machinery, and now successfully compete in excellence and price with the manufacturers of watches in any country on the globe.

In 1870 there were in the United States 1,300 establishments for the manufacture and repairing of clocks and watches, in making watch cases, and in furnishing materials for the watch-makers and repairers. They employ about 4,600 persons to whom wages were paid, that year, to the amount of $2,341,300. These establishments employed $4,774,000 capital, and their annual product was valued at over $7,000,000. Besides the American Watch Company, there are other large and successful establishments for the manufacture of watches by machinery. Excellent watches are made by E. Howard and Company, Boston; the United States Watch Company at Marion, New Jersey; the National Watch Company at Elgin, Illinois; the

The enormous annual product of the precious metals within the domain of the United States is largely exported; but a considerable quantity is converted here into jewelry, silver-ware, and coin. The manufacture of jewelry is carried on quite extensively in our country. In 1870 there were 681 establishments occupied in the art, employing over 10,000 persons, of whom more than 1,500 were feminine. These persons received annually wages in the aggregate, amounting to $4,500,000. There were nearly $12,000,000 capital employed, and more than $9,000,000 of materials consumed. The annual product was $22,104,000.

The use of jewelry is of very ancient origin. Specimens of personal ornaments of pre-historic races have been found, and the art of making them appears to have been among the earliest works of man. Between three and four thousand years ago, the departing Hebrews "borrowed jewels of gold and jewels of silver" from their Egyptian neighbors. In the Egyptian collection of the New York Historical Society, may be seen a fine gold signet ring, exquisitely wrought six hundred years before the time of Joseph. Buried cities in the Eastern hemisphere, when exhumed, have displayed immense quantities of jewelry; and the most savage tribes now on the earth exhibit a fondness for personal ornament. It is fair to conclude that this fondness is an innate quality of human nature.

The staid Puritans as well as the cavaliers who settled in our country, indulged this taste; and since the Revolution, the general equality that prevails in society here, and the "well-to-do" condition of our people makes the use of jewelry, of some kind, quite a universal habit.

Very little jewelry was manufactured in our country before the beginning of the present century. The business first assumed considerable proportions in Providence, Rhode Island, where Nehemiah Dodge began the manufacture of jewelry in 1794. In 1810, the first year when this industry was noticed in the national census, there were one hundred persons employed in that branch of industry, in Providence. The business spread to other portions of the United States, yet Providence still maintains its character as a great centre of that industry. The introduction of machinery in the manufacture, has greatly cheapened the processes. A very large amount is made of baser metals, plated with gold so well by the electro-plating process, that few excepting experts can detect the cheap from the costly jewelry.

The manufacture of silver-ware was begun at Providence, soon after the close of the Revolution, and like that of jewelry, the industry has spread all over the country. There were, in 1870, devoted to that business, fifty-five establishments, employing almost 1,000 persons, and giving an annual product
Electro-plating with silver is now producing such excellent work, that this plated ware in the form of pitchers, urns, salvers, knives and forks, and other table furniture, is largely taking the place of solid silver. The process of electro-plating—the use of galvanism—is a comparatively new one, and is now carried on extensively in the United States, and with great expertness.

A white metal called Britannia, composed of eighty-six parts of tin, ten of antimony, three of zinc and one of copper, that takes a silver lustre when polished, is largely used for various domestic purposes, and in the arts. This composition was first manufactured in England in 1770. It gradually took the place of the wooden and pewter dishes and spoons, in this country, but its use was not common here until about fifty years. Its manufacture was begun at Taunton, Massachusetts, by Samuel Babbitt, in 1825. That industry has assumed large proportions in our country since then.

Another industry in this country, connected with our domestic and social life, is the manufacture of pins. No doubt the thorn suggested to the people of earlier ages of the world, the manufacture of the metal pin. The Egyptians, Romans and other ancient nations, made them of bronze. They were more like bodkins, than the pins of our day, being sometimes six or eight inches in length, having beautifully ornamented heads. They were sometimes made of ivory and occasionally of gold, and were used in disposing of the outer garments, and of the hair. The pins used for fastening the hangings of the temple at Jerusalem, were of metal, and were doubtless of the bodkin kind, in dimensions.

Until the middle of the sixteenth century, the people of England used wooden skewers to perform the duty of our pins; and the first use of metal ones seems to have been by Catharine Howard, the first wife of Henry the Eighth. They were made of brass, and were brought from France in 1540. Three years afterward brass pins were made in England, according to an act of Parliament for the regulation of their manufacture. That business flourished there early in the seventeenth century, and finally Birmingham became the greatest pin-manufacturing town in the world. They were first made by machinery, in England, in 1824, under a patent procured by Wellman Wright, a citizen of the United States.

England supplied our country with pins until the breaking out of the war of 1812, when the interruption of commerce caused a great rise in the price of this article of domestic necessity. They sold at not less than one dollar a paper. Their manufacture was first attempted by two Englishmen at the State prison at Greenwich village, now a part of the city of New York, but they were not successful. The attempt was renewed in 1820, at the Bellevue hospital, in the same city, but without success. At what time Mr. Morse (page 227), invented a machine for making pins we do not know.
Wright's machine made solid-headed pins, the first of the kind ever manufactured. They were introduced to the London market in 1833. The year before, John I. Howe, of New York, obtained a patent for a machine for making pins with wire or "spun heads." This machine was first put into operation in New York, in 1836, by the Howe Manufacturing Company, who, in 1838, transferred their business to Birmingham, Connecticut. There they afterwards made pins with solid heads by a process patented by Mr. Howe, in 1840.

Earlier than this, Samuel Slocum invented a machine for making solid-headed pins, and with Mr. Gillson, an ingenious mechanic in Poughkeepsie, New York, he established a manufactury of pins in that town in 1838. Mr. Slocum afterward invented a most ingenious machine which crimped the paper and stuck the pins in it, ready for market. The interests of Slocum, Gillson and Company, were finally transferred to the American Pin Company, of Waterbury, Connecticut, where the business is now carried on successfully in connection with the manufacture of hooks-and-eyes.

Mr. Slocum's pin-sticking machine was invented in 1840, and was first put into operation in Poughkeepsie. Various improvements have since been made; and one by Thaddeus Fowler, of Connecticut, has superseded all the others. Until a recent period, pins were made of brass wire; they are now extensively made of steel wire. Black pins for black dresses are produced by japanning the common brass pin. The principal manufacturers of these useful articles, in this country, are found at Birmingham, Winsted, and Waterbury, Connecticut. They have been produced, and are still produced by millions in these manufacturing towns. England continues to supply us with needles, though they are manufactured to a limited extent in the United States. In the manufacture of pins and needles, there were, in 1870, nearly forty establishments engaged, employing 650 persons (more than one-half of them women and girls), and capital to the amount of $616,000. The annual product of these establishments was about $1,000,000.

Ever since our primeval mother was clothed in the verdure of the fig-tree, some contrivance has been necessary to secure garments to the person. Strings were undoubtedly first used for the purpose, when long, loose robes became fashionable, to loop them up for convenience in walking. For the same purpose the girdle was employed, the excess of length being gathered above the line and falling over it in graceful folds toward the knee. When it became fashionable to have the robes fit closer, eyelets made of metal or other hard substance, were used to give facility to the string in lacing. Then came the invention of the more convenient button, and this was succeeded by the greatest gift of all, the hook and eye. Millions of these are now made and used in this country, by nine establishments, whose aggregate annual product is valued at a little more than $1,000,000.
The hook and eye superseded the string, eyelets, button and pin. Without these how could dresses be fitted with requisite and uniform tightness? To this invention the gentler sex is indebted for much of their winning grace of form displayed by close-fitting garments. Concerning the original invention of the hook and eye, history is silent. The invention is an immigrant from Europe, and appeared here early in the present century, when hooks and eyes were sold for one dollar and a half a gross. In 1840, when American genius had invented a machine for making them, they were selling for from fifteen to twenty cents a gross.

Buttons, the immediate predecessors of hooks and eyes, are manufactured extensively in the United States. East Hampton, in Massachusetts, and Waterbury, in Connecticut, are the principal seats of this industry in our country. The establishment of the late Samuel Williston, at East Hampton (see page 166), employs about 250 persons, and annually consumes $75,000 worth of materials. The annual product is about $250,000.

The invention of machinery has greatly facilitated the process and cheapened the cost of button-making, and increased the variety. Iron molds or shells are now more extensively used than any others. They are made of tagging iron, wrought expressly for the purpose. The shell is cut and formed by a die moved by steam power; and one machine will fashion over 7,000 an hour. Vegetable ivory buttons are now extensively manufactured at Leeds, Massachusetts, and in other places. The nut is kiln-dried, and the buttons are cut by a lathe. Buttons are also made in beautiful forms, of caoutchouc or India rubber. In 1870 there were, in this country, sixty-four establishments engaged in button-making, giving employment to about 2,000 persons, whose aggregate wages amounted to $600,000. They employed a capital of over $1,000,000 and gave an annual product of almost $2,000,000.

Among all the promoters of domestic comfort for which women are indebted to inventive genius, the Sewing Machine stands conspicuous. Its conception was seen in an invention by Charles F. Wiesenthal, for facilitating hand embroidery, patented in England in 1755. It was simply a needle pointed at both ends with the eye in the centre, that might be used both ways without turning. Its infancy may be discovered in a machine for embroidering, patented in England in 1770, by Robert Alsop, in which the double-pointed needles were used. Its sturdy youthhood may be fairly observed in the invention of Thomas Saint, which was patented in England in 1790, "for quilting, stitching and making shoes and other articles by means of tools and other machines." This invention, which seems never to have been put into practical use, (and was only recently discovered in the English patent office) contained, in a remarkable degree, the essential features of the American Sewing Machine, namely, a horizontal cloth plate and overhanging arm; a vertically reciprocating straight needle on the top of
which was a thread spool giving out its thread continually; and an intermediate automatic feed between stitches. It also made the chain stitch. Why this invention, which was so near the perfection of those which have given honor and riches to others, should have been so long hidden from the world is a marvel.

From 1790 to 1830, the Sewing Machine awaited a new birth. Then Barthelmy Thimonier, a Frenchman, patented one of his invention, and a few years afterward eighty of them, made of wood, were in operation in Paris, when they were destroyed by a mob guided by the same erroneous ideas as those of the men who pulled down the saw-mills in England. The mob in Paris was mostly composed of women. In 1848 Thimonier set up improved machines in Paris which made 200 stitches a minute in any material from muslin to leather. These were also destroyed by a mob. The inventor barely escaped with his life, and died in poverty in 1857. His invention was patented in France in 1848, and in the United States in 1850.

Walter Hunt, of New York, had invented a sewing machine as early as 1834, which embraced a curved eye-pointed needle at the end of a vibrating arm, and a shuttle making what is known as a lock stitch. He neglected to pursue his invention and lost one of the grandest chances for fame and fortune. When, in 1854, Mr. Hunt applied for a patent for his invention, it was refused—because it was essentially covered by a patent obtained by Elias Howe Jr. eight years before.

Howe's patent was granted in September, 1846. He began the study of his invention three years earlier, and in 1844 had devised the curved needle and the interlocking shuttle. When his patent was obtained he had a struggle for funds to make it useful; also in the courts to maintain his patent against infringements by other inventors. He succeeded in making a compromise with them and was paid a royalty on every sewing machine manufactured. The aggregate of this royalty, before the expiration of his patent, which was extended for seven years, in 1860, was full $200,000 a year, and he died in 1867 worth, at least, $2,000,000.

Many improvements have been made by American inventors, in the sewing machine, since Howe's patent was granted thirty years ago, until it has reached its present perfection. These inventors and inventions are numerous. For a long time a device called the "feed" was a serious want—a device by which the cloth could be moved along in such a way as not to interfere with the functions of the needle. It was long sought for, and some devices were used, but none seem to have acquired perfection until A. B. Wilson invented the "four motion feed." Mr. Wilson was the first important improver of the Hunt machine which Howe had patented, but his product in 1849, was not the excellent Wheeler and Wilson sewing machine of to-day.

In 1850, the late Isaac M. Singer turned his attention to the improvement
of the Hunt sewing machine patented by Howe, and the next year he obtained his first patent. Other patents were subsequently granted, until he perfected the machine now so extensively used in all parts of the civilized world. It is made by the Singer Manufacturing Company, and has for many years had an annually increasing sale. Their principal manufactory is at Elizabethport, New Jersey, fronting on Newark bay, and is contiguous to the line of the New Jersey Central railroad. They have a factory, also, in Glasgow, Scotland, for the manufacture of machines; another in South Bend, Indiana, for making cases, and silk mills in Newark, New Jersey, for the manufacture of silk twist perfectly adapted for the use of their machines.

After carrying on the business of making sewing machines at various places in the city of New York, the Company purchased thirty-two acres of land at Elizabethport, on which they erected substantial buildings of brick, that cover five acres. The main building has a frontage of 860 feet on one street, and 240 on another, and a width of 50 feet. It is four stories in height, with a French roof. The girders are of iron, supporting brick floors in arched form resting on heavy iron pillars. Very little wood is used in the structure. There are a cabinet-shop and packing box factory, each 40 by 200 feet, and three stories in height. The forge-shop is 700 by 50 feet, with spacious wings, and one lofty story in height. The foundry is 400 by 100 feet, with two wings each 100 feet square. This is well lighted and ventilated. It contains three cupolas, one with a capacity of six tons and the other two of eight tons each. The manufactory has four steam elevators, and the cabinet-shop and packing box factories, one each. The stair-cases are made of iron. The buildings are all lighted by gas at night, and continually warmed by steam.

This land and their buildings cost about $1,500,000, and the perfect machinery of every kind required, with which the establishment is furnished, cost about $500,000 more; total cost of lands, buildings and machinery, $2,000,000. The motive power is steam, furnished by seventeen boilers, operating five engines, with a capacity of one thousand horse-power. Two of the lofty chimneys that tower above the buildings, are each 160 feet in height, and four others are 125 feet in height. The works consume about 6,000 tons of coal annually, and 2,000,000 feet of Canada timber.

The Company have a wharf 900 feet in length, with a powerful crane for handling merchandise. They have a propeller, which is continually employed in conveying freight to and from various points in the city of New York and Jersey City. About 3,000 persons are employed in the establishment, who receive about $1,500,000 a year, in wages.

At their South Bend establishment, where the cases are made and shipped to Elizabethport, about 2,000,000 feet of black walnut boards are used annually. Every part of the machine is manufactured at Elizabethport. There
a very great variety of needles are made of the best English steel, and about 250,000 of these are drawn, grooved, straightened, eyes drilled, pointed, tempered, smoothed, polished, inspected, counted and packed, each week. They manufacture for family use more than twenty different styles of machines, all alike so far as working quality is concerned; the difference in cost depending upon the style of the case and the degree of ornamentation. Their sales are enormous, and are constantly increasing. In 1871, when there were twenty-five different sewing machine companies in active competition with the Singer Company, they sold 181,260 machines, their chief competitor, Wheeler & Wilson, selling at the same time, 128,526 machines. In 1872, the Singer Manufacturing Company sold 219,758 machines, and in 1873, their sales were 232,444, being as many as were sold by all their competitors combined. In 1874, they sold 241,679 machines, and in 1875, their sales amounted to 249,852. This is by far the largest sewing machine factory in the world.

Mr. Singer, the inventor, was a son of a German millwright, of Rensselaer county, New York. He began the struggle of life alone, when he was about twelve years of age, from which time he supported himself by his industry. Without serving an apprenticeship, he became a machinist, and was in the employment of R. Hoe and Company, New York. While engaged in that establishment, he devoted his leisure hours to the study of the drama, and he became an actor and theatrical manager.

Mr. Singer invented a steam-drilling machine, and another for carving wood, metals and stone. While engaged in introducing the latter to the public, his thoughts turned to improvements in sewing machines. In eleven days he introduced and made the first Singer sewing machine. That was in 1850. Several patents or improvements were afterward obtained by him. The results of his invention have been noticed above. In 1860, Mr. Singer retired from the active management of the business, and afterward resided most of the time in Europe. He purchased a fine estate at Old Paignton, near Torquay, in Devonshire, England, where he dispensed a generous hospitality, for his property was valued at several million dollars. There he died in July, 1875, in the sixty-fourth year of his age.

The principal office of the Singer Manufacturing Company is in a magnificent building, No. 34 Union Square, New York, where they have elegant sales-rooms. Branch offices are established in the principal cities of the United States, and in many places in foreign countries.

In 1870 there were forty-nine establishments in the United States engaged in making sewing machines, and employing 7,300 persons, to whom wages to the amount of over $5,000,000 was paid. There were also employed in the business capital to the amount of almost $8,800,000. The aggregate product of thirteen of the principal manufacturers that year, was a little
more than 362,000 machines, valued at more than $14,000,000. The number of machines sold by seventeen of the principal establishments, in 1874, was 529,000. There were exported sewing machines, and parts of machines, during the year ending with June, 1875, to the value of $1,798,000. In 1872, there were employed in the production of sewing machine fixtures, twenty establishments, employing more than a thousand men, and giving an annual product of $1,750,000. The total annual product of the sewing machine industry in the United States is probably not less than $20,000,000 at this time.

This great industry is the growth of less than thirty years. The origin of the sewing machine as an accepted implement of labor, can not be dated earlier than 1846. Its cost, at first, seemed to be an insuperable bar to its popular use. The machinery now employed in its construction, and which vastly cheapens the product, was then almost unknown. The various machines for the purpose, have nearly all been invented since the sewing machine has become extensively used. It takes nearly one hundred of them to make a Wheeler and Wilson machine.

In its varied applications, even in its present development, the sewing machine enters so largely into the social life of our country, blessing the household by its beneficent saving of time and labor, that it may be considered as one of the most useful inventions of our day. What its capacity for usefulness may be, is not yet known, perhaps not suspected. We may almost be justified in believing that the time is not far distant, when the common sewing needle, and also the seamstress, will be as rare as are the flax-wheel and the class of spinsters of a hundred years ago. Already Hood's "Song of the Shirt" has become almost unintelligible to the younger makers of garments, for they can not feel the force of the refrain—

"Stitch, stitch, stitch,"

as did their wearied sisters a generation ago.

Even the labor of the sewing woman's feet, in cities and the larger villages where public water-works supply the dwellings with streams, may now be dispensed with, by the use of a contrivance invented by W. J. Lane, and manufactured by Lane Brothers of Millbrook, Duchess county, New York, who have obtained patents in this country and in Europe. It is ornamental in appearance. It may be attached to a water-pipe in a building, and with the force of a very small stream from the pipe, the sewing machine may be propelled. This contrivance saves much labor now complained of. It may also be used as a motor for other small machines at an expense that is merely nominal.
CHAPTER XXII.

The coinage of gold and silver, with copper, has been carried on regularly in our country, since 1794. It was begun at the National mint in Philadelphia, in that year.

How early metals were coined—stamped in a die with the value of each piece, in numerals—we know not. That metals were used as a medium of exchange, instead of commodities, at a very early period in the history of our race, we do know, from recorded testimony. We read that Abraham, who lived about two thousand years before Christ, and who was "very rich in cattle, in silver, and in gold," paid for a cave in which to bury his beloved Sarah, "four hundred shekels of silver, current money with the merchants." The value was calculated by weight for many centuries afterward. Homer, who flourished in Greece about a thousand years afterward, does not mention coined money.

Some have supposed metals were coined in Asia more than eight hundred years before Christ, but such money seems not to have been in use among the Hebrews five hundred years before our era, for we read in Jeremiah—"And I bought the field of Hanameel, my uncle's son, that was in Anathoth, and weighed him the money, even seventeen hundred shekels of silver." Herodotus, who lived between four and five hundred years before our era, speaks of coins in his day, and says the Lydians were the first who struck money. Pliny says coinage was invented by Servius Tullius between five and six hundred years before Christ.

The earliest coins of the Romans were copper or bronze, and were first cast in molds and afterward the devices and dates were made with a hammer on a prepared anvil. Silver was coined in Athens before it was struck in Rome; and the money of both nations was irregular in form, gradually verging toward the disc. The perfect circle, obtained by stamping coin in a ring or collar, was not seen before the seventh or eighth century of our era. The first coin that bore the effigy of a reigning monarch, was issued by Julius Caesar, who obtained permission from the Roman Senate, to place his profile on the money of the empire. It was not until about the middle of the seventeenth century that the forge and hammer gave way, in the process of coinage, to the mill and screw, in France and England.
One of the petty British princes, in the first century of our era, coined copper, silver and gold at Colchester, in England. In the tenth and eleventh centuries, there were establishments in many towns in Britain for coining money. Their number was reduced after the Norman conquest; and in the time of Queen Elizabeth, all coins for the realm, were made at a mint in London.

The first coinage done in America, was that of silver pieces of the value of three, six, and twelve pence, made at “a mint house” in Boston, in 1652, established by the general court of Massachusetts. Having the device of an evergreen-tree on one side, this coinage was known as “pine-tree money.” So early as 1642, some coins were made in Bermuda, for use in the Virginia colony. The Massachusetts mint existed about thirty-four years, but all the coins issued from it bear the dates of 1652 and 1662, the same dies having, probably, done service throughout the period.

In the reign of William and Mary, copper coins bearing the figure of an elephant, were struck in England for Carolina and New England, bearing the date of 1694. Coins were also made for Maryland, bearing the effigy of Lord Baltimore. In 1722 and 1723, William Wood obtained a royal patent for coining small money for the English plantations in America. He made it of pinchbeck, an alloy of copper and zinc. One side of the coins made by Wood, bore the image of George the First, and on the other side was a large double rose, with the legend, Rosa Americana utile dulci. In the coinage of 1724, the rose was crowned. Efforts were made by Wood to introduce this base money into Ireland, but there, as well as in the English colonies, it was vehemently opposed. A writer of the day, speaking of the speculation, said Wood had “the conscience to make thirteen shillings out of a pound of brass.”

The power of coinage was exercised by several of our individual States, from 1778 until the adoption of the National Constitution. By the authority of the legislature of Vermont, a mint for coining money was established at Rupert, in that State, in 1785, where copper cents were issued, bearing on one side a plow, and a sun rising from behind hills, and on the other a radiated eye surrounded by thirteen stars. Some half cents were issued at the Vermont mint.

In the same year (1785), the Connecticut legislature authorized the establishment of a mint at New Haven, where copper coins were issued, having on one side a head, and on the other the figure of a young woman holding an olive branch. This mint continued in operation about three years. Parties obtained authority of the legislature of New Jersey, in 1786, for coining money, and they established two mints in that State, one not far from Morristown, and another at Elizabethtown. On one side was the head of a horse, with a plow beneath, and on the reverse a shield. The head of a
horse and three plows now form the chief device of the great seal of New Jersey.

Cents and half cents were issued in Massachusetts, in 1788, exhibiting on one side the American eagle with arrows in the right talon, and an olive branch in the left, and a shield on its breast bearing the word "cent." This was then, and is now, the chief device on the Great Seal of the United States. On the other side of the Massachusetts cent was an Indian holding a bow and arrow; and there was also a single star.

Robert Morris, the Superintendent of Finance, submitted to the Continental Congress, in 1782, a plan for coining money for the United States, devised by Gouverneur Morris. The Congress approved the establishment of a Mint, but nothing more was done by that body until 1785, when a plan submitted by Thomas Jefferson was adopted, and in 1786, provision was made for coinage. Morris' plan was upon a decimal basis. So also was Mr. Jefferson's. The latter proposed to strike four coins, namely a copper cent, or one-hundredth part of a dollar; a silver dime, or a tenth part of a dollar; a silver dollar, and a golden eagle of the value of ten dollars.

The matter rested until 1787, when the Continental Board of Treasury, by authority of Congress, contracted with James Jarvis for three hundred tons of copper cents, which were coined at the New Haven mint. On one side is a device of thirteen circles linked together; a small circle in the middle with the words: United States around it, and in the centre the words, We are one. On the other side is a sun-dial with the same above it, and Fugio—1787, on opposite sides. Below the dial were the words: Mind your business.

Laws for the regulation of the mint were enacted in April, 1792, and David Rittenhouse, of Pennsylvania, was appointed the first Director. The mint was not put into full operation until 1795. The interval was chiefly spent in experimenting. Some silver dollars were coined in 1794. During these three years, a variety of silver and copper coins appeared, the most noted of which is the "Washington Cent," so called because it bears a profile of Washington on one side.

The subject of a device for the coins was warmly debated in Congress. The head of the president was objected to, as it might be viewed as a stamp of royalty in our coins; and finally a head of Liberty was chosen for the inferior coins, and the figure of an eagle for the golden one.

The Mint was established at Philadelphia, then the seat of the national government, and it was never removed from that city. It was the sole mint until 1835, when Congress created three branches; one at Charlotte, North Carolina, another at Dahlonega, Georgia, and a third at New Orleans. These went into operation in 1837 and 1838. In 1854, a branch mint was established at San Francisco, California, and in 1870, one at Carson City,
Nevada. Assay offices were established at New York, in 1854; at Denver, Colorado, in 1864, and at Boise City, Idaho, in 1872.

An act was passed in 1873, which established the mint and assay offices, as a bureau of the Treasury Department. The several institutions were placed substantially upon an equal basis, and they were brought under the general supervision of the chief officer of the bureau, whose title is Superintendent of the Mint at Philadelphia. He is under the direction of the Secretary of the Treasury, and is appointed by the President of the United States, for the term of five years, by and with the consent of the Senate. The dies used in coinage in all the mints in the United States, are made under the supervision of the engraver of the mint at Philadelphia.

Our minor coins now are a five cent and a three cent piece, (composed of three-fourths copper and one-fourth nickel,) and a one cent and two cent piece, ninety-five per cent. tin and zinc.

From the establishment of the national mint until the close of the fiscal year in 1873, a period of eighty years, the total coinage has been as follows: Gold, $1,097,683,511; Silver, $172,392,780; minor coinage, $11,919,838; entire coinage, $1,281,996,130. The number of gold coins struck was 181,673,669; of silver, 524,624,186, and of minor coins, 674,597,467.

The manufacture of Textile Fabrics in our country, is an extensive industry which has been developed within the last eighty years. During that time, spinning and weaving excepting in families, have been done chiefly by machinery in the manufacture of both woolen and cotton cloth.

The manufacture of cloth from wool seems to have been practiced at a very early period in the history of our race. When, a little more than three hundred years before Christ, Alexander the Great invaded Asia, he found natives of India wearing shawls of wool of great beauty—far superior to anything then known in Egypt or Greece. Undoubtedly to the Hindoos the Egyptians and Grecians were indebted for the later perfection of the art in their respective countries. The latter introduced improvements, and Byzantine cloth made at Constantinople, was long universally praised for its beauty and excellence. The Romans learned the art from the Greeks, and it flourished in the Roman colonies. From Italy it spread over Western Europe, and was practiced in the Low Countries, France and Spain, at an early period in their history.

A guild of woolen manufacturers was formed in the Low Countries as early as the tenth century, and in the thirteenth century, the woolen cloths of Spain were greatly celebrated. In the same century some friars established the art at Florence, in Italy; and not long afterward that city had three hundred establishments for making woolen cloth. The Flemings became famous manufacturers of this fabric, and the skilled workmen of
that country, introduced the art in its more perfect form, into England in the time of Edward the Third. Manufactories were established there; and down to the end of the sixteenth century, there was much complaint and some laws were established concerning the cheating of native workmen—"untruthful making of cloth." The finest specimen of the time, often turned out to be no better than "shoddy." Queen Elizabeth encouraged the immigration of cloth-weavers from the Continent, and the art was placed on a better foundation in her realm. From that time until the invention of machinery for spinning and weaving, the manufacture of woolen cloth was a growing industry in Great Britain. With the advent of those inventions, it began to assume gigantic proportions.

The manufacture of cotton cloth was pursued in India, in very remote times, where the spinning-wheel, such as our grandmothers used, was common long before it was known in Europe. The Egyptians and Greeks made threads for the weaver, by the slow process of placing the cleansed fibre upon a forked stick called a distaff, which was held under the left arm, and with the right forefinger and thumb the fibre was drawn out and twisted into a thread, in fineness according to the delicacy of touch and expertness of the spinner. When the thread was long enough to reach the ground, it was wound on a stick called a spindle. The ancient Egyptians, Greeks and Romans attached a light weight to the thread, and so the twisting into greater fineness was accomplished.

Such was the method of spinning in England until the reign of Henry the Eighth, when the spinning-wheel was brought from India. In this the spindle was made itself to give the twist, and also wound up the thread, being caused to revolve rapidly, as with the right hand a large wheel was sent around, and carried the spindle by a cord or belt with greatly increased velocity. To a projecting hook at the end of this the thread was attached, and was passed thence to the bunch of fibre held upon a distaff in the left hand of the spinner. A modification in this machine was made in the form of the "little wheel," known as the Irish flax-wheel, at which the spinner sat at her work, and moved the apparatus by a treadle, with her foot, as in the case of the sewing machine.

But even with this improvement, the cotton thread was too irregular to be used for anything else than for the woof of the fabric, the warp being made of linen thread. The spinning was done by families in the vicinity of the looms of weavers, and yet the former could not supply the increasing demands of the latter class of workmen, whose looms were worked by hand. This condition of things stimulated inventive genius, and in 1738, John Wyatt, in the name of Lewis Paul, obtained a patent in England for a spinning machine. The honor of inventing the "spinning-jenny," is claimed for Thomas High and John Hargreaves respectively. The former obtained a
patent for a spinning machine, in 1764, while Hargreaves did not secure his patent until 1770. He claimed to have made the "jenny" in 1767, which carried eight spindles, and made the same number of threads at the same time. It was called a "gin," the contraction of engine, and finally "jenny."

The spinners, jealous of Hargreaves' machine, drove the inventor from his home in Lancashire, when he built a small mill in Nottingham, to spin yarn by his machines. Into the same region went Richard Arkwright, a barber, (who shaved in a cellar for a penny, until he was twenty-eight years of age), and set up a spinning-frame of a new model, which he had invented. He had made a little money out of the sale of hair-dyes, and on that he relied for subsistence, while studying out his invention. He produced a spinning-frame, in 1768, by which the thread could be spun of any required fineness and strength, and with immense velocity.

Arkwright enlisted in his invention, the firm of Need & Strutt, the latter an ingenious mechanic, who by a few suggestions, perfected the invention. One of these, driven by horse-power was soon in operation. This was followed by another, moved by water-power, in Derbyshire; and in 1769, Arkwright received his first patent. His machine, which he afterward improved, was intended to spin cotton fine, with a hard twist, and fit for warp. This was done by the use of drawing rollers, by sets of two, the second set moving faster than the first, and by a fast revolving spindle giving a twist to the cotton as it came out from between the second pair. This machine was far superior to that of Hargreaves, and its introduction caused the latter to die of grief. Arkwright was uneducated, and learned the mere rudiments of learning after he was fifty years of age. He was knighted in 1786, and died in 1792, at the age of sixty years, leaving a fortune of $2,500,000. With his spinning machine one man can do as much as one hundred and thirty men could before the invention; and it is estimated that 40,000,000 men could not do the spinning now done by machinery, in England alone.

In 1779, Samuel Crompton, of Bolton, England, invented a machine for spinning, which combined Hargreaves' "jenny" and Arkwright's rolling spinning. It was called a "mule," (German mühlen, mill), or "mule-jenny." The spindles were attached to a carriage which was run out on wheels about five feet, drawing out and stretching the roving as it was twisted at the same time into thread. As the carriage or "mule" was run back the spun threads were wound on the spindle, the process of spinning or winding thus alternated. Crompton's original machine was intended for twenty or thirty spindles. It was afterward enlarged so that 2,200 spindles were carried on one mule, managed by one attendant.

In 1785, Edmund Cartwright, an English clergyman, invented the power-loom. It was opposed by workmen and master spinners who, gathering in a mob, set fire to the first mill in which it was used, containing five hundred
Improvements were made, and the power-loom slowly gained in popularity. In the year 1809, Parliament voted Cartwright £50,000 on the memorial of the principal cotton-spinners of England.

These facilities for manufacture made an enormous increase in the demand for cotton wool. Whitney's cotton-gin appeared almost immediately after the perfection of Arkwright's, Crompton's and Cartwright's inventions; and it, alone, enabled cotton producers to supply that demand, with the results in this country already alluded to. The inventions in England gave that country the monopoly of the cotton manufacture, which was guarded, as all other manufacturing interests were, with jealous care by the government. So early as 1774, Parliament passed an act prohibiting the exportation of machinery to foreign countries.

The British government put obstructions in the way of textile manufactures as well as of iron, in the English-American colonies. The result was that domestic manufactures supplied the people with their coarser cloths, known as "home-spun." The spinning-wheel and the loom appeared in almost every family, especially after the beginning of the disputes between the colonists and the British ministry and Parliament.

In 1765, a society was formed in the province of New York, who repudiated foreign cloths and adopted measures for encouraging and promoting home manufactures. Among their rules was one which required that the flesh of sheep should not be eaten, in order that the wool product might be increased; and such was the result. Many cloth-weavers came from England, and found employment in families. This immigration was stimulated by the non-importation agreements among the colonial merchants; and in the year 1774, several thousand cloth-weavers came to America.

In a letter written at Newport, Rhode Island, at the beginning of 1768, it was stated, that at a social gathering of ladies one afternoon, "It was resolved that those who could spin ought to be employed in that way, and those who could not, should reel. When the time arrived for drinking tea, bohea and hyperion were provided, and every one of the ladies judiciously rejected the poisonous bohea, and unanimously, to their very great honor, preferred the balsamic hyperion." The latter was made of the dried leaves of the raspberry plant, and was a domestic manufacture.

In Boston, a party of forty or fifty young women, calling themselves Daughters of Liberty, met at the house of the Rev. Mr. Morehead, where they amused themselves during the day with spinning "two hundred and thirty-two skeins of yarn, some very fine, which were given to the worthy pastor, several of the party being members of his congregation." Many spectators came in to admire the spinners. Refreshments were indulged in, and "the whole was concluded," wrote an eye-witness, "with many agreeable tunes, anthems and Liberty songs, with great judgment; fine voices
performing, which were animated in all their several parts by a number of the Sons of Liberty.” It is said there were more than one hundred spinners in Mr. Morehead’s congregation.

In another letter written at Newport, and published in Hugh Gaine’s New York Mercury, in 1768, the writer said: “Within eighteen months past, four hundred and eighty-seven yards of cloth, and thirty-six pairs of stockings have been spun and knit in the family of James Nixon, of this town. Another family, within four years past, hath manufactured nine hundred and eighty yards of woollen cloth, besides two coverlids [coverlets], and two bed-ticks, and all the stocking-yarn for the family. Not a skein was put out of the house to be spun, but the whole performed in the family. We are credibly informed that many families in this colony, within the year past, have each manufactured upwards of seven hundred yards of cloth of different kinds.”

So it was that the domestic manufacture of woollen cloth was begun in our country; that of cotton cloth began later. So it was that by the inauguration of that manufacture, the women of our country, a hundred years or more ago, helped their “fathers, brothers, husbands and sons, to fight in the council and the field, for the inalienable rights” of man.

But wool was so scarce during the Revolution, that, it is said, there was not enough in all New England, though best supplied, to make each inhabitant a pair of stockings. Wool was worth seven shillings a pound in Philadelphia, in 1778, and men were advised to wear leather breeches. Some were compelled to do so. In the summer of that year an advertisement appeared in a New Jersey newspaper, saying that “one good shirt, and a pair of woolen drawers or trousers” had been found, and the owner might have them by paying the price of the advertisement, “$2.00.” Referring to this, in a speech at the anniversary dinner of the Silk Association of America, in May, 1875, Mr. John L. Hayes said:

“Compare the poverty of woolens of that period with the abundance during the late war. Why our soldiers threw away enough overcoats and blankets in a single battle, to have supplied Washington’s army. At the close of the war there was an overplus of 2,000,000 overcoats, enough to supply one-third of the voters in the United States. And these were all made of sound and indigo-dyed wool. See a crowd of laborers in winter, and you would think that these garments would never wear out. A single mill in Massachusetts has a capacity, working day and night, to keep clothed a million men. Another, in the same town, works up every week the fleeces of ten thousand sheep. In the decade closing in 1870, we increased the manufacture of woolens proper from 61,000,000 to 155,000,000, and nine-tenths of these woolens are made of domestic wool. We have 10,126 sets of machinery, in every State from Maine to Georgia, and from Oregon to
Massachusetts, consuming 220,000,000 pounds of wool, besides other fibres. We so completely satisfy our own people, that importations of woolens are regularly declining; and one chief trouble of the manufacturer is, over-production from competition, of which the consumer gets the benefit. We consume the wool from about 30,000,000 of our sheep, and encourage the production of animal food, so that the consumer gains many times more in the cheapness of meat due to the protective influence of the tariff, on sheep-husbandry, than he is assessed by free-traders to pay as a tax on his cloth in consequence of the same tariff. The masses of our people are clothed with American woolens, principally by means of the new industry, the ready-made clothing manufacture—seven-eighths of whose cloths are furnished by American mills. Few are aware of the cheapness and excellence of these goods, and of their vast consumption."

The ready-made clothing business, in our country, was begun in what were called "slop-shops"—places where sailors were fitted out with complete suits for short or long voyages. The business was, for a long time, conducted wholly by the Jews, who were famous as dealers in second hand clothing. It gradually extended to the general furnishing of cheap clothing ready-made, known as the product of "slop-work," and was supported by the poorer class of citizens. This phase of the business continued until about twenty years ago, when it assumed a better form, until now there are establishments which furnish almost every kind of garment, of finest texture, fashionable shape and excellent workmanship, for both sexes.

The introduction of sewing machines and other labor-saving apparatus, has greatly facilitated the growth of the manufacture of ready-made clothing until it is reckoned to be the third, in importance, of our national industries. In the year 1870, there were, in the United States, over 9,700 establishments engaged in making children's, men's and women's clothing, employing almost 120,000 persons, of whom over 69,200 were feminine. To these were paid, that year, in the aggregate, $33,261,000. These establishments employed nearly $94,000,000 capital, and their annual product was valued at almost $162,000,000. Since 1870 the business has greatly increased, and the annual product now is probably full $170,000,000. Large fortunes have been made in the business, some firms employing hundreds of persons.

"The wonderful clothing manufacture," said Mr. Hayes, "which is too little appreciated, and which is one offshoot of our woolen manufacture, and the creation of protection, has changed the external aspects of our society. When Alexander, Czar of Russia, visited England, accustomed to see his serfs clad in sheep-skins, and astonished at seeing on some public festival an immense public clothed in substantial cloth, he exclaimed: 'But where are the people?' But this was a city crowd. In England the rural population are still clothed in rags. If we could imagine the imperial visitor, penetrat-
ing over the most remote of our agricultural districts, he would say, not 'Where are the people?' but 'Where are the country people?' The country people, as marked by their garb, have disappeared. City fashions, in cut and material, prevail alike in country and city. All are dressed alike, from New York to Chicago. Our common people wear better and finer cloth than kings wore a hundred years ago. Uniformity of dress is both a cause and an evidence of social equality. Our woolen manufacture has contributed no little to the social progress, and is thus in harmony with the genius of our institutions."

In his famous report on the public finances, Alexander Hamilton mentioned a woolen mill at Hartford, Connecticut, where cloths and cassimeres were manufactured, but expressed a doubt whether American wool was suitable for fine cloths. He probably derived his information from Washington, who, during a tour in New England in the fall of 1789, made a personal inspection of the factory at Hartford. In his private diary, under the date of October 20, 1789, Washington wrote:

"After breakfast, accompanied by Colonel Wadsworth, Mr. Ellsworth and Colonel Jesse Root, I viewed the Woolen Manufactory at this place, which seems to be going on with spirit. Their Broadcloths are not of the finest quality, as yet, but they are good; as are their Coatings, Cassimeres, Serges and Everlastings; of the first, that is, broadcloth, I ordered a suit to be sent to me at New York, and of the latter, a whole piece, to make breeches for my servants. All the parts of this business are performed at the Manufactory, except the Spinning—this is done by the Country people, who are paid by the cut."

One of the first woolen factories established in the United States, was set up in Byfield parish, Newbury, Massachusetts, in 1794; and the same year a carding machine for wool was first put in operation in our country. It was constructed under the direction of John and Arthur Schofield. They established a woolen mill at Pittsfield, Massachusetts, where, in 1808, were manufactured the thirteen yards of broadcloth that composed the suit of clothes worn by President Madison at his inauguration. Grey mixed broadcloths were made there, and were sold in New York as foreign goods because of the prejudice in favor of foreign manufacture.

The first woolen mill in the State of New York was set up at Oriskany, Oneida county, in 1809, in which De Witt Clinton had an interest. Another was erected in Duchess county, New York, by the Glenham Wool Manufacturing Company, in 1814. At the same time the largest establishment in New England, for making fine broadcloth, was that of the Middletown Manufacturing Company, who, in 1812, made daily thirty or forty yards of broadcloth which sold by the piece at $10 a yard. Such were the feeble
beginnings of the great woolen manufacturing interest in our country, which has fairly kept pace with the manufacture of cotton.

The total value of the product of the woolen factories of the United States, in 1840, was $20,697,000; in 1850, $43,208,000; in 1860, $62,000,000, and in 1870, $155,496,000, exclusive of worsted carpets and hosiery which, together amounted in value that year to $43,762,000. The total value of the products of our woolen manufactories in 1870, was almost $200,000,000.

It will be seen by reference to the foregoing figures, that the worsted manufacture is becoming an important industry in the United States. It was begun in the town of Worsted, Norfolk county, England, in 1340. In this manufacture the long wools are used, the staple of which varies in length from five to twelve inches. These are called combing wools. The object in view in preparing the wool, is not that thorough interlacing of fibre which is completed in fulling, but rather to produce a simple spun or woven fabric. Accordingly the chief preparation of the wool consists in obtaining the fibres in a straight and parallel condition, and that is done by combing.

The manufacture of worsted braids is a new industry in our country, which was begun about fifteen years ago. Previous to that time, worsted braids, used in the United States, were all imported, at an annual cost of between two and three million dollars.

The business of manufacturing worsted braids was begun in 1861, by D. Goff and Son, in Pawtucket, Rhode Island. One or two other parties began the manufacture at about the same time. For various reasons, such as inexperience in the business, want of proper machinery, and heavy importations of goods under a low tariff, they all lost money in the experiment. Messrs. Goff and Son persevered under the weight of heavy losses and discouragements, until the tariff of 1867 gave them fresh courage. They were then making better goods than any that were imported or manufactured in our country, and their business began to be remunerative. Now they are on the full tide of success, and they maintain the reputation of making better goods than were ever imported, while they supply consumers at twenty per cent. less than they formerly paid for the imported articles.

The establishment of D. Goff and Son consists of a mill 200 feet in length, 54 feet in width, and five stories in height, which is lighted by gas, heated by steam, thoroughly ventilated, and furnished with the best of machinery. A turbine water-wheel of 275 horse-power, drives the machinery; and theirs is the last water privilege on the Blackstone river which empties into Narragansett bay, a few miles below. Tide-water flows up to their mill.

About 150 persons are employed in this worsted braid manuactory, whose average production is about 100,000 yards a day, of alpaca skirt braid.
That amount is sufficient to trim about 20,000 dresses. The value of their yearly product is more than $300,000; and they carry at the mill an average stock of 60,000 dozen, consisting of black and about one hundred different tints and shades of color. They sell directly to the jobbing trade all over the country, receiving orders by mail and telegraph.

The processes of manufacture of Goff's braid, are the most perfect known, and are similar to those pursued in England and on the Continent. First the wool is assorted, and all short and coarse fibre is thrown out. Then it is scoured and afterwards prepared by being put through several heavy machines called "preparers," which are graded, the teeth or pins in each machine being finer than those of the preceding one. By this process the fibre is straightened and prepared for the comber. In the last-named process they use the Lister and the Noble combers. By the combing, the short wool is taken out or separated from the long wool, and the former is sent to the woolen mills to be manufactured into cheap yarns. The drawing, spinning and twisting of the fibre, is done in a manner similar in principle to that employed with cotton.

In the establishment of the Messrs. Goff, the yarn passes directly on to the braiding machines, and is converted into braid. Then comes the singeing process, or burning off the nap, after which it is "set." The braid being closely wound in a cake form, is kept in boiling water for several hours, which removes all its previous tendency to curl and kink. Dyeing follows, when the braid is dried, and sent to the packing-room to be prepared for market. Then it is cut into lengths sufficient for a dress, the prevailing fashion requiring much shorter lengths than when large hoop-skirts were worn. After being cut it is wound into pieces known as "sticks" of braid. The goods are packed for shipping, in cases, each containing twenty-four paste-board boxes filled with one hundred and forty-four dozen pieces of braid.
CHAPTER XXIII.

The production of felt from wool, for hats and seamless clothing, has become an important industry in our country. It is a process by which the fibre is so intertwined that a kind of cloth is produced without weaving. It is believed that cloth was so made in ancient times, before the art of weaving was discovered. The natives of some of the South Sea islands, when discovered by Europeans, felted the fibre of the inner bark of trees, by pounding them when made pulpy by water, until they formed a sort of cloth.

Felt has been used for centuries in the manufacture of hats, a very extensive business in the United States, and one that formed a large item in the statistics of our few colonial manufactures. Head-coverings have been used by man from the earliest ages, the most ancient being, probably, that of the Phrygian cap or bonnet, known as the "liberty-cap" because the Romans gave one to a slave when he was liberated, and made a freedman. This cap, called pileus, was made of felted wool. The Roman priests from the time of Numa, wore conical caps of wool; and nothing resembling the hat of our day was known until the beginning of the fifteenth century, except a brim added to the pileus of the Romans, in the time of Augustus Cæsar, made a head-covering somewhat in the shape of our round felt hats.

Cæsar found the Britons with no covering on their heads, as a rule, but their own thick hair; and the Anglo-Saxons, down to the eighth century, had no other covering than their own long thick locks, which they carefully cultivated. The first hats, proper, seem to have been made in Paris, by a Swiss, at the beginning of the fifteenth century; and when, in 1449, Charles the Seventh made his triumphal entry into Rouen, he wore a hat lined with red velvet, and surmounted by a rich plume of feathers. The hat, in time, distinguished classes of men, the red hat of the cardinal, for example, betokening his readiness to spill his blood for the sake of Jesus Christ. The Spaniards became the most elegant hat-makers, and introduced the art into England in 1510. From that country it was brought to America, where it was fostered by the early colonists.

In 1662, the colonial government of Virginia offered a premium of ten pounds of tobacco (then the currency), for every good hat made in the pro-
vince, of wool or fur. In 1672, hat-makers asked the legislature of Massachusetts to grant them the exclusive privilege of manufacturing the hats used in that colony. The righteous and sensible answer was, "You shall have the privilege when you shall make as good hats and sell them as cheap, as those from other parts." In 1675, the exportation of wool and raccoon furs from the province was prohibited. A similar movement was made in Pennsylvania nearly thirty years later.

The business of hat-making rapidly increased in the colonies; so rapidly, that in 1731, the felt-makers in London, complained to Parliament that the foreign markets were almost entirely supplied with hats from America. Even into England, the enterprising colonists had sent hats, to the detriment of the trade in that country; and these English hatters petitioned to have the exportation of hats from America into foreign markets, prohibited. Parliament listened to this selfish proposition, and sent a commission to the colonies to inquire into the matter. That commission reported that in New England and New York, 10,000 hats were annually manufactured, and that in Boston alone, forty hats a week were produced, which were exported to foreign countries. Whereupon Parliament in 1732, enacted that "no hats or felts, dyed or undyed, finished or unfinished, shall be put on board any vessel, in any place within any of the British plantations, nor be laden upon any horse or other carriage, to the intent to be exported from thence to any other plantation, or to any other place whatever, upon forfeiture thereof, and the offender shall likewise pay £500 for every such offence." This law, which dealt a stunning blow upon this branch of colonial trade, remained in force until the Revolution, and formed one of the grievances of the colonists.

The business of the manufacture and exportation of hats continued on quite a large scale, in spite of these laws and penalties; and when the Revolution broke out the American establishments were able to supply the home demand. After the war the business steadily increased, and at the beginning of the century it was carried on in almost every State in the Union. According to the census of 1810, eighteen States and Territories had hat manufactories, their annual products then being valued at about $4,324,000. Twenty years later, the annual product was valued at $15,000,000; in 1870, it was (including that of caps), almost $25,000,000. Of this amount, New York produced more than one-third. There were then 483 establishments engaged in the manufacture of hats and caps, employing over 16,000 persons, to whom wages were paid to the amount of $6,500,000. In this business were invested about $6,500,000, and over $12,000,000 worth of material was used. There were sixty-two establishments engaged in making hat materials, in which business over 1,000 persons were employed, and gave an annual product of $3,226,000.

These figures represent other than felted wool hats. The furs of the
beaver, nutria, raccoon, muskrat, rabbit and hare have been extensively used, all felted into wool bodies. Within the last thirty years these furs have been almost entirely superseded by silk plush, mostly imported from Paris, which is glued on bodies made of thick muslin that has been saturated in a solution of gum shellac in ammonia and water.

Down to about the year 1840, the hat manufacture was carried on almost wholly by hand. Patents for facilitating processes were obtained, in this country, at the beginning of this century, but hats were made by hand until 1846, when H. A. Wells, of New York, obtained a patent for an improved machine for felting. This machine, with subsequent improvements by H. A. Burr and others, is now in general use. It is known as a “former,” and with one of these, and the labor of three men and a boy, 400 hat bodies may be made in a day, of uniform thickness and perfection of texture.

A machine for “blocking,” or putting the hat into required size and shape, was invented by Rudolf Eickemeyer, of Yonkers, New York. Other machines for other processes in hat-making, have been invented in our country, and now almost the entire labor in the business, is done by machinery. The binding is done by sewing machines.

The manufacture and use of soft wool hats is very extensive in the United States. These are generally sized and felted in fulling-mills. Light bodies being in demand for the so-called “stove-pipe” form, cork, cut very thin, is used; also woven willow, produced by a method invented in Philadelphia. The manufacture of palm-leaf hats from materials brought from the West Indies, was begun in Massachusetts, in 1820.

Many years earlier than that, hats and bonnets for women and girls, were made in this country, from straw or meadow grass. Of the latter the “red-top” grass is best adapted for this purpose. So early as 1798, a young girl in Dedham, Massachusetts, named Betsy Metcalf, only twelve years of age, made a bonnet of oat-straw (which she smoothed with scissors, and split with her thumb-nail), of seven braids, with bobbin insertion like open work, and lined with pink, in imitation of the fashionable English bonnet. The straw was bleached in the vapor of burning sulphur. Ladies came to Dedham from the neighboring towns, to see and admire the bonnet. The young inventor instructed workmen how to make them, and so the foundation of an extensive business in Dedham and other New England towns, was laid.

In 1821, Miss Sophia Woodhouse, of Wethersfield, Connecticut, sent to the Society of Arts in London, samples in raw, bleached and manufactured states, of a smooth-stalked meadow grass growing in the Connecticut valley, as a new material for making straw hats and bonnets, in imitation of those of Leghorn. It was proved to be superior in fineness and color, to the best Leghorn. The Society offered Miss Woodhouse a silver medal if she would send them some seed of the grass, and a description of the treatment. At
about that time, she was married to Gardner Wells, and she and her husband obtained a patent for her process of making hats and bonnets of grass.

The hats and bonnets for women and girls, made of straw and grass, muslin, silk, satin, velvets, et cetera, and trimmed with ribbons and flowers, is an extensive industry in our country, in which women are chiefly engaged. In 1870, there were nearly 1,700 millinery establishments in the United States, employing about 7,200 persons, of whom 6,100 were feminine. They had invested in the business, nearly $2,500,000, and they paid in wages that year, the aggregate sum of about $1,157,000. The total value of their product was over $6,513,000.

The cotton manufacture occupies a large space in our national statistics. At the close of the old war for independence, some knowledge of the English spinning machinery had found its way to this country, through immigrants who had become familiar with it in England. Some attempts were made to reproduce it, but with very little success at first. There was a disposition to foster the enterprise, and in 1786, the legislature of Massachusetts granted "£200 lawful money" to Robert and Alexander Barr, mechanics from Scotland, to aid them, in constructing machinery for carding, roving and spinning, cotton. They were employed by Mr. Orr, of East Bridgewater. A similar grant was made by the same body the next year, to Thomas Somers, to enable him to complete some spinning machinery.

The same year (1787), the first cotton factory in the United States was built by a company at Beverly, Massachusetts, who started with a capital of $70,000. The company was organized for the manufacture of corduroys and bed-ticking. The whole capital was swallowed up in fifteen years, together with a considerable sum granted them in 1790, by the legislature of Massachusetts. They only succeeded in introducing the manufacture of cotton goods into this country, but with very imperfect machinery. Another company was formed for a similar purpose, in Providence, Rhode Island, in 1788, for making "home-spun cloth," as they called it. Their spinning machines, carrying each only thirty-two spindles, were very crude, and were propelled by cranks worked by hand. This machinery was sold to Moses Brown, of Providence, who, with his son-in-law, William Almy, (both Friends or Quakers), had then several hand-jennies at work in private houses, making yarns for the weft of mixed linen and cotton goods.

The advent of a new and important industry in our country, was now at hand. We have already noticed (page 226), the appearance of Samuel Slater, at Providence, early in 1790, and his successful reproduction and working of English machinery for the manufacture of cotton. The first Arkwright spinning machinery was put in operation in December, of that year, consisting of three cards, drawing and roving, and a frame of seventy-two spindles, all worked by the water-wheel of an old fulling-mill. Fourteen months afterward,
Mr. Brown wrote to the Secretary of the Treasury, that machinery and mills could now be erected in one year, of capacity to supply the whole country with cotton yarn, and render further importation unnecessary. Another mill, with seventy-two spindles, was built by Almy, Brown and Slater, at Pawtucket, Rhode Island, in 1793.

These were only spinning mills; the weaving was all done by hand in the old-fashioned looms. It remained for a native of the United States, whose name one of the great manufacturing centres of our country now bears, to establish the first complete cotton factory, as we now know them, in our land. That was Francis C. Lowell, a Boston merchant, who had just returned from Europe when the war of 1812-15 broke out. In England, he had inspected the weaving as well as the spinning machines, and he conceived the idea of establishing a factory for cotton cloth weaving, by power-loom. He associated with himself, in the enterprise, Patrick S. Jackson. They had neither drawings nor a model for a guide in making a power-loom, nor could Mr. Lowell reproduce one that he had seen, so he set about inventing one. If an English clergyman could invent one, so could a Boston merchant, and he and Jackson put their wits together to such a good purpose, that in the autumn of 1812, they had constructed a model in which they saw such promise of success, that they proceeded to erect a mill at Waltham.

Paul Moody, a practical mechanic, was employed in the construction of the machinery. After many failures and alterations, they succeeded in perfecting looms that worked well. It was soon ascertained that it would be more economical to spin their yarn than to buy it, and a spinning-mill, with seventeen hundred spindles, was completed in 1813. Waltham, thereby, acquired the distinguished honor of having the first mill ever erected in the world, in which was combined all the processes for converting raw cotton into finished cloth, for at that time, in England, the weavers continued to buy their yarn of the spinners.

The single gross of spindles set running by young Slater, in Rhode Island, constituted the whole capacity for machine-spinning in the United States, eighty years ago. What a contrast with the same industry in the United States to-day, when full 9,500,000 spindles are employed; and our production of cotton goods, in weight, is more than half of that of England. Let us look into one or two cotton manufactories in New England, in the operation of which we may perceive the vastness of the progress made in that single industry in our country. We will first examine the Atlantic Cotton Mills of Lawrence, Massachusetts, that were established for the manufacture of cotton sheetings and shirtings.

The Atlantic Cotton Mills, are owned by a company incorporated by the legislature of Massachusetts, in February, 1846, with a capital of $2,000,000, now reduced to $1,500,000. The buildings of the Company, devoted to the
manufacture of goods, are of brick, six in number, and consist of two, each 220 by 60 feet, six stories in height; one 140 by 106 feet, seven stories; one, 180 by 65 feet, two stories; and two, each 140 by 50 feet, five stories. These are grouped, in connection, between the Merrimac river and a canal 80 feet in width.

The product of these mills originally, was about 3,500,000 pounds of goods annually; now the yearly product is about 7,000,000 pounds, or 430,000 yards a week. The machinery is propelled by water-power estimated at 1,500 horse-power, they also have a steam-engine of 500 horse-power, to be used, if necessary, in times of drought. About 1,200 persons are employed in the mills, a large proportion of whom are feminine. There are 87,000 spindles, and 1,800 looms in the establishment; and about 16,500 bales of cotton (or, say nearly 7,000,000 pounds), are consumed annually, with about one hundred tons of potato starch.

The amount of cotton consumed in the Atlantic Mills in one year, is more than double the entire cotton product of the United States when Samuel Slater set up the seventy-two spindles at Providence. These mills produce only unbleached cotton cloth. They have no dyeing or bleaching apparatus; but they have ample machinery of the most perfect description, for carding, spinning, dressing and weaving cotton cloth. The goods are packed for market, in bales containing twenty pieces each, and are sold in the brown.

The city of Lawrence, where these mills are situated, lies on each side of the Merrimac river, twenty-six miles from Boston, with which city it is connected by three lines of railway. In 1845, an association was incorporated for the purpose of building a dam at the Falls of the Merrimac, and for other purposes connected with manufactures, under the name of the Essex Company. The spot was originally occupied by farmers and fishermen. There the Company built a dam (chiefly of granite) across the Merrimac, which with its abutments, is 1629 feet in length. It is 35 feet in width at the bottom, and 40 feet in height, and gives a water flow of 900 feet. They also constructed a distributing canal a mile in length. The cost of the dam was about $250,000, and that of the canal $200,000.

The principal stockholders in the Essex Company, were members of the Lawrence family, in Boston; and when in 1847, the village was incorporated, it received the name of Lawrence, in honor of that family. It now has a population of over 30,000 souls. Of that number, full 13,000 are of foreign birth; and one-third of the entire number of the inhabitants are employed in the eight principal textile manufacturing establishments situated there. These are the Atlantic Cotton Mills, incorporated in 1846; Lawrence Duck Company, incorporated in 1853; Pacific Mills, incorporated the same year;
PACIFIC COTTON MILLS.

Washington Mills, incorporated in 1858; Everett Mills, and Pemberton Company, both incorporated in 1860; Lawrence Woolen Company, incorporated in 1863, and Arlington Woolen Mills, incorporated in 1865. These eight establishments employ an aggregate capital of $7,590,000, and over 11,000 operatives. They have an aggregate of 356,649 spindles, and 8,634 looms.

Let us step into a still more extensive factory than the Atlantic Cotton Mills, and further learn, by actual comparison with the establishments of Almy, Brown and Slater at Providence and Pawtucket, the wonderful progress made in the manufacture of textile fabrics in our country, within the space of about eighty years. We will choose the Pacific Mills, in Lawrence, Mass., an establishment devoted to the manufacture of calicoes, lawns, delaines, alpacas, serges and other worsted goods. The company was incorporated in 1853, and its present capital is $2,500,000. They manufacture ladies' dress goods from cotton wholly, from wool wholly, and of cotton and wool combined. They have print works and dye works; and their fabrics such as plain and fancy cotton goods, printed and dyed, and worsteds in great variety, are well-known in every part of our country as staples. Let us look minutely into the internal workings of this great establishment, in its material and moral aspects, under the management of John Fallon, of Lawrence, the resident acting agent. J. Wiley Edmands, of Boston, is the treasurer of the company, and James L. Little & Co., Boston and New York, selling agents.

The establishment has twelve mills and buildings, which contain forty-one acres of flooring. They have 135,000 cotton spindles; 25,000 worsted spindles, and 4,500 looms. They use every week 116,000 pounds of cotton, and 65,000 pounds of fleece wool. They produce from the mills and the printery, each week an average of about 1,000,000 yards of cloth. They keep twenty-four printing machines printing from two to sixteen colors. They have also 11 turbine wheels of 36 mill power, (equal to 2000 horse power), and employ steam engines to the extent of 1200 horse power, requiring 50 boilers, under which 23,000 tons of coal are annually consumed. They use 5,000 gas-burners, at an annual cost of $35,000, in lighting the mills.

The Pacific Mills employ 3,534 women and girls, and 1,766 men and boys—whole number, 5,300. The average daily earnings of women and girls, is ninety-eight cents; of men and boys, one dollar and forty cents. The cost of labor in the mills, each month, is $160,000. They have provided two hundred and seventy dwelling-houses for their workpeople.

The Company have well cared for the operatives, in providing means for the improvement of their moral and intellectual condition, as far as possible
without interfering with business duties. At the commencement they founded a library and reading-room for the operatives. The library, which is open from nine o’clock in the morning until nine o’clock in the evening, for the free use of the work-people and their families, now contains nearly seven thousand volumes, and has an average of seven hundred daily readers.

A relief society was established in 1853, whereby the sick were provided with a weekly allowance during sickness. This has worked well, and has been the means of allowing the operatives to pay to themselves, aided by the Company, $5,000 a year. More recently a “Home” for the sick has been provided by the Company. It is under the charge of a matron and the care of a physician, and has all the appliances known to sanitary science. There the sick are better cared for than they could be in one of the large boarding-houses of the Company, or even in their own houses. To sustain the relief fund, every individual in the employment of the Pacific Mills Company, must be a member of the Society. Every member is required to pay two cents a week, after paying the amount of a fortnight’s contribution on entering. A sick member is allowed two dollars a week, for ten weeks, if sick so long, and one dollar a week for ten weeks longer, if the sickness continues.

The heads of families have been encouraged to build houses for themselves and their dependents, the Company often loaning money to enable them to do so. It is believed that forty per cent. of the heads of families own their dwellings. The moral tone of the employees is excellent. There has never been shown, among them, any disposition to organize “strikes.” When difficult questions of policy and right have arisen, they have been amicably settled.

The Emperor Napoleon instituted a new order of awards at the Universal Exposition at Paris, in 1867. Ten prizes, of ten thousand francs each, were directed to be given to ten different individuals or associations who, in a series of years, had accomplished the most to secure a state of harmony between employers and their work-people, and had most successfully advanced the material, intellectual and moral welfare of the same. Five hundred applications for these prizes were received from all the countries of Europe, and from the United States. Nine of the awards were given to France, Germany, and other countries of Europe, and only one to the United States, that being awarded to the Pacific Mills Company. Great Britain received none. The Pacific Mills were preceded by only two of the successful candidates. One of these—Mr. Schneider—being a member of the jury, withdrew his claims to a prize for his great establishment at Creusot, leaving the Pacific Mills the second successful candidate. Such is a brief outline picture of one of the great textile manufactories of our country now.
The advent of Slater marked a new era in the manufactures of the United States. He was joined by his brother in 1806, and the manufacturing town of Slatersville, Rhode Island, was founded. Other cotton factories started up in Rhode Island, Massachusetts and New Hampshire. One was built at Waltham, in 1807, and there the first power-loom used in the United States was set up by Francis C. Lowell and others, in 1813; a fact already alluded to.

At Lowell, one of the principal manufacturing centres in the United States, a cotton mill was established in 1822. Now there are eighty cotton and woollen mills there, employing more than $16,000,000 capital, and about 16,000 persons, of whom 10,000 are women and girls. They have an aggregate of nearly 679,000 spindles, and over 15,000 looms; and manufacture 2,600,000 yards of cotton cloth, 60,000 yards of woolen cloth, 37,500 yards of carpeting, 2,500 shawls, and 16,800 dozens of hosiery, every week. There are dyed and printed there about 65,000,000 yards of cotton cloth a year; and besides the immense water-power, fifty engines, with an aggregate of 6,188 horse-power, are employed. Lowell is on the Merrimack river, at the mouth of the Concord river, and has a population of about 43,000 souls. Of these over 15,000 are of foreign birth.

The principal print-works in the United States, (excepting the Pacific Mills), may be found at Fall River, a city and port of entry on Mount Hope Bay, in Massachusetts, at the mouth of the Taunton river. It has a population of 30,000, of whom 12,000 are of foreign birth. The principal industry there is the manufacture of cotton cloth, the chief item of production being prints, commonly known as calico. The business has wonderfully increased there within the last ten or twelve years. There are now between forty and fifty mills, employing about $15,000,000 capital, and full 16,000 persons, the relative proportion of the sexes being about the same as at Lowell. To them over $500,000 is paid, each month, in wages. The aggregate number of spindles employed is nearly 1,500,000, and of looms, 30,000. These mills consume 133,000 bales of cotton in a year, and produce 332,000,000 yards of cloth.

The name of Calico is derived from Calicut, a sea-port town on the coast of Malabar, from which cotton cloth was first imported into England. The English still apply the name to all cotton cloths, plain as well as printed, while in our country, it is applied only to printed cloth. The practice of ornamenting cloth with forms and colors is a very ancient one. The art doubtless came to Europe from India. The Egyptians practiced it extensively, by a curious process thus described by Pliny:

"They take white cloths, and apply to them, not colors, but certain drugs which have the power of absorbing or drinking in color; and in the cloth so operated on there is not the smallest appearance of any dye or tincture.
These cloths are then put into a caldron of some coloring matter, scalding hot, and after having remained a time are withdrawn, all stained and painted in various hues. This is indeed a wonderful process, seeing that there is in the said caldron only one kind of coloring material; yet from it this cloth acquires this and that color, and the boiling liquor itself also changes according to the quality and nature of the dye-absorbing drugs which were at first laid on the white cloth; and these stains or colors are moreover so firmly fixed as to be incapable of removal by washing. If the scalding liquor were composed of various tinctures and colors, it would doubtless have confounded them all in one on the cloth; but here one liquor gives a variety of colors according to the drugs previously applied."

When Cortez entered Mexico a little more than three hundred and fifty years ago, he found the natives clad in cotton cloth ornamented with figures in several colors, some of them curious and brilliant. In the East the designs were carefully drawn on the cloth, or were printed by engraved wooden blocks. The art was introduced into Europe from Asia, but it was little practiced until in the seventeenth century. In England, the opposition of the silk and woolen manufacturers to printed calico was so great, that in 1720, Parliament by law forbade the sale and use of printed cotton cloth, under a penalty of £20 for each offence on the part of the weaver, and £100 on that of the seller.

The restriction was finally repealed, but the industry was burdened with a tax of about five cents a yard, until 1831. The calico was all printed by hand, with wooden blocks, until a very recent period; now it is done by immense machines, which have a series of copper cylinders accurately adjusted, each containing a portion of the design, engraved on its surface. These are each supplied with a different color, (sometimes to the number of fifteen or twenty) and each gives its impression on the cloth, in regular order, and in exact "register," in its single passage through the machine. By this means the process of printing has been wonderfully facilitated. Now one machine with one attendant, will do the work, in the same time, that was done by one hundred men, by the old method of block printing by hand. The highest chemical talent and the most exquisite taste of the artist is employed in the preparation of the colors and designs for calico printing.
THE first cotton mills in our country were devoted to the production of yarn only for cloth, and it was not until near the close of the last century, that Sewing Thread made of cotton, was attempted. Before that time linen thread—the product of flax—was in universal use for sewing. It is believed that the wife of Samuel Slater suggested the substitution of cotton for sewing thread, after observing the evenness of the yarn which she produced on a hand-spinning machine, with the long-fibred Sea Island cotton, and that Mr. Slater first produced cotton sewing thread. Vast improvements have since been made in the manufacture, until the "six-cord" spool cotton thread now in use, was perfected.

The processes used in making this thread, are remarkable. The cotton from the bale is passed through a "picker," which has cylinders with iron teeth, that revolve more than two thousand times in a minute. The fibre, after leaving the "picker," undergoes the process of "doubling" or intercombining, over 20,000,000,000 times. The mind can not easily grasp the fact. A perfect six-cord thread could not be made with less "doubling." There are six-cord threads which are manufactured with only 500,000 doublings, but as every "doubling" adds to its strength and value, the best manufacturers should make the enormous number mentioned. Such is the labor and care used in the product of the best six-cord spool cotton thread. Sewing machines have greatly increased the demand for this kind of thread and this industry, introduced into this country within the last dozen years, has already become an extensive one in the United States. The annual product and sale in our country at this time, is about 16,000,000 dozen spools of 200 yards each, or 108,400,000,000 yards. Among the most extensive manufacturers of spool cotton, in this country, are George A. Clark and Brothers, of New York City. The Willimantic Linen Company, of Willimantic, Connecticut, manufacture linen thread very extensively and successfully, as well as the six-cord spool cotton thread.

The number of cotton factories in the United States in 1810, when embargoes and other disturbers of commerce with Europe, stimulated that industry here, was 241, and the number of spindles was 96,000. At the close of the war with Great Britain, that broke out in 1812, and ended early
in 1815, there were $40,000,000 invested in the cotton manufactures in the United States, and 100,000 persons were engaged in that business. They were producing annually 81,000,000 yards of cotton cloth valued at $24,300,000. Of the mills, 165 were in Connecticut, Rhode Island and Massachusetts. When, at the close of that war, commercial intercourse with Europe was resumed, the pent-up textile fabrics of Great Britain very soon flowed into our country, overstocked the American market with both cotton and woolen goods, and the textile industry of the United States was almost utterly prostrated. After a season of great depression and wide-spread disaster among the cotton and woolen manufacturers of our country, the business revived, having received new life from the protective tariff plan known as the American System, put into operation before the close of John Quincy Adams' administration. The power-loom had been generally introduced; and in 1830, there were 1,500,000 cotton spindles in operation in the United States.

It was not until ten years later (1840), that trustworthy and complete information was given by the census concerning the manufactures of our country. At that time there were 1,240 cotton mills in the United States, with about 2,285,000 spindles, and 129 dyeing and printing establishments, giving occupation to over 72,000 persons, who produced goods in a year, valued at $46,350,000. There was then capital invested in that industry to the amount of over $51,000,000.

In 1870, there were 956 cotton manufacturing establishments in our country, employing 135,369 persons, to whom wages to the amount of more than $39,000,000 were paid. The capital invested in the industry was about $141,000,000. The number of spindles was 7,132,415, and the number of looms was 157,810. Aggregate value of materials used, $112,000,000; aggregate product, $177,500,000. The number of the establishments in 1870, were 284 less than in 1840; and they were 135 less than in 1860. The reason of the decrease in number is the general tendency toward consolidation. In other respects, there was a great increase in ten years, the number of spindles in 1870, being twenty-eight per cent, greater than in 1860, while the value of goods produced in 1870, was fifty-three per cent, greater than in 1860. There were used in 1870, in the United States, 398,308,237 pounds of cotton, manufactured into the following articles: sheetings, shirtings, and twilled goods, 478,204,513 yards; lawns and fine muslins, 34,533,462 yards; print cloth or calico, 489,290,053 yards; yarns not woven, 30,301,087 pounds; warps, 73,018,045 yards, and ginghams and checks, 39,275,244 yards. The total product weighed 349,314,592 pounds, or more than 48,000,000 pounds less than the raw material.

The Americans have always been large importers of foreign goods from trans-Atlantic countries, especially from England. Now they are exporting such goods. From the first of January to the end of the first week in
March, 1876, there were 12,000 packages exported from New York, in place of 5,500 packages in 1875, and 3,500 in 1874, for the same period. For the week ending March 7, 1876, there were exported from New York, cotton goods to the value of over $268,000. Of this amount, $124,000 in value went to China, $26,000 to Liverpool and London, and $14,000 to France. The balance was shipped to Germany, Brazil, the West Indies, Japan and Africa. During the same week $176,000 worth of cotton goods were exported from Boston.

Large quantities of prints have been sent to England, from Fall River, since the opening of the year 1876. These goods appear to be confined to no particular market, but go to all parts of the world. Whether this turn in commercial affairs will be permanent, remains to be seen. Our present trade with Great Britain, will be noticed hereafter.

Cotton cloth to be dyed or printed is first subjected to a singeing process for the purpose of removing the fibrous down or nap, and then it must be thoroughly bleached, not only for the purpose of making it white, but to prepare it properly for receiving the color. Bleaching for printing is the most difficult part of the bleacher's art, and requires great skill and care in the process. Establishments for this business have increased in this country, with the increase in the manufacture of prints. In 1870, there were in the United States, 250 bleaching and dyeing establishments, employing 4,000 persons, and a capital of $5,000,000. They handled materials valued at $53,167,000, and the aggregate product that year was valued at $58,572,000.

The most extensive and completely equipped, and the most successful of the bleaching establishments of our country, is the Moshassuck Bleachery, owned by Messrs. W. F. and F. C. Sayles. It is situated upon the Moshassuck river, about two miles from Pawtucket, Rhode Island, in the midst of picturesque scenery, and in railroad communication with the whole country. The waters of the stream are pure, and well-adapted for the purposes of the bleachery. There, in the year 1848, William F. Sayles began the business without any previous knowledge of the art, and with a very moderate capital, but with a determination to make the establishment, whatever it might grow into, a model one of its kind.

Mr. Sayles was contented, at first, to turn out two tons and a half of bleached goods each day. The business gradually increased, and in 1854, when it had reached about four tons a day, it was regarded, especially in the perfection of its work, as the leading bleaching establishment in New England. It was attracting the finest goods from the looms of that region, when fire totally destroyed it. It was re-built the same year (1854), with a capacity of six tons a day. Before the close of the next year, further enlargements were made; and from that time to the present, the extensions have been going on almost continuously, its present capacity being forty tons a day, or 300,000 yards of bleached goods.
The buildings of the bleachery are made substantially, of brick, and their entire arrangements, within and without, are perfectly adapted to the business, which is conducted with the greatest care and intelligence. The constant study of the proprietors is to discover methods for the production of the cheapest and best bleaching of the most delicate cotton fabrics. Within a circle of three hundred feet not far from the bleachery, an exhaustless supply of the purest water bubbles up from a hundred springs. In addition to the water-power, the bleachery has two large Corliss engines. Attached to it is a fire-proof planing-mill; a machine-shop; drying houses, and everything necessary for carrying on the business with perfection and great despatch. With the constant increase of its productive capacity, the scientific knowledge to be employed keeps pace, and it will soon be, if it is not already, the leading bleachery of the world.

In connection with the industrial features of the establishment, there are pleasing ones which pertain to the higher concerns of life. Like many of the great manufactories of our country, that of the Messrs. Sayles presents the picture of proprietors careful of the moral, intellectual and spiritual welfare of those whom they employ, and the community in which they live. The dwellings of the families of the work-people are neat and commodious, and the grounds are kept in order, so that nothing shall offend the taste. They see to it that a free public school is kept up to the highest standard of excellence; that temperance and habits of thrift are encouraged; that the Sunday-school is upheld, and its library (of six hundred volumes now) is steadily augmented, and that public worship is maintained. The consequence is that the little hamlet in which their bleachery is situated, is one of the most quiet, orderly and thrifty of any in New England. Many of the work-people have been there for years, and some of them have very pleasant accounts to contemplate in the savings' bank.

The manufacture of hemp, flax and jute, the first into coarse cloth for bagging, and also in making cordage, is an important industry here. The English use it in making coarse shirting, sheeting, towelling and table-cloths, known as huckaback. We have seen that in 1870, we raised about 13,000 tons of hemp (more than half of it in Kentucky), and over 27,000,000 pounds of flax. Of jute—an East Indian plant like hemp—very little has yet been cultivated in our country, though it promises well in California. Much of it, however, is manufactured and used here. The value of our export of jute, raw and manufactured, in 1873, was $4,500,000. When huge chignons—hair twisted and falling on the neck—were in fashion a few years ago, a large quantity of jute was made into "switches" for the purpose. It is used in the manufacture of coarse cloths, matting and cheap carpeting; but its most extensive employment here is in the manufacture of gunny-bags for packing rice, coffee, cotton and other products for shipping.
Hemp is manufactured here principally into bagging, and also cordage. It was found growing wild by the English settlers, who in New England, observed the Indians using the fibre for making fishing-nets. The Puritans made the same use of it. Finally they imported hemp seed, cultivated the plant, and at the middle of the seventeenth century began the manufacture of cordage. The General Court of Massachusetts, in 1662, authorized John Heyman, of Charlestown, to manufacture "ropes and lines" of hemp. The business soon spread through the other colonies; and at the close of that century there were several extensive rope-walks in Philadelphia. The business was largely carried on in Boston, Providence and Newport, early in the eighteenth century, and spread rapidly to other sea-port towns. In Maryland, at near the close of that century, it was a very important industry, for, it is said, that in 1790, in the ship-yards of that State, were built more vessels than in those of any two other States combined.

It was claimed, in 1810, that our domestic production of cordage, principally from Russian hemp, was equal to the home demand. Finally machine power was applied to the manufacture—water and steam. As early as 1827, rope-works at Wheeling, Cincinnati and Louisville, were run by steam. A machine was introduced into New York, in 1834, which spun rope yarn from hemp without previous hatcheling, and thereby ten per cent. of the material was saved. Other inventions for rope-making, have facilitated the process, until now, a single establishment may, in the course of sixty or seventy hours, manufacture a complete "gang" of rigging for the largest ship.

With the improved machinery the largest ropes are made as easily as twine. Cordage is manufactured here in the greatest perfection; and the American product is becoming so popular abroad that considerable quantities are exported. During the year ending with June, 1875, we exported cordage, rope and twine to the amount of over 3,000,000 pounds, valued at nearly $391,000. The year before, the amount was about 1,600,000 pounds, valued at $243,000. The principal manufactories of rope, cordage and twine in the United States, are at Boston, Plymouth, New Bedford, Brooklyn and Philadelphia. There is also much cordage made of cotton.

The manufacture of linen cloth from flax, was a very ancient industry. The Egyptian priests were not allowed to enter their temples in other than linen garments; and these were used by the Hebrew priests. In the time of Herodotus, the Egyptian manufacturers who were famed for their textile fabrics, not only supplied their own people with linen (who used it very extensively), but furnished foreign markets with it. Some of it was of finest texture, comparing favorably in this respect with the products of our machinery. The inner wrapping of the mummies was coarse, but the outer wrappings were very fine. Some of these linens were as thin and transparent as the most delicate Indian muslins, and contained more threads to the inch.
than the products of the best looms of Decca. In the British Museum is a specimen of this "fine twined linen," which contains 270 threads to the inch in the warp, and 110 in the woof. The finest Deccan muslins contain only 100 threads in the warp, and 84 threads in the woof.

The manufacture of flax in our country, is not as extensive as it might profitably be. We have already observed its early cultivation in the English-American colonies. Bounties for its production were offered in some of the provinces. It was encouraged in Georgia by specific grants from the British parliament from 1733 to 1749; and its manufacture as a domestic industry, was extensive throughout the country, at the time of the breaking out of the war for independence. After that war it became, on a small scale, a factory business, and finally machinery was invented for facilitating the production of linen goods. A large manufactory was set up at Fall River, in 1834, but the industry has not greatly increased since. We import most of the linen goods consumed in this country. The imported flax goods, including some made of hemp and jute, amount to over $20,000,000 annually, nearly the whole coming from Great Britain.

Flax is extensively raised in Ohio, there being in 1873, over 85,000 acres of land in that State, devoted to the crop. In 1870, there were 90 establishments in the United States engaged in dressing flax, the product of which was valued at over $800,000. Of these establishments, 46 were in New York, and 27 in Ohio. Over 4,300 tons of raw flax were imported in 1875, and this was manufactured into linen of various kinds, generally of a coarser quality. In 1870, there were ten establishments in our country for the manufacture of flax and linen goods, with an invested capital of over $2,325,000; the annual product of which was valued at $2,179,000. They employed over 1,700 persons, of whom 760 were feminine. Jute is now extensively used in the manufacture of the coarser linens.

Some of the articles manufactured from the textile fabrics, in our country, which might seem, at first thought to form but insignificant items in our national statistics, nevertheless go far toward swelling the aggregate. In 1870, there were 33 establishments in the United States engaged in making bagging of flax, hemp and jute, employing about 3,000 persons, and $3,000,000 capital, and giving an annual product of $4,500,000. At the same time there were 45 establishments that manufactured awnings and tents of the same materials, whose annual product was over $600,000. The business of tent-making was very profitable during the Civil War.

In the manufacture of hosiery (socks and stockings), there were 208 establishments engaged in 1870, which employed about 15,000 persons, and paid to them in wages that year, $4,500,000. The capital invested in the business, was about $11,000,000, and the annual product was $18,500,000. Knitting machines have already been considered.
Linen collars and wristbands are extensively manufactured in the United States. These detached portions of the inner garments are a product increasingly called for, by an excellent habit of cleanliness in garments as well as in person. The purity of wristbands and collars could not, when attached to the shirt, be maintained as long as that of the garment itself, and some contrivance to keep up the elegant fashion of displaying pure white materials at the neck and wrists, seemed necessary. The first movement toward making the shirt in detached pieces, was in the construction of the "dickey" or "false bosom." Then followed the detached collars, about forty years ago, and within the last fifteen or twenty years, the wristbands have appeared. These were at first all made tediously by hand. Machinery was invented to relieve manual labor, and now millions of these articles are manufactured annually, where hundreds were made a few years ago.

It is estimated that, at this time, more than 300,000,000 wristbands and collars are made and used annually, in the United States. These are not all made of linen. Within a few years the manufacture of them of paper, in exact imitation of the linen ones, has been introduced, and vast numbers of them are now made and used. Travellers find them very convenient, for they will keep pure as long as linen ones, and the cheap rate at which they are manufactured by machinery, makes it more economical to buy and throw away paper wristbands and collars when soiled, than to have them washed. In 1870, there were 33 establishments in our country, for the manufacture of paper collars and cuffs, employing over 2,000 persons, of whom more than 1,400 were feminine. They gave to these persons in wages, an aggregate of $575,000, and their annual product was valued at over $3,000,000. The immense increase in the business since then will doubtless make the value of the annual product now, $5,000,000.

The manufacture of hoop-skirts while the fashion of wearing very extended ones prevailed, was an important industry in our country for more than a dozen years. That fashion arose about twenty-five years ago. These skirts diminished in size soon after the close of the late Civil War, and in 1870, they began to disappear altogether, or were greatly reduced in volume; yet the manufacture of them was then a very considerable industry. In the census of 1870, that and corset-making were enumerated together. At that time there were 194 establishments in the United States, engaged in the manufacture of hoop-skirts and corsets, employing about 4,400 persons (3,000 of whom were feminine), to whom wages were paid, amounting to $1,000,000. They consumed $2,276,000 worth of material, and gave an annual product valued at $4,800,000.

The manufacture of gloves and mittens of wool, linen, cotton, leather, India rubber and skins, employs many persons and much capital, in our country. In 1870, there were 221 establishments in the United States
engaged in the manufacture of these articles, employing over 4,000 persons, (about 3,000 women and girls), and a capital of about $2,300,000. They paid in wages $1,000,000; used materials of the value of $2,000,000, and gave a yearly product valued at about $4,000,000. The chief branch of the manufacture in the United States is that of making buckskin gloves.

The use of gloves for comfort or ornament is a very ancient custom, and mention is made of them in very old records. Acute commentators say that the expression of "he drew off his shoe," in the story of Ruth and Boaz, in our version of the Bible, should undoubtedly read, as in the Chaldaic version, "he drew off his glove." Homer speaks of Laertes wearing gloves when working in his garden, and Xenophon alludes to King Cyrus being without gloves.

In the earlier historic ages, the giving of gloves as a pledge, at the conclusion of a bargain, was a custom; and in the times of chivalry, there arose a custom of casting down a glove as a challenge to combat, and the taking it up denoting acceptance of the challenge. At tournaments, the great pastime of the Middle Ages, the glove of a lady worn on the helmet, was regarded as an honorable token. Challenging by a glove is still a custom at the coronation of British sovereigns. When Queen Victoria was crowned thirty-nine years ago, the Queen's (formerly the King's) champion entered Westminster Hall, armed and mounted, and throwing down his glove, challenged any person who should dare maintain that she was not a lawful sovereign. Schiller composed a poem on "The Glove"; and Oliver Wendell Holmes wrote:

"Wear seemly gloves; not black, nor yet too light;  
    And least of all the pair that once was white;  
    Let the dead party, where you told your loves,  
    Bury in peace its dead bouquets and gloves,  
    Shave like the goat, if so your fancy bids,  
    But be a parent—don't neglect your kids."

Vast quantities of so-called kid gloves are made of the skins of rats. Nearly all of our "kid" gloves are imported, being manufactured chiefly in France and Italy. Very few are made in the United States.

The manufacture of umbrellas, large and small, is an important industry in our country. They are made dome shape, with ribs of iron, rattan or whalebone, and covered with silk or cotton cloth. They have been used in the East, as shields against the heat of the sun, from the earliest ages, and were introduced into use in Europe at a comparatively recent period. The Italians called the sun-shade, a parare (to ward off), sole (the sun)—parasol. The French gave to the umbrella proper, used for a shield against rain, the name of parapluie. Juvenal speaks of effeminate men in Rome, as using a parasol; and when the umbrella was first used by men against the rain, in
France and England, about a hundred years ago, the custom was ridiculed as an effeminate one. It is said that the first man who used one commonly in London, to keep off the rain, was John Hanway, the philanthropist, who died in 1786. At first a single umbrella was kept at a coffee-house, to be lent like a coach or sedan chair in case of a sudden shower. Even such use then was ridiculed. A hundred years ago the following advertisement appeared in The Female Tattler: "The young gentleman belonging to the Custom-house who, in fear of rain borrowed the umbrella from Wilkes' Coffee-house shall, the next time, be welcome to the maid's pattsens."

"As late as 1778," wrote John McDonald, a footman, "there were no umbrellas worn in London, except in noblemen's and gentlemen's houses, where there was a large one hung in the hall to hold over a lady, if it rained, between the door and her carriage." This footman ventured into the street with one, covering himself and sister, and he was so much insulted and abused by the hackmen and cabmen, who regarded the umbrella as a rival in their business, that the woman was compelled to relinquish her brother's arm.

Umbrellas are produced in our country by ingenious machinery. The manufacture of canes is generally carried on in the same establishment. There were 83 manufactories of these articles in the United States, in 1870, employing over 2,600 persons, (nearly 1,800 of them women and girls), and capital to the amount of $1,700,000. Nearly $2,000,000 worth of materials were consumed, and the value of the annual product was over $4,000,000. Ten establishments were then engaged in making umbrellas from linen, whose annual product was valued at more than $724,000.

The upholstery business is an important one in our country. There were 600 establishments engaged in it, in 1870, employing nearly 4,800 persons, (1,250 women and girls), to whom $1,680,000 were paid in wages. They employed $4,700,000 capital and consumed materials valued at about the same amount. Their annual product was over $9,300,000.

The manufacture of sails for vessels, and oil-cloths for floors, are among the heavier uses to which coarse textile fabrics are devoted. Sail-making is an ancient art, and has been carried on in our country ever since the dawn of our colonial commerce. In 1870, there were 179 establishments in the United States, engaged in that business, employing about 1,000 persons, and giving an annual product of about $2,236,000. Oil-cloths are largely manufactured here, for their use in covering passages is very common. The canvas is made of flax and hemp, placed on frames, and first covered on the back with a heavy coat of thick paint which is well worked into the web. Then the same process is applied to the face, and additional coats of paint are smoothly laid on. The patterns are printed by wood blocks in the manner of calico printing formerly. In 1870, there were 34 establishments
in the United States for making floor oil-cloths, employing more than 1,400 persons, and giving an annual product of $4,212,000.

Almost a novelty among the textile manufactures, in our country, is that of hair-cloth, which is used chiefly for the covering of furniture. Until very recently, all of the hair cloth consumed in this country, was imported from Germany and Belgium. So early as 1813, coarse cloth composed of the hair of neat cattle mixed with wool, and called *Taurino* cloth, was manufactured at Rahway, New Jersey, by a company having a capital of $400,000. They used crude machines invented by Shotwell and Kinder, of New York, and could produce 500 yards of cloth a day. But this was not the true hair-cloth, such as was imported. For the manufacture of this true cloth, there were two establishments in this country, in 1835; one of them at Dedham, Massachusetts. In 1870, there were five in successful operation, employing 250 persons, and yielding an annual product of about $500,000 in value.

The chief material used in making hair-cloth, is the hair of the tails of horses, mostly brought from Siberia, where it is often cut from the living animals, and sold for forty cents for each tail. The hair will generally grow out to the same length again, in two years. This horse-hair composes the weft of the cloth, the warp consisting of stout cotton thread. It is (or has been) a difficult fabric to make, inasmuch as uniformity in the length of the hairs was desirable, and as only a single hair at a time could be put into the warp. This process was done entirely by hand (and still is in all the factories abroad), requiring two persons to manage one loom, one to pick up the single hair and put it in the warp, and the other to operate the loom.

After much study, Isaac Lindsey, of Rhode Island, invented a machine which automatically picks up the hairs from the bunch, and carries them into the warp. It is a tiny affair. It may be packed in a box two inches square, and which, when attached to the loom, forms the point on which the whole manufacture turns. It picks up a hair at a time, with an apparatus that can not be fully seen by the naked eye. This invention is the property of the Pawtucket (Rhode Island) Hair-Cloth Company, where it is attached to 400 power-loom, ten of which can be tended by one girl. So it is that by the aid of this little machine, (a part of its operations being invisible to the unaided eye,) one girl can do the work of twenty persons in the ordinary method. This mill, owned by Messrs. Littlefield and Metcalf, is the only one of the kind in this country. They employ 150 persons in the factory, and make 600,000 yards of hair-cloth in a year, using an amount of hair equivalent to the tails of 600,000 horses.

Shoddy, a rag wool, obtained from old blankets, stockings, carpets, flannels, et cetera, is largely employed with mungo (tailors' clippings and pieces of old woollen garments), in the manufacture of cheap woollen cloth, in this
STRAW GOODS, BROOMS AND BRUSHES.

It is manufactured into blankets, druggets, carpets, pilot-cloths, table-covers, petershams, et cetera, by mixing it with staple wool fibre, and sometimes constituting nine-tenths of this fabric. In 1870, there were, in the United States, 56 establishments for the manufacture of shoddy cloth. They employed over 600 persons, used more than $1,000,000 worth of materials, and produced goods valued at about $1,769,000.

Straw goods of every variety are largely manufactured in the United States. In 1870, there were 75 establishments engaged in the business, employing about 15,000 persons, over 12,000 of whom were women and girls. They employed a capital of over $2,000,000, and paid, in wages, more than $2,100,000. They used materials valued at $3,662,000, and gave an annual product valued at $7,282,000.

The making of broom and whisk brushes, is a large item in the list of American manufactures. In 1870, there were 635 establishments in the United States engaged in that business. They employed over 5,200 persons, (nearly 1,000 of them feminine); paid $1,200,000 in wages; employed over $2,000,000 capital; used $3,673,000 worth of materials, and gave an annual product of about $6,622,000 in value. Other brushes, such as are used for the hair, flesh, teeth, nails, shoes, and by artists, are also largely manufactured here. In 1870, there were 157 establishments engaged in that business, employing more than 2,400 persons; a capital of $1,683,000; using materials that year, of the value of $1,313,000, and giving a product valued at $2,695,000. The most extensive establishment of the kind in the United States then, was that of E. Clinton and Company, Philadelphia, who manufactured every kind of brush known in the trade. From that establishment the greater portion of the supply of brushes provided by our government for its various industries, was obtained.

The manufacture of narrow textile fabrics composed of cotton, wool, flax and silk, chiefly for trimmings for ladies' and children's dresses, upholstery, regalia and banners for societies, theatrical wardrobes, fancy costumes, coaches, military goods, et cetera, is now extensively carried on in our country, especially by the house of Horstmann, in Philadelphia, already mentioned in connection with that of the silk manufacture. The founder, William H. Horstmann, began the manufacture of coach lace, and other trimmings, as we have observed, in 1815, in a small dwelling-house in Philadelphia, near where the immense manufactory of every species of narrow textile goods, buttons, et cetera, of his sons, now stands. There his own and his industrious wife's unaided fingers performed all the labor of his "establishment" at first; now hundreds of persons, with thousands of power-loomos and costly machines of other kinds, some of them invented by Mr. Horstmann, are employed. These are driven by steam-power, and in their ware-rooms
may be seen all narrow textile fabrics, with manufactured costumes, regalies, banners and flags.

In connection with this topic, may properly be mentioned the fact, that the business of making regalies and society banners, and emblems, is quite an extensive one in the United States, occupying twenty separate establishments in 1870, and employing over 1,900 persons. Capital to the amount of $2,500,000 was invested in it, and with the use of materials valued at $1,293,000, the product that year was valued at over $3,257,000.

The manufacture of combs exhibits a considerable item in the list of American productions. The comb was used for utility and ornament, in very ancient times. Of the former class, some specimens made of hard wood, with coarse teeth on one side, and fine ones on the other, as they are now made, may be seen in the Egyptian collections of the New York Historical Society, that were used by Egyptian families, possibly in the time of Moses. In the course of time, horn, ivory and the precious metals were used for making ornamental combs among the Greeks and Romans; also the shell of the tortoise. The Greek poets speak of "golden combs" being worn by the goddesses.

The Spaniards were among the most elegant of the modern comb-makers. The art was carried into England from Spain, and from the latter country the American colonists imported their combs. Some horse-combs were made at West Newbury, Massachusetts, in 1759; and the Provincial Congress of Massachusetts, in 1774, suggested the encouragement of "horn-smiths"—persons who made combs, powder-horns, shot-horns and horn spoons. A comb factory was established in Boston, in 1793, and two or three at Leominster were set up the same year, where 6,000 dozens of combs were made in the space of twelve months. Isaac Tryon, of Connecticut, invented the first machine for making combs; and from time to time afterwards other inventions were patented. Now, by the use of ingenious machines and processes, combs of every kind and of elegant patterns, are made of India rubber. The chief seat of the ivory comb manufacturing, in our country, is at Meriden, Connecticut. In 1870, there were 37 establishments in the United States engaged in the manufacture of combs, employing 675 persons, and producing annually goods valued at about $689,000.
CHAPTER XXV.

The leather industry in the United States, considering the amount of capital and labor employed in all its departments, is regarded as next in importance to that of agriculture. Such does not seem to be the case in Great Britain and on the continent of Europe, where the consumption of leather, in proportion to population, is much less than in the United States.

Leather, which is defined as an "insoluble compound of the gelatine and fibrine of hides and skins with tannic acid," (sometimes without such chemical union,) has been in use since the most remote historic periods. The Egyptians used it for water and wine "bottles" for transportation, and from them the Hebrews learned their use. This explains the meaning of the injunction not to put "new wine into old bottles," for old leather ones might be more easily rent. The skins, as we read in Exodus, were sometimes colored. We are told of a covering for a tent of "rams' skins dyed red, and a covering of badgers' skins above that."

According to the teachings of drawings seen in Egyptian temples, the methods of manufacturing leather in those ancient days, were similar to those employed by the more modern tanners. On the temple walls at Thebes may be seen figures of men stretching and working leather with implements similar to those in common use now, such as the currier's circular knife. There is seen the shoemaker with his awl and knives of present form, and the stone for polishing the leather. The tanner, currier and shoemaker are so frequently represented, that we may not doubt that the business of making and manufacturing leather was among the most important industries of that ancient people. A separate quarter in Thebes, was assigned to the leather-makers and workers. In tanning, the Egyptians used the pods and bark of the acacia tree, a native of the desert.

Traces of leather manufacture were found in the sepulchres of the ancient Mexicans, when they were discovered by the Europeans, like those in Egypt, such as the shoemaker's knife; also among the barbarous tribes of our continent. The dressing of the skins of wild beasts (they had no domestic animals) and birds, for clothing, was an art widely practiced. Morton, an early historian of New England, tells us that the northern Indians converted skins
"into very good leather, making the same plume and soft." He says that they commonly dressed the moose skins bare, and made them "wondrous white." They striped them "with size around about the borders in form like those set on by a Taylor"; and some they striped "with size and works of several fashions very curious, according to the several fantasies of the workmen, wherein they strove to excel one another." From these moose skins the Indians made moccasins and leggings.

The Southern Indians were more expert in the manufacture of leather and in coloring it. A Spanish writer says of this industry among them: "The skins are well curried, and they give them what color they list, so perfect, if it be red, it seemeth a very fine clothe in graine, and the black is most fine, and of the same colours." To-mo-chi-chi, the famous Creek chief whom Oglethorpe met in council, on the site of Savannah, presented to that gentleman a handsomely dressed buffalo robe, on which was depicted the figure of an eagle because, he said, that bird was an emblem of speed, and the buffalo of strength, and he likened the English to them.

The making and manufacturing of leather employs a larger number of establishments, in our country, of various kinds, furnishes occupation for a greater number of people, and gives an annual product of greater value, than any one raw material, wood; alone, excepted. It gives a constant and strong support to our agricultural industry, and to our commerce. This industry, in 1870, in the production of tanned, curried, morocco tanned and curried, patent and enamelled leather, and dressed skins, employed 7,569 establishments, in which the machinery was moved by an aggregate of steam and water equal to 39,583 horse-power. They employed 35,243 persons, to whom $14,406,000 were paid in wages, and in the business was invested capital to the amount of $61,125,000. Materials of the value of $118,600,000 were used, from which came a product, that year, valued at $157,037,000.

The extent of the manufacture of the principal articles made of leather in our country, in 1870, such as boots and shoes, saddles and harness, belting and hose, may be estimated by considering the following statement: In the manufacture of boots and shoes, 23,428 establishments were engaged, in which about 136,000 persons were employed, over 19,000 of them feminine. To the work-people wages to the amount of $52,000,000 were paid. There were invested $49,000,000 capital. Materials valued at over $93,500,000 were used, and an aggregate product was given that year, of $181,644,000 in value.

In the manufacture of saddles and harness, 7,007 establishments were engaged, in which 23,500 persons were employed, who received over $7,000,000 in wages. The invested capital was about $14,000,000. Materials valued at over $16,068,000 were used, and the product that year was valued at almost $33,000,000.
In the manufacture of leather-beling and hose, 91 establishments were engaged, in which 808 persons were employed, to whom over $554,000 were paid. There were invested in the business over $2,118,000; and materials were consumed, valued at $3,231,000, from which came a product for the year, of the value of $4,558,000.

The operations and results of the leather-making, and of the leather manufacturing industry in our country, in its principal branches, exclusive of the production of materials in tanning, et cetera, may be seen in the following tabulation:

<table>
<thead>
<tr>
<th>Kind of Business</th>
<th>No. of Establishments</th>
<th>Persons Employed</th>
<th>Wages</th>
<th>Capital</th>
<th>Materials</th>
<th>Total Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making leather...</td>
<td>7,569</td>
<td>35,000</td>
<td>$14,406,000</td>
<td>$61,125,000</td>
<td>$18,600,000</td>
<td>$157,037,000</td>
</tr>
<tr>
<td>&quot; boots &amp; shoes</td>
<td>23,428</td>
<td>136,000</td>
<td>$52,000,000</td>
<td>$40,000,000</td>
<td>93,800,000</td>
<td>181,644,000</td>
</tr>
<tr>
<td>&quot; saddles &amp; har.</td>
<td>7,007</td>
<td>23,500</td>
<td>7,000,000</td>
<td>14,000,000</td>
<td>15,068,000</td>
<td>33,000,000</td>
</tr>
<tr>
<td>&quot; belting &amp; hose</td>
<td>91</td>
<td>808</td>
<td>554,000</td>
<td>2,118,000</td>
<td>3,231,000</td>
<td>4,558,000</td>
</tr>
<tr>
<td>Total</td>
<td>38,095</td>
<td>195,308</td>
<td>76,960,000</td>
<td>157,243,000</td>
<td>331,399,000</td>
<td>376,239,000</td>
</tr>
</tbody>
</table>

In the above total of products should be included only those of articles manufactured from leather, amounting in the aggregate to $219,102,000 in value.

Leather was manufactured at an early period in almost all of the English-American colonies, after neat cattle had been introduced. The first tanning in New England was done in the town of Lynn, and the first shoemaker who settled there, whose name is preserved, was Philip Kertland. Lynn is now a city of over 30,000 inhabitants, and is unsurpassed by any place in the Union in the manufacture of shoes. There are about 200 establishments there engaged in that industry, which employ about 10,000 persons. About 10,000,000 pairs of shoes, (the larger portion of them low-priced ones for women, misses and children), are annually made there and shipped, having an aggregate value of about $13,000,000. There are several establishments there engaged in the manufacture of morocco, employing about 400 workers, and $1,000,000 capital.

During the whole colonial period the manufacture of leather was a constantly increasing industry in our country. The use of hemlock bark in tanning, which is but little inferior to that of oak in the production of tannic acid, has been very extensive in the United States, for in clearing lands
covered with this timber, for the husbandman’s use, it has been produced abundantly and cheaply.

The supply of raw material for leather, is found in great abundance within the domain of our republic. Vast quantities of hides come from the prairies of our States and Territories west of the Mississippi river; and also from Mexico and Central and South America. Of the heaviest ox and cow-hides, sole-leather is made; of the skins of not full grown cattle, “upper” leather is made, and from those of calves, the softer leather called “calf-skin” is manufactured. The American bison or buffalo furnishes good materials for leather. Horse-hides are used to a limited extent, and tanned hog skins are converted into the best saddle-seats. The skins of sheep are more abundant than any others, and furnish, probably, more kinds of not strong nor solid leather, than are derived from any other source. Deer-skins are used for making buckskin gloves, and soft “chamois” leather. It is estimated that the total annual supply of domestic hides of all kinds, manufactured in the United States, amounts to 7,000,000 in number, each year.

Various inventions and improvements for the manufacture of leather have been made within less than one hundred years. Probably the first and most important ones were by William Edwards, a native of New Jersey, who began the manufacture of leather at Northampton, Massachusetts, in 1790. His improvements greatly facilitated and perfected the art. Other improvements have followed, and with them new varieties of leather have appeared, until now we have japanned or patent leather, which was first made in America about the year 1819, by Seth Boyden, at Newark, New Jersey, the making of which became a large business there; also enamelled leather, another kind first manufactured in this country by David Crockett, at Newark, and which is used chiefly for carriage-tops. It differs from the patent leather in showing the irregular surface of the natural grain of the skin. For awhile leather made from the skins of young alligators, was popular, but it was soon almost abandoned.

Belting-leather is manufactured here of the first quality, and the making of leather belting is a large industry in our country. One of the most extensive of the establishments in the United States, for producing this belting, is that of H. L. Fairbrother and Company, in the town of Pawtucket, Rhode Island. Their works are on the Blackstone river, five miles from Providence, and adjoining the old cotton factory built by Slater. There they manufacture superior leather belting of every kind, and lace-leather.

Lewis Fairbrother, father of H. L. Fairbrother of the present firm, commenced the leather business in the fall of 1834, in a one story wooden building 30 by 20 feet in size. His capital was exactly $84, being the aggregate savings of the ten previous years of his life, which had been chiefly spent in acquir-
ing a thorough practical knowledge of the tanning of leather, in the neighboring town of Attleborough, Massachusetts. He began with a single vat, and with no assistant. When his product, which was of the value of $100 a week, was ready for market, he took it to the different cotton and woolen mills then springing up in New England, and found a ready and remunerative sale.

The business increased every year, and from time to time, with but one change of location, Mr. Fairbrother made extensive enlargements and improvements. He retired from business in the fall of 1861, leaving his son as his successor, when the latter introduced a new feature in the work. Before that time Mr. Fairbrother had purchased his leather (tanned with bark), in the open market. It was not always possible to obtain the quality that was required, and the son determined to adopt a method whereby he might be assured of the possession of a regular and uniform supply of the best stock. By a series of protracted experiments, he became satisfied that gambir (the product of a tree of the family to which the Peruvian bark tree belongs, and a native of the East Indian archipelago), was the best article for tanning belting leather, to give it strength and uniformity in tension. It is called tera-Japonica—Japan earth—from the fact that when it was first produced, its origin was unknown, and it was supposed to be a kind of earth from Japan.

Mr. Fairbrother tanned leather with gambir, and submitted the product to consumers for practical tests of its excellence. It was soon proven that his belting made from leather tanned with gambir would endure greater strain and remain straighter (thus obtaining more power), than belting made from leather tanned with oak or hemlock bark. He has since followed that process of tanning.

As the use of machinery rapidly and widely extended, the Fairbrother leather belting was almost as widely called for, and the business rapidly increased. Now the one story building, in which the founder of the house worked alone, has expanded into buildings which, if placed on a line, would measure 300 by 70 feet, and four stories in height. In these buildings 75 men are employed, who may turn out $600,000 worth of goods annually. The capital of $84, has expanded into $300,000, and the products of the establishment are found in every part of our country where leather belting is used. The motive power of the establishment is supplied by a forty-horse steam-engine, a greater portion of the vapor being used for drying purposes, their style of tanning being such, that the product must be dried by artificial heat.

Fairbrother and Company claim that their leather is an improvement upon the English gambir tanned. They claim it to be essentially an American product and as such, solely, they show it at the Centennial Exhibition in Philadelphia. It is presented as one of the great improvements in the
useful arts made in the United States, within the century just closed, and as a most potent ally in the development of our wonderful variety of machinery employed in the multitude of manufactories, in our land.

The manufacture of caoutchouc or India rubber, the inspissated juice of trees and plants found in the East Indies, Mexico, and Central and South America, is an industry in our country, the origin of which is very recent, and its expansion, in every way, most remarkable. The South American Indians called the product, caucho, and we call it caoutchouc. The first product brought from the East Indies, having been used for rubbing out the marks of lead pencils, it is better known as India rubber. Probably the most fruitful region for the production of caoutchouc, is the province of Para, in Brazil, a vast region watered by the Amazon and its tributaries.

This article was known long before its very valuable qualities and its adaptiveness to various purposes were suspected. It was first brought prominently to the notice of Europeans during the latter half of the last century. In his work on Perspective Drawing, published in 1770, Dr. Priestly speaks of this substance from India, as excellent for erasing pencil marks. It was then sold for the purpose, under the name of India rubber, at the price of about seventy cents for a half of a cubic inch of it. In 1797, a patent was obtained in England, for rendering cloth water-proof by covering one side of the fabric with a coating of dissolved India rubber, upon which was sprinkled wool or any other fibre.

In 1813, Jacob F. Hummel, of Philadelphia, obtained a patent for "gum elastic varnish"; and a water-proof cloth called "mackintosh" was made under a patent obtained in 1819, by a Scotchman named Mackintosh, who established a factory at Glasgow. Water-proof shoes were made by the natives of Brazil of the caoutchouc of Para, in a very rude manner, a little more than fifty years ago; and some of these uncouth foot-coverings were first imported into this country by Thomas C. Wales, a merchant of Boston, in 1823. He afterward sent lasts to Brazil, and far better shaped shoes made over them were returned. Very soon afterward a lively export trade in Para shoes was created, between the port of Para and the United States and Europe. In 1874 we imported 14,746,119 pounds.

In 1832, Wait Webster, of New York, obtained a patent for attaching soles to India rubber boots and shoes. Others obtained similar patents soon afterward; and in 1833, J. M. Hood, of New York, exhibited India rubber boots and shoes, at the fair of the American Institute. Meanwhile, Edwin M. Chaaffee, of Roxbury, Massachusetts, had discovered that lamp-black mixed with caoutchouc, would preserve the latter from spontaneous decomposition and the ill-effects of sunlight. This was a very important discovery. He with others formed an association known as the Roxbury India Rubber Company, with a capital of $400,000, which was chartered in 1833, the first
privilege of the kind ever granted for the purpose in this country. They manufactured coats, shoes, life-preservers, et cetera, the caoutchouc being dissolved in camphene or spirits of turpentine. The apparent success of the Company caused a fever of speculation. The shares of the par value of $100 each, rose to $400, and other companies were organized in Massachusetts and elsewhere.

In 1834, Mr. Chaffee obtained a patent for making India rubber hose; and the following year he devised a method for spreading India rubber, without a solvent, which greatly facilitated the business, and saved much expense. It was a very important improvement, and consisted of a machine for grinding the caoutchouc between heated rollers. This machinery is universally used in preparing India rubber for the vulcanizing process, for which Charles Goodyear, after many experiments, obtained a patent in the summer of 1844.

In 1835, Mr. Goodyear patented a process for making India rubber cement; and in 1838, he bought the right to employ an invention by Nathaniel Hayward, in which the use of sulphur in preparing caoutchouc played a conspicuous part. Finally, in the spring of 1844, Mr. Goodyear purchased Mr. Chaffee's patent, and employed him in the manufacture of India rubber by the vulcanizing process. In June, that year, Mr. Goodyear obtained a patent for making vulcanized caoutchouc; and in the series of law-suits in which he became involved in defence of many of his patents, (sixty in number), the processes of Mr. Chaffee, but not his name, were continually prominent, the conflict being wholly on the point of priority in methods of vulcanization. It is said that the first machine for spreading caoutchouc, invented by Mr. Chaffee, has never been bettered.

Caoutchouc is used very extensively in the arts. Of it are made shoes, water-proof cloth, hose, tubing, car-springs, and a great variety of other articles. By the use of the pure gum and sulphur combined, subjected for a long time to a high degree of heat, a beautiful product called hard rubber, or ebonite, is obtained. Of this material a great variety of useful and ornamental articles are manufactured, such as optical and surgical instruments, ornamental boxes and cases, combs, buttons, dress ornaments, watch-cases, et cetera. The substance is strong and elastic, and is capable of a high finish.

There were, in the United States in 1870, fifty-six establishments engaged in the manufacture of India rubber and elastic goods. These included manufactories of goods made of gutta-percha, a substance from the islands of the East Indies, similar in its nature to that of India rubber. It was first brought into notice here about thirty years ago, and a company was formed in Brooklyn, New York, for its manufacture. From it tubes of remarkable strength are made for aqueducts, feed-pipes for steam-engines, hose, pump barrels, and a great variety of other things. It has been successfully employed
for the coating of telegraph wires, the first use of which was upon a wire stretched across the Hudson river at Fort Lee, in 1849.

The fifty-six establishments mentioned, employed, in 1870, more than 6,000 persons of both sexes, to whom over $2,500,000 were paid in wages. The capital employed was $7,486,000, and the total product was valued at $14,566,000. Of this product was 1,250,000 car springs, 906,000 pounds of belting and hose, 552,500 braces, more than 5,402,000 pairs of boots, and 30,000 overcoats.

Probably the most extensive manufactory of India rubber goods, in the United States, is that of the National Rubber Company, at Bristol, Rhode Island. The founder of the establishment was the late George O. Bourn, who was a shoe-dealer in Providence, and bought and sold Para overshoes, which he refashioned on lasts in the cellar of his store, lining some of them with cotton flannel and trimming them around the edge with fur. For these he found a ready sale, and he hired attic rooms, put in one or two machines for spreading the rubber, and began the manufacture of overshoes. That was in the year 1840. Afterwards he purchased an old oil factory thirty by sixty feet in size, and two stories in height, where he put in several machines and a steam engine to drive them. Manufactured shoes, made of sheet rubber, with leather soles and heels, now took the place of the shoes imported from Para, and Mr. Bourn’s business was rapidly increased.

In 1847, the firm of Bourn and Brown was formed, and they manufactured shoes that were made entirely of rubber, which were perfected by dipping them in strong boiling acids. The production of their establishment was soon increased to 300 or 400 pairs a day. In 1851, the firm associated with themselves Edwin M. Chaffee, the inventor of the first machine for the vulcanizing process above mentioned. They enlarged their factory and commenced the manufacture of vulcanized India rubber shoes under a license from Mr. Goodyear, the patentee. This arrangement was soon disturbed because Mr. Goodyear had already disposed of his own rights to other companies. The consequence was long and vexatious lawsuits with other licensees. These continued until 1858, when an amicable arrangement was made and the suits were discontinued.

Mr. Bourn, with others, had established a large manufactory of vulcanized rubber goods in Montreal, and both establishments were carried on in connection, until 1858, when the Providence partners separated from the Montreal concern. Mr. Bourn died the next year, and was succeeded by his son, A. O. Bourn. In 1861 the association was incorporated under the name of the Providence Rubber Company, who continued the business in the same place until the increase was so great that the buildings they occupied were too small. They could not well enlarge them and they built a new factory at Bristol, Rhode Island, one of the oldest towns in the State.
It is in a beautiful situation on Narraganset Bay, about twelve miles from the sea, and not far from Mount Hope, the seat of the Wampanoags, of whom Metacomet—"King Philip"—was the last reigning sachem and noted chief. The facilities of the company have been increased, from time to time, until now they have one of the finest establishments of the kind in this country.

The buildings of the National Rubber Company are mostly one story in height, composed of stone and brick. They have been made with reference to security against fire, the dread of all India rubber manufacturers. There are about seven acres of land in the inclosure of the establishment, all of which are occupied by the works. The main factory covers about three acres of ground. Besides this, there are store and boiler houses, and machine, carpenter and box shops. In the latter about 1,500,000 feet of lumber are annually used in making packing boxes.

The company employ about 1,200 persons in the busy season, and the manufacture of boots and shoes constitutes about two-thirds of the entire product of the establishment. When it is in full operation they make about 12,500 pairs a day, and these are distributed all over the northern States and Territories, from Maine to Oregon. The motive power of this establishment is steam generated by twenty cylindrical boilers that drives three Corliss engines of 600 horse-power. There are about seventy-five horse-power of Harrison's boilers to furnish steam for the ovens in which the goods are vulcanized.

Besides boots and shoes, the company make belting, hose and other articles adapted to manufacturing and mechanical uses; cloths, piano-covers, door-mats, curry-combs, druggists' articles, elastic bands and rings and every kind of staple article made of soft rubber. The officers of the Company are Richard Levick, President; Albert C. Eddy, Vice President; Augustus O. Bourn, Treasurer; Andrew R. Trotter, General Agent, and Isaac F. Williams, Superintendent. They have a paid-in capital of $725,000.

The more important manufacturing industries of our country, not already mentioned, that pertain to the domestic and social comfort and convenience of the people, are basket-making; the preparation of desiccated meats, vegetables and fruits; the making of furniture, looking-glasses and picture frames; the manufacture of friction matches, pumps, soap and candles; of trunks, valises and satchels; of tobacco and cigars; of wooden, willow, tin, copper and sheet-iron ware; blacksmithing, and the making of confectionery and glass.

Basket-making is now a considerable industry in our country. In 1870 there were 127 establishments engaged in it, employing nearly 1,000 persons, and giving an annual product of almost $600,000. It is a very simple and very ancient art; and it has been found in practice among almost every barbarous and savage nation, in some form. The little "ark" in which
Moses was preserved on the bosom of the Nile, was, undoubtedly, a basket of bulrushes, and covered with bitumen or some other substance was made impervious to water. The Romans had boats of basket-work covered with skins; and such structures, made in great perfection, were found in use among the ancient Britons. They were very expert in basket-making; and Juvenal mentions this kind of work made by the Britons as among the extravagances of the Romans of his time. Some of the natives of South America make baskets of rushes so tight that they will hold liquids. Basket-making remained a purely domestic industry, in our country, until late in the present century, when it became a factory business.

The preparation of fixed food, animal and vegetable, including macaroni and vermicelli, is a business very recently established in our country, and has already become quite an extensive business. There were 124 establishments engaged in it, in 1870, employing about 1,200 persons, and giving an annual product of over $3,500,000. The canning and preserving of fruit and vegetables, as a factory business, is also of recent date. In 1870 there were 97 establishments engaged in it, employing nearly 5,900 persons, and capital to the amount of $2,336,000. The value of the materials used was the sum of $3,100,000, and the yearly product was $5,426,000.

The best results of science have been brought to bear in what is known as the Alden process of desiccating meats, vegetables and fruits, by which these products may be preserved for an indefinite length of time, in a very condensed form and be reproduced with all the plumpness and freshness (in fruit and vegetables) of the period when they were plucked from the living stems. It is a process defined as "pneumatic evaporation." A recent writer says, in illustration of the results of the process, "A large load of pumpkins may be driven in from the field in the morning, and shipped to the antipodes at noon, in a barrel. . . . Parsnips and carrots, grass and clover, prepared by pneumatic evaporation, will become practically new articles for fodder, fresh at all seasons and in all places. Forty pine-apples have been compressed into a small cake which an infant might hold in its hand, and afterward resurrected as forty pine-apples again."

The discoverer of this process, Charles Alden, is a native of Randolph, Massachusetts, and in his early years showed a great aptitude for invention. He was one of the earlier manufacturers of condensed milk, for which he obtained a patent, and set up the first condensed milk factory in this country not far from Poughkeepsie, New York. Afterward he founded an establishment at Newburgh, New York, for condensing milk and desiccating meats and vegetables. He pushed his scientific inquiries further, and at length discovered the wonderful power of pneumatic evaporation, in what is termed "Supermaturation."

The business of manufacturing furniture is an extensive one in the
United States. In this general term are included tables, chairs, sofas, bedsteads, bureaus, wash-stands and other furnishings of rooms, not of textile fabrics, excepting mirrors, ornaments, and works of art. In this general business, there were, in 1870, no less than 5,952 establishments in our country, employing over 53,000 persons. Wages to the aggregate amount of $20,500,000 were paid; and in the business over $43,000,000 were invested. Materials valued at more than $25,500,000 were used. The total product for the year was valued at $68,500,000. In chair-making alone there were 12,462 persons employed, of whom over 3,000 were women and girls.

Ever since men began to live in houses, household furniture of some kind has been used, first as a necessity and afterwards as a luxury. In the early historic ages, a great degree of elegance was displayed in furniture; and it is a notable fact, revealed by sculptures, that the chairs and other articles for domestic use were made by the ancient Assyrians and Egyptians in forms similar to those now made. The Greeks and Romans improved on the more ancient types, and the couches on which the latter reclined at their meals, were very luxurious. Sometimes the wood was inlaid with ivory, gold, silver, and precious stones, and the cushions were covered with the costly stuffs of the Persian looms.

For centuries after the downfall of the Roman empire, the art of making elegant furniture greatly deteriorated; and down to the time of Henry the Eighth, the articles of this kind, in England, even in the palaces, were few and rude. The following is an inventory of the furniture of that monarch's bedroom: "Two joint-cupboards, a joint-stool, two handirons, a fire-fork, a pair of tongs, a fire-pan, and a steel mirror covered with yellow velvet." Until that time very little attention had been paid to the preparation of beds, which were usually made of straw or rushes.

Beds, in Queen Elizabeth's reign, were very luxurious, both as to softness and the costliness of their coverings, and also in the elegance and richness of the bedsteads. The houses of the "common people" were better furnished then than were those of the nobles a century before; and the farmers and mechanics, an old writer says, "were then able to garnish their cupboards with plate, their beds with tapestry and silk hangings, and their tables with fine napery." Elegant bedsteads are now made in our country, and great attention is paid to comfort and convenience in the construction of the beds.

There was rapid improvement in the style of making furniture in Queen Elizabeth's reign. It was made of costly woods, highly carved and ornamented, and generally in massive style. These were sometimes elegantly inlaid and covered with costly stuffs, such as silk and velvet, as seats now are. But after the reign of that queen the art degenerated, and when the first English colonists settled here, they had furniture of the most simple kind. There occasionally appeared articles of the Elizabethan period, but they
were rare. This plainness continued, with a few exceptions, down to the
old war for independence. After that conflict, and when prosperity invited
luxuries, our wealthier people imported fine furniture. The domestic manu-
facturers were engaged in making plain articles, until within a comparatively
few years ago. Now our cabinet-makers vie with their fellow-craftsmen
abroad. Among our native woods, black walnut is the most elegant, and of
this material vast quantities of furniture, of unsurpassed elegance in shape
and finish, are made by the cabinet-makers of the United States.

Looking-glasses or mirrors are manufactured to some extent in the
United States. The larger plate-glass for mirrors are usually imported, and
the "silvering" done here. In 1870, there were eleven establishments in the
United States, engaged in making mirrors, in which about 200 persons were
employed, giving an annual product valued at $500,000.

Still water was doubtless the first mirror used for the toilet. The Greek
poets tell us that Narcissus, seeing his beautiful form reflected in a fountain,
was so enamored that he pine away with hopeless love, and was changed
into the flower that bears his name. In the oldest literary production ex-
tant, the book of Job, we may read: "Hast thou, with him, spread out the
sky, which is strong, and as a molten mirror?" And we read that Moses
caused "the laver of brass" to be made "of the mirrors of the women
assembled at the door of the tabernacle of the congregation." Here is an
allusion to the custom of the women of ancient Egypt, of wearing little
mirrors attached to their garments when in full dress—a custom that was
condemned by an old French moralist many centuries afterward. "Alas!"
said the Frenchman, "in what an age we live, to see such depravity as we
see, that induces them [the women] even to bring into church these scan-
dalous mirrors hanging about their waists!" "It is true," continued the
moralist, "that at present none but the ladies of the court venture to wear
them; but long it will not be before every citizen's daughter and every
female servant will wear them." He believed that eternal damnation would
be the result of this vain fashion.

In the Scriptures and in profane history are many allusions to the use
of mirrors, which, until about the thirteenth century, were made of metals;
those used by the Greek and Roman ladies, were generally made of silver.
The ancient Peruvians had mirrors made of a kind of pyrites called Inca's stone.

We find glass mirrors first mentioned in the thirteenth century. The
glass was backed by pouring melted tin or lead over it. It was not until
early in the sixteenth century, that an amalgam of tin and quicksilver was
used for that purpose, first in Venice. That Venetian process was almost
identical with the one now in common use.

In connection with mirror-making in our country, is that of the manu-
facture of frames for looking-glasses and pictures. In 1870, there were
THE MINOR MANUFACTURES.

engaged in this business, in our country, 320 establishments, employing nearly 3,600 persons, and $2,500,000 capital. The wages paid to the workpeople amounted to over $1,600,000, and the annual product was valued at $6,000,000.

One of the marvels among our minor manufactures, by which great convenience in domestic life is afforded, is the making of "lucifer" or "friction" matches. So early as 1680, a few years after the discovery of phosphorus, fire was obtained by introducing a stick which had been dipped in sulphur, between two pieces of brown paper on which phosphorus had been previously rubbed. The chemical action with the wood produced a flame. This was the simple idea of the modern match. Other apparatus with phosphorus, were introduced, but the common flint, steel and tinder were generally used until John Walker, an English chemist, by repeated experiments produced the "lucifer," "loco-foco," or "friction" match, in 1829. From that year may be dated the beginning of that important branch of industry in Europe and in America.

Matches began to find their way into this country, in 1831 or 1832, when they were sold in boxes for twenty-five cents each, containing twenty-five sticks—a cent a-piece. The first patent issued in this country, for the manufacture of friction matches, was given to Alonzo D. Phillips, of Springfield, Massachusetts, in the fall of 1836. Large establishments and much capital are now devoted to that industry in the United States, and they are made by machinery. In 1870, there were 75 establishments engaged in the business, employing over 2,500 persons (more than 1,000 of them women and girls), and capital to the amount of $1,500,000. The material annually used, was valued at $1,180,000, and the total product at more than $3,540,000.

In the manufacture of pumps, largely for domestic use, there were 465 establishments engaged in 1870, employing about 2,000 persons, and giving an annual product of $2,218,000 in value. In the manufacture of soap and candles, there were engaged 614 establishments in 1870, in which more than 4,400 persons were employed, and a capital of $10,500,000. They used in that year, materials valued at more than $15,000,000, and gave an annual product of the value of over $24,500,000.

It is believed that the simple force-pump now in use was known in Egypt before the Christian era. When the common suction-pump was invented, can not now be determined. The general principle of these appears in all pumps, made at all times; it is only in the methods of its application that inventions and improvements have been made and adopted.

For travelling purposes, trunks, valises and satchels are extensively manufactured in the United States. In 1870, there were engaged in this business, 222 establishments, employing 3,480 persons, and over $2,000,000 capital. The total annual product was valued at over $7,726,000. In the
making of tin, copper and sheet-iron ware, so largely used in this country, there were 6,646 establishments engaged. These employed about 26,000 persons, and over $21,000,000. They paid out, that year, more than $9,516,000 in wages, and gave an annual product valued at over $40,637,000. The value of the material used was over $19,000,000.

The manufacture of wooden-ware, so largely used in families in the form of bowls, pails, et cetera, occupied 269 establishments in 1870, in which 3,169 persons were then employed, who gave a total product valued at $4,142,000. Another kind of manufactory of wood, is that of cooperage, which was a colonial industry, and has expanded with the increase in population and the wants of the people, until now the business forms a very important industry in our country. In 1870, there were 4,961 establishments engaged in that industry, employing 23,314 persons, and about $10,000,000. The wages that year amounted to about $8,000,000, and the materials used, to about $13,000,000. The product was valued at over $26,800,000.

Willow-ware, in its various forms presents the features of a large industry here. In 1870, there were employed in the business 168 establishments, and 1,733 persons, with an invested capital of $2,500,000. The total annual product was over $5,000,000.

Among the most useful industries of our country, and one that is more intimately connected with the various departments of our social life than any other, is that of blacksmithing, a business that has been carried on here ever since the first settlers came, and has expanded through all the colonial, revolutionary and national periods of existence as a body politic, with that of its population and material advancement. During the whole colonial period they were almost the only domestic manufacturers of iron work in this country; and at all times they served the people in unusual extremities.

The business of the blacksmith is as old as the world, since Tubal-Cain; and the Greek poets tell of Vulcan, the lame iron-worker among the Olympian gods, whose forge was in the bosom of Mount Etna. The trade still flourishes notwithstanding machinery has largely taken the place of human muscle in the legitimate business of the blacksmith. He has usually been the pioneer tradesman in our newly settled regions; and many of our large cities and villages are the consequences of the planting of a blacksmith-shop, around which gathered a hamlet.

If the blacksmiths of our country were associated, they would form an enormous guild, for in 1870, there were 26,364 blacksmithing establishments in the United States, in which about 53,000 persons were employed, and receiving wages annually of the amount of $9,246,000. They used materials valued at $13,224,000, and gave a total product of $42,000,000 in value. There were $16,000,000 invested in the business as capital, and nine women were then pursuing the art.
The luxury of sugar eating in the form of confectionery, is widely indulged in here, and it has created a large and important industry, in which there are now engaged about 1,000 establishments, in which 6,000 persons are employed, one-quarter of whom are women and girls. About $5,000,000 capital are invested in the business, and the materials annually consumed amount to nearly $10,000,000 in value. The total yearly product is valued at nearly $17,000,000.

There is another luxury very widely indulged in here, as well as in Europe, which is far less delicate and harmless than confectionery. It is, in a greater number of cases, positively injurious to the user. I refer to tobacco. The manufacture of it into chewing and smoking tobacco, and cigars and snuff, is an important industry in the United States, where, as we have seen, the plant is largely cultivated. In 1870, there were 5,104 establishments engaged in the business, employing 46,848 persons. Of that number, 7,735 were women and girls, and 7,957 were boys and youths. They had an invested capital of $24,000,000, and paid in wages, that year, $14,315,000. They used material valued at about $34,657,000, and the total product was $71,781,000.

Although Americans use tobacco extensively, a very large proportion of the crop is annually exported, as may be seen by reference to figures on page 187. Large quantities of cigars are imported from Cuba, but we employ 4,631 establishments in making them. In these establishments over 26,000 persons find work, more than 21,000 of whom are girls and women. Cigar-making in the United States employs $1,368,000 capital, and yields an annual product of over $32,000,000. This amount of money and labor is wasted in a generally hurtful indulgence, and the results are smoke, a fearful production of nervous disturbance and consequent ill-health, and a vast amount of uncleanliness and domestic annoyance. A homely rhyme comes to the support of King James' famous essay against tobacco, in the following words:

"Tobacco is an evil weed,
And from the ground it doth proceed;
It steals my money, soils my clothes,
And makes a chimney of my nose."

In every well-regulated household cleanliness is one of the prime virtues. It is regarded by the wise as next to godliness among the better qualities of the Christian character. It is said that in no country in the world is there more attention paid to personal cleanliness than in the United States; and in no country is there so large a quantity of soap, the chief agent with water, in maintaining cleanliness, used in proportion to the population.

Soap is mentioned as an article of use among the Hebrews, in the time of Jeremiah, who said: "For though thou wash thee with nitre, and take
thee much soap, yet thine iniquity is marked before thee, saith the Lord thy God." It was used then, as now, in the manufacture of woolen cloth, for Malachi speaks of "fullers' soap." The Egyptians used a lye made of the ashes of certain plants, but when the process of softening the too great causticity of this lye by causing it to combine with oils or grease, was first known and practiced, can not be determined. Strabo mentions a natural alkaline water in Armenia, which was used for washing clothes. We have, on our immense Western plains, large pond-like deposits of soda in a crystalline condition.

The first certain reference to soap as we know it, is by Pliny, who ascribed its invention to the Gauls. He says the Germans manufactured both hard and soft soap. In exhuming portions of Pompeii, a soap-boiling establishment was found, which, after being buried 1700 years, presented well-preserved soap. It was known to the civilized Europeans from the time of the Cæsars down to our day; and the early settlers here brought the art with them. A hundred years ago, it was a domestic industry in our country, and remained so until a comparatively recent period, when it has become a factory business here. It is made in large quantities in our country, and its use in our manufactories is very extensive. Soap and candles have usually been made in the same establishment, and are ranked under one head in our statistical tables.

In 1870, the number of establishments in the United States employed in making soap and candles, was 614; employing 4,422 persons and $10,454,000 capital. Their total product that year was more than $22,500,000 in value. These establishments manufacture fancy soaps of every kind, as well as those used for washing clothes, and in the manufactories.
CHAPTER XXVI.

COMMERCE—the exchange of merchandise on a large scale between different communities—is the legitimate offspring of Agriculture and Manufactures, and is an important measure of the industry, productive power, thrift and enterprise of a nation. Its chief function is the simple interchange of the products of labor of various kinds, which are not needed for the use of the producers; and the wealth of a nation may be estimated, in a degree, by its surplus of products, whether of the soil, the forge, or the loom, beyond the necessary annual consumption and natural waste.

Commerce has been a thing of slow growth and natural development. First it began between one family and another; then between one village and another; then between one city or sea-port and another, and at length it was carried on between nations.

The history of Commerce, properly considered, is a history of civilization. The highest type of civilization is that which co-exists with civil and religious liberty, its strongest foundation; but we must not confound civilization with these. Florence under the sway of the Medici, and France during the reign of Louis the Fourteenth, two hundred years later, were brilliant with a civilization that has been called "resplendent," but there did not exist in either country, civil or religious freedom. There was much intellectual and esthetic culture among what are called the "higher classes." Art and literature flourished; but the many were kept in profound ignorance, and were the drudges of the few, without any civil, religious or political franchises.

Commerce was enthroned at Florence. Merchant princes ruled the State. Caravans and argosies brought the wealth of the Orient to the province, and Italy became, by commerce and navigation, what Great Britain became in later years, by the same means—Mistress of the Seas. But Florence was a sort of barbarian queen, with all her tasteful trappings and refined phrases. Her people lost their liberties, and became slaves. Louis the Fourteenth seemed, at one time, to hold the destinies of Europe in his own hands, and his reign presents to the superficial observer, dazzled by show, a gorgeous spectacle, but it was a kind of barbaric splendor.

In both countries, citizenship as we understand it, and as it is displayed
in our republic, was unknown. The English political axiom born of Magna Charta, that “every man’s house is his castle, and must remain inviolate,” had not been heard of in Italy and France. The famous remark of Louis: L’etat c’est moi, “I am the State,” might, with equal propriety have been spoken by Lorenzo the Magnificent, for it was equally true in both countries. In each there was a reign of Taste, not of Faith—faith in man and faith in God, upon which all true civilization rests, and which is manifested by the full sway of civil and religious freedom.

The history of the progress of the United States from the date of their settlement until now, presents a record of greater and more rapid development of trade, and the profits arising from it, than that of any country in the world; at the same time that history shows a growth in civil and religious freedom here, altogether unequaled in magnitude and beneficent results, seen elsewhere on the globe. Our commercial greatness, and the full fruitage of that civil and religious liberty upon which is built our civilization, have nearly all been won since the birth of the republic, a hundred years ago, though the implements for those achievements, full and vigorous, had then been accumulated, and only waited for their release from the thralls of Great Britain to begin their marvellous work.

The English-American colonies possessed superior advantages for the promotion of a rapid and healthy growth in greatness, which their Agriculture, Manufactures and Commerce reveals. The settlers began life here with an ample supply of fertile land, and freedom to cultivate it. As a rule, the immigrants, especially those who settled in the more northerly portion of our domain, were intelligent, persevering, and thrifty, and were possessed of inventive genius which necessity, “the mother of invention,” stimulated to action. The manual force necessary to fell the forests, and cultivate the virgin soil, was prodigious, and invention contrived implements for saving exhausting toil.

Another reason for the rapid progress in the industries, was the wonderful increase in the number of the population, by emigration—a process still going on, by which the yet uncultivated regions of our republic will speedily yield largely the fruits of the tiller’s labor and skill. Our generally healthy climate, the morality of the people, and the excess of births over deaths in the earlier days of our history, tended largely not only to the natural increase of the population, but to invite immigration to our shores. By frugal habits the people rapidly accumulated capital, for they always, after the first few years of settlement, produced far more than they consumed. The capital thus accumulated was applied, as far as restrictive laws would permit in colonial times, to reproductive industries.

Since the freedom of the Republic was secured, capital has been so applied almost without stint, while money brought hither in the hands of emigrants,
and sent here for investment, because it would command a larger interest than in Europe, has caused an immense accumulation of wealth in our country. Here, too, the people, who constitute the sovereignty of the nation, have the absolute control of their own wealth. No monarch could or can, engage them in wasteful wars in support of a throne or a dynasty. The substance of the people has not been eaten up by costly standing armies, the fruitful source of the demoralization and impoverishment of a nation.

When we view the great standing armies of Europe, seated heavily upon the industries of the people, we have reason for devout thankfulness that our free institutions and our popular sovereignty allow us to dispense with such an expensive and sometimes dangerous agency for upholding the national government.

At the close of the old war for independence, our regular army, retained after the promulgation of peace, consisted of seven hundred men. These were under the command of General Knox, and were placed in garrison at West Point and at Pittsburgh. They were soon discharged, excepting twenty-five men left to guard the stores at Pittsburgh, and fifty-five men at West Point. There was no officer retained above the rank of captain; but provision was made for Connecticut, New York, New Jersey and Pennsylvania to furnish seven hundred men to do garrison duty in Western forts, when the British, in accordance with the treaty of peace, should evacuate them. For awhile our standing army was almost invisible, and our military force was latent in the patriotism, energy and intelligence of the people. To the militia of the country the government looked for defence.

The British did not comply with the treaty. British political emissaries and British fur-traders, excited the hostility of the Indians toward the Americans, and a military establishment for defence was created, consisting of 600 men commanded by Brigadier-General Harmar. There had been an insurrection in Massachusetts, and out of troops raised to quell it, there had been formed two artillery companies, one of which had been stationed at Springfield, to protect the government armory there, and the other was stationed near the frontier, at Pittsburgh. This was the military establishment of the country, when the nation began its career under the new Constitution.

Our standing army was gradually increased as the settlements extended, and at times it was temporarily enlarged to meet some special exigency, such as the apprehended war with France in 1798. Some coast-defences were thrown up and garrisoned.

At the close of the war of 1812-15, the number of the army was fixed at 10,000. There were two major-generals and four brigadiers; and the necessary number of staff, regimental and company officers were appointed.

Again wars with the Indians, and with Mexico, caused a temporary increase in the number of the standing army of the republic. The war
with Mexico employed a large portion of the regular troops and 50,000 volunteers were accepted by the government. From the close of that conflict until the breaking out of the late Civil War, the numerical strength of the army seldom exceeded 16,000 men. They were very widely scattered in garrisoning forts, and protecting the Western frontiers against hostile savages.

When the Civil War broke out in 1861, the total regular force was 16,000 men. A greater portion of them were on the Western frontiers. The forts and arsenals in the Southern States had been almost stripped of their defences, and became an easy prey to the insurgents. When the Civil War ended, as we have observed, there were a million men of all arms, for sea and land, in the military and naval service of the United States. In the course of a few months afterward, full 800,000 of them had returned to the peaceful occupations of life.

Our standing army now consists of 25,000 men. There are four military divisions, and nine military departments. The army is scattered in small detachments over a wide extent of territory, much of it unpopulated, and making the cost of transportation of the necessaries of military life, expensive. These troops are engaged in extensive surveys of territory and routes of travel and commerce, and in protecting frontier settlements from the inroads of savages. Within the last three or four years, they have been intrusted with the humane work of affording relief to sufferers in remote regions from the ravages of grasshoppers and other misfortunes. During about ten months of the year 1875, there were issued for this purpose, under the direction of military officers, 1,957,108 rations, to 63,593 adults, and 43,942 children under twelve years of age, residing in the States of Minnesota, Nebraska, Iowa and Kansas, and the territories of Dakota and Colorado.

The army has charge of National Cemeteries in various States, in which are buried the remains of soldiers gathered from the battle-fields of the late Civil War. The total number buried in these cemeteries to the close of June, 1875, was 306,053. Head-stones are placed at the graves of all whose remains are identified, with the name and other data on each. There have been 62,112 of these stones erected.

The War Department has under its charge, the important Signal Service (to be considered hereafter), in which only officers of the army are employed. In this, as in various other ways, that army, in its high moral tone and occupying the position which Kossuth said, twenty-five years ago, those of Europe were approaching, when "bayonets would begin to think"—a standing army of only 25,000 men charged with the military guardianship of a country almost three million five hundred thousand miles in extent—is doing efficient service for the arts of peace and the promotion of our national commerce, foreign and domestic.
The entire annual expenditures of our War Department amount to a very small sum, compared with the expenses incurred by foreign governments in the support of their military establishments. In the year ending with June, 1875, the total expenditures of the Department, including the cost of river and harbor improvements, was $41,277,375. The estimated total expenditures for the year ending with June, 1876, amount to $32,488,969. In this estimate is included the sum of $14,301,100 for the improvement of rivers and harbors, an amount approaching nearly one-half of the entire expenditures of the War Department.

The untrammeled and unburdened industry of our people at the close of the Revolution soon began a career of unexampled prosperity and material progress. The arts and manufactures of Europe took root here in a genial soil, until now, great in estimated money value as is our agricultural products, those of our manufactures is greater. In every department of work we have realized, by the use of labor-saving machines, the wildest dreams of our youth, as a nation. We have established a sound, graceful and attractive political structure; we have organized and perfected a healthful social system; we have secured by chartered franchises, civil and religious freedom to every inhabitant of the Republic worthy of the privilege, without distinction of race or color; we have set the candles of popular education on every hill, where they may not be hidden; we have spread the light of civilization and Christianity over a continent; we have brought out untold riches from the bosom of the earth; we have laid a vast net-work of railways over our domain; we have made our rivers and lakes, and highways of every kind teem with internal commerce and travel, and we have displayed the black smoke of our steamships, and the white sails of our wind-propelled vessels in every port of the habitable portions of the globe where traffic and gain may attract them. And all this is the result of less than one hundred years of progress. Let us look at a few figures, which denote this growth.

In the year 1790, when the first census was taken, our population was about 4,000,000. This was the result of nearly two hundred years of growth. In 1870, or eighty years afterward, the population was almost 40,000,000. In 1790, the annual products of our agricultural industry, amounted in value to $150,000,000. That of manufactures was not reported. It must have been quite small. The assessed wealth of the people then was estimated at $479,293,000.

In 1850, or sixty years after that first enumeration, the population of the republic was 23,192,000; the value of the annual products of agriculture was given at $1,070,000,000; of manufactures at $1,019,000,000; and the assessed wealth at $2,276,000,000.

In 1870, or twenty years later, when our population was almost 40,000,000, the annual agricultural products, including crops and betterments; animals
slaughtered and sold for slaughter, home manufactures, and forest, market-garden and orchard products, were estimated, in value, at almost $3,000,000,000. The amount of wages paid in 1870, to persons engaged in these various agricultural industries, was $310,286,285.

The total product of our manufactures in 1870, were valued at $4,232,325,000, or $1,232,325,000 more than the total value of the agricultural products of the country, and $3,213,325,000 more than in 1850; an increase of over three hundred per cent, in twenty years. In these various manufactures, there were employed 252,148 establishments which used, in the aggregate, of steam and water-power, (nearly equal), the equivalent of 2,347,142 horse-power. They also employed the brains and muscles of 2,054,000 persons, or a little more than one-twentieth of the entire population of the republic. Of these, 323,770 were of the gentler sex, over fifteen years of age. To the whole were paid in wages, that year, $775,584,000.

They also had invested capital to the amount of $2,118,209,000, and used materials valued at $2,488,500,000. The assessed value of the entire property, real and personal, of the 4,000,000 inhabitants of the United States in 1790, as we have observed, was $479,293,000. The value of the property of the 40,000,000 in 1870, was estimated at $14,178,986,732, an increase in eighty years of about $13,700,000,000. The estimated real value of the real and personal property of the United States, in 1870, (not including the value of what is called government property), was $30,000,000,000.

The foregoing figures show at a glance, the wonderful progress made by our people in Agriculture and Manufactures, the parents of Commerce, and of their accumulation of wealth, within the present century, and especially within twenty years. It is the evidence of the rebound of our energetic people, freed from the dead weight of unjust laws that might not be evaded.

It was the policy of the imperial government to make the colonists not only absolutely dependent upon, but a source of profit to the mother country, and with unwise notions of political economy, they repulsed every attempt of the British subjects in America to do anything that might seem to interfere with any of the various industries in England. It was not an easy matter to do this, for the colonists saw all around them opportunities for a wonderful development, not only of the agricultural and mineral resources of the country, but of riches for themselves, that might grow out of free industry.

But the British government, ever jealous of its sources of wealth, watched the movements of the colonists with keen vision and sleepless vigilance. When they were seen to undertake any new industry that seemed to conflict with a similar one at home, they were immediately restrained by law. We have seen that they were not permitted to engage in the manufacture of
iron further than that of pig; to make hats, or cut down pine trees for the manufacture of staves, turpentine and rosin. They were forbidden to coin money; to manufacture wool, and to export any product excepting in English vessels of which the master and three-fourths of the crew were English. Parliament forbade them indulging in banking institutions; and when they manufactured their native wools into “home-spun” cloth, they increased the displeasure of the imperial government. So the people were driven to agricultural pursuits, mostly; and commerce, before the old war for independence, had a sickly existence here, excepting in the form of coast and inter-colonial exchanges and in trade with the West India islands.

On account of the sterility of much of the New England soil, and the rapid increase in population there, the products of agriculture could not give a full supply of provisions to the whole people, and large numbers turned to the sea as a means for gaining a livelihood, and gathering wealth. Navigation and fishing employed large numbers, and many others were engaged in ship-building, cooperage and other pursuits connected with the industries on the sea.

At that time prodigious shoals of codfishes and mackerel were found on the New England coasts, and the bays and rivers were filled with delicious salmon. In the taking, curing and packing of these fish a large number of persons were engaged. The New Englanders also frequented the banks and coasts of Newfoundland that were teeming with fish, and also the fishing grounds of the Gulf of St. Lawrence. They even went up the coasts of Labrador far toward the ice-pack of the polar seas, in search of whales. They bargained with the Newfoundland fishermen for a part of their “catch,” giving them in exchange American and West India rum. A hundred years ago, more than 600,000 gallons of this liquor were exported from the colonies (chiefly from New England), to Nova Scotia, Newfoundland and Quebec.

The dawn of American commerce occurred in 1635, when a Massachusetts-built vessel, belonging to Isaac Allerton, a passenger in the Mayflower, began voyages in which a profitable trade for its owner was carried on for several years, with the settlers in Connecticut and the colonists at New Amsterdam and in Virginia. The following year a Massachusetts vessel of thirty tons, made a trading voyage to the West Indies; and two years afterwards [1638], another vessel went to New Providence, one of the Bahama Isles, and returned with a cargo of salt, cotton, tobacco and negroes. This was the introduction of slaves into New England; and after that the slave-trade was carried on briskly in that region, until the middle of the last century.

The New England colonists engaged in the general carrying trade along the coasts, and kept up a circuitous commerce with the foreign West India
settlements (mostly with the French,) taking to them lumber, pork, beef, fish of inferior quality, horses and other live-stock, poultry, garden vegetables, butter, corn, flour, inferior tobacco, cider, sometimes apples, and small vessels built for use among the islands. For these articles they received gold and silver coin, chiefly, with some sugar and much molasses. The last-named product of the cane, they converted into rum—an article much inferior to that made in the West Indies. This liquor, as we have observed, was sent to the far Eastern fishermen; also in large quantities on board of slave-ships to the coast of Africa, to exchange for slaves, or for the gold-dust, ivory, and precious woods of the resident European slave-merchants. Much of it went among the Indian tribes in exchange for peltry and furs.

The coin received in the West Indies was sent by the colonists to England, together with their best fish and tobacco, fish oil, whale-bone, candles made of spermaceti, masts and spars, to pay for manufactured commodities which they were compelled to buy there. The commerce with the West Indies was beneficent in its prime operations, for it enabled the colonists to dispose of their surplus products with considerable profit, and it furnished the West India planters with supplies that were indispensable for carrying on their business.

The more productive soil of New York, New Jersey, Pennsylvania and Delaware, gave to the inhabitants of these provinces a surplus of food, and they exported, chiefly to the West Indies, large quantities of corn, neat cattle, hogs, sheep, poultry, flour, bread, flax, hemp, lumber, staves, shingles (the last two articles named, in spite of navigation laws, or rather in evasion of them), pot and pearl ashes, and even wooden houses ready to be set up. They also built vessels for the West India merchants, superior in quality to those made in New England. They exported products quite largely to Madeira, and to Spain and Portugal, while to England and Ireland they sent iron in pigs, flax, hemp, flour, skins and furs, and some lumber.

Maryland and Virginia were, for a long time, chiefly engaged in the production of tobacco, and exported immense quantities with good profits. Toward the close of the colonial period, the production of tobacco in those provinces was diminishing, owing to the exhaustion of the soil by unwise tillage; and the planters had turned their attention to the cultivation of wheat and other cereals. These products they exported to foreign countries, but their tobacco was not allowed to be sent to any other country than to Great Britain. There was considerable tobacco produced in North Carolina, but, evading the navigation laws, the inhabitants produced and exported much tar, turpentine and pitch, sometimes more than 100,000 barrels of these in a year. To the West Indies, the North Carolinians sent salted pork,
corn and peas. South Carolina and Georgia exported rice and indigo; their great staple, cotton, was then only raised here and there, in gardens.

In the year 1770, when the war for independence was a-kindling, the entire exports of the colonists to Great Britain, the south of Europe, the West Indies and Africa, amounted, in value, to $14,262,000, more than one-half of which went to Great Britain. With the greedy wish to secure the whole of this trade, and, at the same time, to raise a revenue from the American colonies—to replenish the public treasury, exhausted by the expenses of war, the British government, in 1764, laid a heavy burden on the trade of the colonies with the West Indies, in the form of a tax.

This measure crippled colonial commerce, and exasperated the people; and when it was followed by other oppressive measures, such as the stamp-tax and other burdens, with the arrogant assumption that parliament had a right to tax the colonies without their consent, the latter turned upon their oppressors with determined resistance. With patience most admirable, they first used remonstrance, petition and warning. Then they used countervailing commercial measures, and refused to trade with Great Britain at all; and finally, when peaceful measures appeared utterly futile, they appealed to the dreadful arbitrament of arms.

During the colonial period, ship-building, in connection with commerce, assumed the proportions of a considerable industry, especially in the provinces of Massachusetts and Maryland. The business was confined, chiefly, to the production of small vessels, suitable for the coast and the West India trade.

Ship-building is a very ancient art, and implies the antiquity of commerce. It has experienced many modifications from the time when the Phoenician vessels navigated the Mediterranean sea, and ventured beyond the Pillars of Hercules as far as the coast of Britain, and the ponderous vessels that navigated the Nile when it was brim full, and overflowed the surrounding country.

The great vessel built by Noah for the salvation of animal life on the globe, certifies that the art of ship-building was then quite perfect. The interesting fact is stated, that the dimensions of the Ark, in length, breadth and depth, as given in the Book of Genesis, are almost precisely the same as those considered by the most eminent architects now, the best for combining the elements of strength, capacity and stability. The Ark was 547 feet in length, 91 feet beam, and 54 feet in depth. Its capacity was about 26,000 tons. The Great Eastern steamship, of our time, has a capacity of about 18,000 tons.

The huge Nile vessels were simply large monsters of the art. They had each a square sail, but were moved chiefly by oars. One built by Ptolemy Philopater, was 420 feet in length, 57 feet beam, and 83 feet in depth, with four decks. It had forty banks of oars, some of the latter being over fifty
feet in length, and loaded in the handles with lead. It carried 4,000 rowers, 400 sailors, and 3,000 soldiers. The great Nile ships now used in the season of the inundation, carry from 10,000 to 24,000 bushels of grain.

The immense nautical toy built in the harbor of Syracuse for Hiero, king of Sicily, under the direction of Archimedes, was a wonder in naval architecture. It had three decks and twenty tiers of oars. On each side of the middle deck were fifteen dining-rooms, besides other apartments sumptuously furnished, with floors paved with mosaics representing scenes in the Iliad. On the upper deck were gardens, garnished with vines, and a temple of Venus paved with agates and covered with cypress wood. The apartments were adorned with paintings and statuary, and were furnished with costly couches and drinking vessels. There was a library, baths, cabins for soldiers, and stabling for twenty horses. In the forecastle was a salt water fish-pond and an immense cistern of fresh water for common use. From the sides of the vessel projected beams, each supported by a caryatid (figure of a girl), upon which were built ovens, mills and kitchens. Around the deck were eight wooden towers for defence, and there was a catapult for hurling stones of three hundred pounds weight; also a balista for throwing darts eighteen feet long, a distance of three hundred yards. The crew consisted of 600 men, and she could carry 60,000 bushels of corn, 10,000 barrels of salted fish, and 20,000 barrels of salted meat.

When Hiero became wearied with his great toy, he determined to convert it into a carrier of grain from port to port, but it was so huge that it could not get into most of the harbors in that region, so he filled it with grain, and sent it to Alexandria, as a present for Ptolemy, of Egypt. That monarch did not need the grain, but he thanked his “cousin” for the gift, emptied the ship, and left it to perish on the shore.

The Phoenicians were the great ship-builders and navigators of antiquity. The merchant vessels of their day were made round-bottomed, for the sake of capacity, and the bows were ornamented with figures which were called insignes. The ship in which St. Paul was wrecked had the “sign of Castor and Pollux,” the twin sons of Leda. The larger vessels carried immense coils of rope to bind around their frail sides during a tempest. The ship that carried St. Paul was, evidently, so bound. The war ships of that day had stout oaken beaks, pointed with iron, sometimes above the water and sometimes below, wherewith to penetrate the sides of an enemy’s vessel—the prototype of the “rams” used so effectually during our late Civil War.

The ships in which the Saxons went to Britain in the fifth century, were very frail. Their sides were made of wicker-work; but those of the Northmen, in which the latter made more perilous voyages, were stronger. Long low galleys were made on the Mediterranean sea, in the time of Alfred the Great, and he used these in fighting the Danes, with so much success that
the British navy, at that early period, (ninth century) became sovereigns of the ocean.

In the course of time the Normans became the best ship-builders, and they first introduced the rudder in place of the great steering oar before used. To the Genoese is conceded the credit of building the first vessels that were propelled wholly by the wind; and such were employed in England before the middle of the fourteenth century. They were bulky in form, with only one mast, and no bowsprit; were high fore and aft, simply rigged and slow sailers.

In the fifteenth century the war and merchant navies of the Netherlands, Venice, Spain and Portugal, obtained much renown. The mariner's compass and astrolabe were introduced, and with these longer voyages were successfully undertaken. That century was crowned, at its close, with glory for the ship-builder's art and the navigator's skill, in the discovery of America. Then it was that commerce began to spread its wings for flight to distant seas and continents. Ships went around the Cape of Good Hope from Western Europe to farther India, and America became the goal of many bold voyages of discovery, by searchers after wealth.

Finally, in the next century, Magellan and Drake sailed around the southern cape of America, and over the Pacific ocean, and so made the circuit of the globe in ships. When Drake achieved his great exploit, the Royal Navy of England had been founded about a hundred years, and its supremacy was soon afterward asserted in the defeat of the greater ships of the Spanish Armada.

Ship-building very soon became an important industry in England. The establishment of the East India Company there in the year 1600, and the commercial importance which America soon afterward assumed, stimulated the growth of that industry, and caused many improvements to be made in ship-building. A Shipwrights' Company was incorporated in 1612, and general charge was given to the association, over ship-building throughout the kingdom. The British war vessels were without rivals; and in 1637, the first three-decker was built. She was called the Sovereign of the Seas, and was regarded as the best man-of-war in the world, until near the close of the century, when she was accidentally burned.

The English had now become decidedly a maritime people, and her American colonies partook, in a large degree, of the spirit of Mother-land. But for a long time the articles that passed between England and America were carried wholly in British-built ships. In 1670, a British publicist wrote: "Our American plantations employ nearly two-thirds of our English shipping, and thereby give constant subsistence to, it may be, 200,000 persons here at home."

When the old war for independence was a-kindling, ship-building was
carried on in all of the thirteen colonies. The number of vessels built in these in 1771, and the amount of their tonnage, were as follows:

<table>
<thead>
<tr>
<th></th>
<th>Square-rigged vessels</th>
<th>Sloops and schooners</th>
<th>Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Hampshire</td>
<td>15</td>
<td>40</td>
<td>4,991</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>42</td>
<td>33</td>
<td>7,704</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>15</td>
<td>60</td>
<td>2,148</td>
</tr>
<tr>
<td>Connecticut</td>
<td>7</td>
<td>39</td>
<td>1,483</td>
</tr>
<tr>
<td>New York</td>
<td>9</td>
<td>28</td>
<td>1,698</td>
</tr>
<tr>
<td>New Jersey</td>
<td>2</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Pennsylvania and Delaware</td>
<td>15</td>
<td>6</td>
<td>1,307</td>
</tr>
<tr>
<td>Maryland</td>
<td>10</td>
<td>8</td>
<td>1,645</td>
</tr>
<tr>
<td>Virginia</td>
<td>10</td>
<td>9</td>
<td>1,678</td>
</tr>
<tr>
<td>North Carolina</td>
<td>8</td>
<td>241</td>
<td>241</td>
</tr>
<tr>
<td>South Carolina</td>
<td>3</td>
<td>4</td>
<td>560</td>
</tr>
<tr>
<td>Georgia</td>
<td>2</td>
<td>4</td>
<td>543</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>128</strong></td>
<td><strong>241</strong></td>
<td><strong>24,068</strong></td>
</tr>
</tbody>
</table>

The tonnage entered and cleared for the year 1771, was as follows:

*Clear*ed from the colonies for Great Britain, 98,025; for Southern Europe, 37,237; for the West Indies, 108,150, and for South and Central America, 107,552. The total tonnage cleared was 350,964.

*Enter*ed the colonies, from Great Britain, 82,934; from Southern Europe, 37,717; from the West Indies, 108,150, and from South and Central America, 104,576. The total tonnage entered was 331,942. The exports, in tonnage, exceeded the imports, about 19,000.
CHAPTER XXVII.

By a comparison of the statistics of a former period, contained in the closing pages of the last chapter, with those of the present time, as given below, we may form an idea of the progress of our country in commerce and navigation within the space of a century.

The total number of merchant vessels belonging to the several customs—districts and ports of the United States, at the close of June, 1875, was as follows: sailing vessels, 17,747; steam vessels, 4,000; unrigged vessels 9,059, and unrigged vessels not reported, 1,680. The aggregate number of vessels of all classes engaged in the merchant service, was 32,576.

The amount of tonnage of the several classes of vessels above mentioned, at the close of June, 1875, was as follows: sailing vessels, 2,383,275; steam vessels 1,119,766; unrigged vessels 1,024,187; and unrigged vessels not reported, 198,115; aggregate tonnage, 4,725,346. In these statements of the number of vessels and their tonnage, are not included canal boats and their tonnage. Of the whole number reported, 23,308 vessels, whose aggregate tonnage was 3,217,004, were on the Atlantic coast; 1,671, with a tonnage of 373,866, were on the Western rivers; 4,755 vessels with a tonnage of 752,716, were on the Northern lakes, and 1,162 vessels with a tonnage of 183,642, were on the Pacific coast.

It will be observed by the above statements that the total tonnage on the Western rivers that were almost unknown and some of them unsuspected a hundred years ago, and were navigated only by the canoes of the savages, or the small boats of traders and French missionaries, now exceeds the entire tonnage of the thirteen provinces, in 1771, by about 42,000 tons.

We have seen that the total value of the products of the colonies exported in the year 1770, was $14,262,000, more than one-half of which went to Great Britain. The value of the products of the United States exported during the year ending with June, 1875, calculated at gold valuation, was $583,141,229. At the same time we exported foreign products valued at $22,433,624, making a total value of exports $605,574,853. The total value of imports during the same period was $553,906,153, leaving a balance in favor of the United States, of $51,668,700. During the same period, we exported domestic specie and bullion to the amount of $83,857,129, and foreign specie to the
amount of $8,275,013, making a total exportation of specie and bullion of the value of $92,132,142. During the same period we imported $20,900,717 in specie, making the excess of our exportations over our importations of specie and bullion, $71,231,425.

Since the Revolution, ship-building in the United States has become one of the most successful branches of the fine art of Architecture, considered in its perfection as seen in our fast sailing wind-propelled vessels, such as clippers, pilot boats and pleasure yachts; and in our steamships and steamboats of every kind. During the last century, the French ship-builders employed the best mathematical talent and the most skillful mechanics, and they surpassed all other nations in the beauty and perfection of their models, and the accomplishment of desired results. The English and Spanish marine architects followed old models and old systems of construction, but continually made improvements. The British-American colonists followed the beaten track. But when the English saw the superiority of the French ships, they were compelled, though reluctantly, to acknowledge the fact. With their proverbial slowness to adopt the methods of others, in anything, it was a long time before British ship-builders would bend to necessity, and follow the French system.

Not so with the American ship-builders and ship-owners, whose commerce was disenthralled by the results of the Revolution, and held out its glittering allurements to a grand theatre of action on the ocean, which promised individual wealth to those who should enter upon it wisely, and also national aggrandizement. They boldly abandoned the old models and the old methods of construction, and created a new era in the ship-builder's art. In the conflict between the United States and Great Britain in 1812-15, and even so early as the speck of war that occurred on the ocean with the French, at the close of the last century, and with the Barbary Powers early in this, the American frigates were acknowledged to be superior to anything then in actual service; and until the introduction of steamships for ocean travel and traffic, the American Liverpool packets were regarded as the finest vessels of the kind then afloat.

The American fore-and-aft rigged vessels, less known abroad than our larger ships, were most remarkable for their perfection; and the schooners of the Chesapeake, known as Baltimore clippers, were especially famous as fast sailers. They were broad of beam before the centre but above the water-line; sharp in the bow; deep aft; long and low, and with raking masts. They were equally remarkable for their capacity, for stability to sustain a large amount of canvas, for great speed, and for holding their course in a wind with little drifting to leeward. The masts were long and slender, the sails were unusually large for vessels of that size, and of so true a cut and perfect set, that no portion of the propelling effect of the breeze
that filled them, was wasted. The chief improvements in ship-building in our country, for strength, speed and safety, have been in the shape of the bow and the increased length of the vessel, the codfish being its general model.

The Baltimore clippers were famous for their exploits in the war of 1812-15, their superior sailing qualities making them admirable vessels for privateering. They were specially fitted for exemption from capture. A larger portion of the American privateers and letters-of-marque engaged in that war, were clipper-built. There were about 250 of these vessels roving the ocean, and depredating upon British commerce during that conflict, and they "took, burned and destroyed" about 1,600 British merchant vessels. Forty-six of these rovers were letters-of-marque, and the remainder were privateers. Of the whole number, 184 were sent out from the ports of Baltimore, New York, Boston and Salem alone. Large fortunes were made by many of their owners—fortunés which some of the descendants of these owners are now enjoying. During that conflict about 500 American merchant vessels were lost.

When in 1851, the American clipper-built yacht, America, constructed by George Steers, carried off the prize in a race at Cowes, England, from the British yachts which had challenged the world to competition with them, a new era began in the construction of larger vessels for the sea. American ship-builders immediately began the construction of clipper ships to engage in the rapidly increasing trade with the East Indies and with California, especially in the immense passenger traffic to the coast of the latter State, on the Pacific. In vessels of this class, the voyage around Cape Horn was less dreaded. The time of a passage from New York to San Francisco was shortened nearly one-half, and was confidently calculated within a few days. A clipper ship, the Flying Cloud, made the voyage in 89 days and 21 hours.

Of this class of ships, the Great Republic, built by Donald McKay, of East Boston, was a grand specimen. It was the largest, and among the faster vessels of its class. It was the greatest merchantman ever built, its capacity being about 4,000 tons. The dimensions were 325 feet in length, beam 53 feet, and the depth 37 feet. There were four masts, all provided with lightning-rod's. The main yard was 120 feet in length; and a single suit of her sails consisted of 15,653 square yards of canvas.

The American river sloops and coasting schooners are the peculiar product of our ship-yards, and are very little known abroad. They have played, and do still play an important part in the business of our domestic commerce, especially on our inland streams and lakes. The steam-screw propeller is rapidly superseding these useful vessels which have given extensive employment to American ship-builders; and steamships are almost universally taking the place of sailing vessels in passenger traffic.
American ship-yards are now extensively employed in constructing steam vessels, and iron is almost universally used in building them. This has been the case, more especially, within the last fifteen years. It is used in the construction of vessels, in order to secure strength, capacity and lightness. It may seem strange to the reader, at first thought, when it is asserted that vessels built entirely of iron are lighter than those built of wood of the same dimensions.

One of the most successful in every way, and the most complete in its appointments for business, among the American ship-building establishments, is that of William Cramp and Sons, known by the title of The William Cramp and Sons' Ship and Engine-building Company. Their works comprise two establishments in Philadelphia, one situated at the foot of Palmer street, on the Delaware river, and the other at the foot of Norris street, on the same stream.

At the establishment at the foot of Palmer street (which has a frontage on the river of 230 feet, and extends from the Port Warden's line to Beach street, 619 feet), they have a machine and blacksmith-shop, and a marine railway, capable of taking out vessels of 2,000 tons burden. There they have just completed one of the largest basin-docks in the United States. It has been constructed with care, in the most scientific manner. The extreme length of the basin is 462 feet, and will accommodate a vessel 450 feet in length on a draft of twenty feet on three feet blocks. The width of the basin is 111 feet, and requires 4,200 piles. The keel blocking is of wedged blocks, arranged to haul under and fit a damaged or hogged keel—a very important consideration. Two rows of sheet piles will make it thoroughly water-tight. It has four centrifugal pumps, each having a capacity of lifting 30,000 gallons of water a minute, making an aggregate pumping capacity of 120,000 gallons a minute. This is greater than the capacity of any dry dock in the United States. By great discharge pipes, it can be entirely freed of water in forty-five minutes. Such facilities for repairing the large class of vessels, the growing commerce of Philadelphia has long demanded. The cost of this great basin and its appurtenances, including the land, was about half a million dollars.

The establishment at the foot of Norris street, has a frontage on the Delaware of 600 feet, and extends back 700 feet to Beach street. The establishment there is mainly devoted to the construction of new work, such as iron and wooden hulls of vessels, and marine engines and boilers; and it is said to be one of the finest, in every particular, in our country. The boiler and machine-shops are on a large scale; so, also, the tools and machinery employed in preparing the iron for ship-building, are of the most approved patterns and of great power.

The regular working force of the Cramp Works is 1,200 men; but the
capacity is sufficient for the employment of 3,000 men, if necessary. The establishment was founded in 1830, and for about thirty years it was engaged in building wooden ships and steamboats. Since 1860, the business of constructing iron vessels has been almost exclusively carried on in them, although they are prepared for building wooden vessels.

These works were of signal service to our government during the late Civil War. There was built the famous iron-clad steam frigate New Iron-sides, and other iron-clad vessels, at a time when neither the resources of the government navy-yards nor the progress of that kind of naval architecture elsewhere afforded facilities commensurate to the performance of the required task. This work was so satisfactorily done for the government, that since the war they have been continually engaged in building iron steamships chiefly for the coast trade. Of this class of ships, some extremely fine specimens have been constructed there.

In 1870, the American Steamship Company was formed by a number of Philadelphia merchants, who believed that an American line of iron steamers could be built and owned there, which would successfully compete with the foreign lines from New York. The Pennsylvania Railroad Company, perceiving the importance of an European connection for forwarding their grain freights from the West, and the possibility of securing a large direct emigrant passenger traffic from East to West, by steamers arriving directly at Philadelphia, became a large stockholder in the Steamship Company. To that railroad company, and especially to the business men of Philadelphia, the credit is due for establishing the line without government aid or subsidies of any kind.

The Company resolved to build four first-class iron steamships, and the construction of these was entrusted to William Cramp and Sons, the first to be delivered by July, 1873, and the fourth by January 1, 1874. When the contract was made, the price of American iron, which they would use, was low in consequence of heavy importations. Afterward the price of iron rose full thirty per cent., but to the credit of the firm, the contract was faithfully fulfilled, and the work was completed at the time specified.

The vessels built for the American line, were named respectively, Pennsylvania, Ohio, Indiana and Illinois. The Pennsylvania, the first one built, cleared for Liverpool in July, 1873, and the Illinois went into the service in January, 1874. These ships have made better average time in their passages than most of the foreign lines, and have thus far carried full cargoes of freight and full complement of passengers, without damage to the former, or accident to the latter. They are commercially as well as mechanically successful.

The four ships are built upon the same general model throughout. They are made of American materials and by American mechanics. Their extreme length, each, is 355 feet; beam 43 feet, and depth of hold 35 feet.
Their tonnage is 3,016 by custom-house measurement. They are rigged as brigs, having two masts with yards for square sails; and they have a capacity for 1,740 tons of dead weight cargo, exclusive of 720 tons of coal. They have also a capacity for 5,141 bales of unpressed cotton. There are in each, accommodations for 100 first-class cabin passengers, and 800 steerage passengers; and each vessel is furnished with an independent compound propeller engine, which develops 1800 indicated horse-power. The dimensions of high-pressure cylinder, 57 inches in diameter; low-pressure cylinder, 90 inches in diameter. They are confessedly the finest marine engines of the compound type ever built in America; and they challenge the world for completeness and excellence in every particular. These vessels make an average speed of thirteen miles an hour. When full freighted, and with a full number of cabin and steerage passengers, officers and crew, outfit and stores, they do not draw over twenty feet six inches in fresh water. These are the only steam vessels that carry the American flag in the trade between the United States and Europe. The cabins of these steamers are elegantly fitted up and furnished, and every appointment for the comfort of passengers is complete.

William Cramp and Sons have built 197 vessels of various classes, amounting to a total of 104,000 tons. These have been freighting and clipper ships, and every other sailing and steam vessel. They have built many of the steamers for the famous Clyde's coastwise and West India lines. Among these are the Clyde, 1,000 tons; the George W. Clyde, 1,000 tons, and the Columbus, 1,850 tons. They have also altered several of the side-wheel steamers of that line, into screw steamers, thereby doubling their capacity for cargo, greatly increasing their speed and reducing their running expenses very materially.

Cramp and Sons have recently completed six iron screw steam colliers for the Philadelphia and Reading Railroad Company, each capable of carrying a cargo of 1,600 tons of coal. These vessels deliver Pennsylvania anthracite coal to the various Atlantic sea-ports of the United States; and when running to Southern ports, they bring return cargoes of cotton and other Southern products.

Cramp and Sons have also built several vessels for the United States government. The first was the New Ironsides already mentioned, that performed efficient service during the Civil War. They have constructed steamers for the light-house service; also transports for the War Department and the double-end gun-boat Wyalusing; and the screw steamer Chattanooga, 3,500 tons. At their establishment was also built the iron monitor, Vassar, 2,500 tons, and there the monitor Tunxis, 2,500 tons was rebuilt. At the present time the double-turret iron monitor Terror is in the course of reconstruction at their establishment.

There are now sixteen establishments in the United States where steam-

In 1874, John Roach and Son, at Chester, on the Delaware river, built two magnificent steamships for the Pacific Mail Steamship Company, which were, in every respect, successful rivals of the best British-built steamships. These were named, respectively, City of Peking and City of Tokio. Their dimensions were 423 feet in length over all; 48 feet in breadth of beam, and 38 feet depth of hold. Each was 5,000 tons burden. In the same month when the City of Peking was launched, the celebrated Cunard steamer Bothnia, was launched on the Clyde, whose length is 455 feet; breadth of beam 42½ feet; depth of hold, 36 feet, and tonnage 4,500.

The establishment of the iron ship-building business at St. Louis, is an important event in the history of American industries and of our internal commerce. It was founded in 1874, when its first vessel was built of plates made by the Laclede Rolling-mill. "There will be plenty of work for such a yard none need doubt," says a late newspaper-writer. "The coming river tonnage for the entire Mississippi Basin, will be iron hulls, mainly for freighting purposes. Iron tow-boats and iron barges for the entire trade of the Mississippi, Missouri and the Illinois rivers, will give abundant work for such an establishment for some time. Ocean vessels with iron hulls may be constructed in St. Louis quite as cheap as elsewhere, as there will be a combination of cheap iron, cheap timber, cheap living and as cheap labor as elsewhere in the country."

The history of the Clyde's Line of Coastwise and West India Steamers above mentioned, forms an interesting chapter in the annals of American commerce and American enterprise. The business was established in 1840, by Thomas Clyde, of Philadelphia. That was about the time when the screw propeller was introduced for practical use for commercial purposes. One of the first successful applications of this new system of propulsion, was by Mr. Clyde, in the establishment of a line of steamers to ply between Philadelphia and Baltimore, called, in honor of the originator of the system, the Ericsson Line. (See page 190.) This line was composed of two of the first screw steamships built in this country. The use of the screw in competition with the less economical side-wheels, has been one of the principal important
causes of the expansion and success of the Clyde system of lines of commercial vessels.

Following the establishment of the Ericsson Line, was the building, in 1844, of the ship McKim, also a screw steamship, and then one of the largest vessels of its class afloat. It was the pioneer of the lines established, and was run in 1844 and 1845, between New Orleans and the Texan ports. This ship also did duty as a transport for the United States government on the breaking out of the war with Mexico. Subsequently the McKim went around Cape Horn to California, during the gold-fever, and laid the foundations of a fortune for every person who became her owner. Finally, after being thoroughly worn out in service on the Pacific coast, she quietly sunk at her anchorage in the harbor of Acapulco, leaving behind her the good character of never having lost a single human being from her decks.

In 1850, Mr. Clyde established a line of screw steamers between New York and Philadelphia, which existed until the breaking out of the Civil War in 1861. He had also established lines, during that period, on the Delaware and Chesapeake bays, running from Baltimore to various Southern ports. The war and the blockade that ensued, put an end to the coastwise business with those ports, while lines not affected by these circumstances continued their operations successfully.

Mr. Clyde took into partnership his sons, and the firm name was then Thomas Clyde and Company. After the Civil War they established additional lines of screw steamers between New York, Norfolk and Richmond; New York and Wilmington; New York and Charleston; New York and Savannah; New York and Fernandina, (Florida); New York, Key West and Galveston; New York and Havana (Cuba); New York and the Haytian ports; New York, San Domingo and Porto Rico; New York, Philadelphia, Providence and Boston; Philadelphia and all the Southern ports; Baltimore, Richmond and the various Southern ports, and between New Orleans and the West India ports.

This expansion of the shipping business of Clyde and Sons has occurred from year to year, notwithstanding the depressing obstacles with which commerce under the American flag has been compelled to contend since the close of the Civil War. These have been so great as to render it practically impossible for it to compete successfully for the trans-Atlantic trade, against foreign lines established during that conflict, and which, in many instances, have been sustained by generous subsidies from their respective governments.

With keen foresight and with commensurate enterprise, Clyde and Sons have extended their shipping system to the waters of the Pacific ocean, with a belief well-founded upon the recent developments of commerce on those seas, that a vast field for profitable traffic there, not only legitimately belongs to the realm of American commerce, but which, unless unwise legislation
shall interpose, the Americans will be able to occupy against all competition. The accomplishment of this end will be of vast benefit to American interests of every kind in connection with the trade with Japan and China, and the islands of the Pacific.

This Centennial year witnessed at its opening the extension of the Clyde system of coastwise commerce with screw-propelled steamships, which has connected the principal Atlantic sea-ports with those of Chili, Bolivia, Peru, and Ecuador; the Central American States; San Diego and San Francisco in California, and Portland in Oregon. In all this immense coastwise business, pursued with most remarkable persistence and courage, wisdom and skill, Thomas Clyde and Sons employ a fleet of over sixty American-built steamships. It involves a capital of many millions of dollars, and implies an annual product of many more millions of dollars.

Iron-clad vessels of war are not so great a novelty as most people suppose, although it is only within the last twenty years that they have come into practical use. The idea of protecting the sides of vessels from the weapons and missiles of an enemy, was seen in the practice of the Norman sea-rovers who arranged their metal and raw-hide bucklers for the purpose, along the sides of their little dumpy ships. In the twelfth century they put a belt of iron-plate around their vessels just above the water-line, and sometimes extended it above the bulwarks for the protection of the archers. In a similar manner, the Crusaders, a hundred years later, protected their ships on the Mediterranean sea.

In the fourteenth century, Pedro the Cruel, of Spain, ordered his ships to be covered with raw-hides to protect them against incendiary missiles. A vessel of the fleet commanded by Andrea Doria in an expedition against Tunis, in 1535, (furnished by the Knights of St. John of Jerusalem), was covered with thick plates of sheet-lead. A partial iron clothing was used for their floating batteries, by the French in their unsuccessful attack upon Gibraltar, in 1782; but it remained for an American citizen to invent a real iron-clad vessel, full sixty years ago.

While I was examining records and models in the Patent-office, several years ago, I found a specification of an iron-clad steam vessel of war, made early in 1814, by Thomas Gregg, of Pennsylvania, for which he obtained a patent in that year. The specification was accompanied by full and sectional drawings, as usual. The following is a copy of a portion of the specification:

"The boat is framed on an angle of about fourteen degrees all around the vessel, where the top timbers elevate the balls, and the lower ones direct them under her. The top-deck which glances the ball, may be hung on a mass of hinges near the ports; said deck is supported by knees and cross-timbers on the lower sides, so that it may be sprung with powder, if required (when boarded by the enemy), to a perpendicular, when the said deck will
be checked by stays, while the power of powder will be exhausted in the open air, and then fall or spring to the centre of the deck again. The aforesaid deck will run up and down with the angle, which may be coppered or laid with iron. The gun-deck may be moved at pleasure, to give room, if required, as the men and guns are under said deck. The power is applied between her keels, where there is a concave formed to receive them from the bow to the stern except a small distance in each end forming an eddy. The power may be reversed to propel her either way. Said power is connected with upright levers to make horizontal strokes alternately. The elevation of her timbers and gearing, will be proportioned by her keel and tonnage."

The specification further states that the whole vessel would be covered with plates of iron. The drawings show that the form of the vessel was almost precisely like those constructed by James B. Eads, a civil engineer at St. Louis, at the beginning of the Civil War, which, because of their peculiar shape were called "turtle-backs," and were extensively and efficiently employed on the Western rivers, during that conflict.

It is also on record, that, so early as 1807, when Fulton made his first voyage from New York to Albany, in the Clermont, Abraham Bloodgood, of Albany, suggested the construction of a steam floating battery, to revolve in a manner not unlike the turret of the Monitor class of iron ships that were constructed and used during the Civil War.

When the harbor of New York and the Chesapeake bay were closely blockaded, toward the close of the war with England, in 1814, Robert Fulton proposed to construct a floating battery for the government of the United States, capable of being moved by steam at the rate of five or six miles an hour, and having her walls proof against the heaviest missiles of war then in use. The government ordered such a vessel to be built. It was begun in June, 1814, and was launched in October the same year; but on account of delays in the construction of its machinery, it was not ready for service before June, 1815, several months after the declaration of peace had been promulgated.

This battery Fulton called the Demologos. It was 150 feet in length, and was composed of two hulls connected parallel with each other, with a separating space between of about thirteen feet in width, in which the paddle-wheel was placed. The battery and machinery were protected by a heavy wooden wall six feet in thickness, but it is not certain that this was covered, in any part, with even a thin plating of iron.

The armament of this vessel consisted of thirty thirty-two-pounders. After the death of the constructor, it was named Fulton, in his honor. That formidable vessel, superior to anything then afloat for the purpose for which it was made, was destroyed by the explosion of its magazine in 1829, while lying at the navy-yard at Brooklyn, as a receiving-ship.
Propositions for the construction of iron-clad frigates were made in France as early as 1826. In 1838, the *Fulton II.*, an American steam ship-of-war, was covered, it is said, with a coat of thin iron-plates; and in 1842, Robert L. Stevens, of Hoboken, New Jersey, submitted to our government the plan of an iron-clad battery, to be moved by steam, for the defence of our commercial ports. The government directed experiments to be made, and finally ordered the construction of a battery, by Mr. Stevens. It was begun in 1854. Its length was 420 feet, and it was to be moved by a screw-propeller. All of the machinery and the men to work the guns were to be within shot-proof armor. The huge vessel was yet incomplete when, in 1874, the State of New Jersey, to which it had been bequeathed by one of the Stevens family, offered it for sale at auction.

The experiments made by the United States government, in the matter of armored ships, were repeated in England and France; and in the spring of 1858, Napoleon the Third, satisfied that an iron-clad ship would be almost if not absolutely invulnerable, ordered the construction of the great armored frigate *La Gloire*, at Toulon. From that time wooden ships began to give way to iron-clads and those made wholly of iron; and the outbreak of our Civil War gave a great impulse to invention here, in that direction. Eads' "turtle-backs" gun-boats soon appeared on the Western rivers. The frigate *Merrimack*, raised from the deep at Norfolk, was converted by the Confederates into an iron-clad "ram," and began depredations among the national shipping in Hampton Roads, when a small iron vessel, its sides scarcely seen above the water, and with a revolving iron turret bearing heavy cannon, appeared in the gloom of night, and attacked and disabled the *Merrimack*. Lieutenant (now rear-admiral) John L. Worden, was the commander of the strange vessel.

That little vessel with a turret, had been built at Greenpoint, near Brooklyn, New York, in one hundred days, under the direction of Captain John Ericsson, at a cost of $275,000, and was called the *Monitor*. The turret system is an invention of Theodore R. Timby, a native of Duchess county, New York, where he was born in 1822. He conceived the idea of a revolving-turret for military purposes when he was a lad. At the age of nineteen, he made a model, and at the beginning of 1843, before he was quite twenty-one years of age, he filed his first caveat in the United States patent-office. Mr. Timby obtained other patents for improvements and received for his invention the official sanction of the national government, several years before Captain Coles of the British navy claims to have invented the turret.

When the Civil War broke out, Mr. Timby perfected his invention, and obtained a fifth patent—a broad one, for it was "for a Revolving-Tower for Offensive and Defensive Warfare whether used on Land or Water." The
constructors of the "monitors" which followed the vanquisher of the *Merrimack*, recognized the validity of Mr. Timby's claim, and paid him a liberal sum for the right to use his invention. To Captain Ericsson belongs the credit of first giving it a practical application in this country, and to Captain Coles, for its application in England. The conflict between the *Monitor* and the *Merrimack*, in Hampton Roads, demonstrated the vast superiority of iron-clads over wooden frigates, and all nations have since been cutting down and iron-plating their wooden vessels, and building new ones of iron.

In the navy of the United States, at the present time, there are 147 vessels of all kinds, carrying an aggregate of 1,195 guns, and are of 152,492 tons measurement. The steam vessels of the navy as distinguished from iron-clads and torpedo-ships, number 95, of which 25 are tugs; and 29 of all classes are in ordinary. Of the wooden ships, 18 are substantially new. Besides these, 32 others, the largest and most efficient vessels in the navy, are in actual service either as cruisers or training-ships. Our iron-clad fleet consists of 26 vessels, of which 21 are of the monitor type, and two are torpedo-ships. All of them are very powerful both for defensive or offensive operations near our coasts.
CHAPTER XXVIII

PEACE between the United States and Great Britain was proclaimed in 1783, and then was opened a new era in the commercial world. The commerce of the United States had been ruined by the war and the few manufacturers which the necessities of that period had called into existence, were compelled to encounter ruinous competition from excessive importations of goods from Europe. The finances of the country were in a wretched state. There was very little specie, and there was no national mint to create any. The country was flooded with paper money to the amount of $360,000,000, for, in addition to the Continental Bills issued by the Congress, each State claimed the right, (and most of them exercised it,) to issue paper money. The Continental bills held by everybody, were worthless, and the State issues were very much depreciated.

The Confederation was in debt over $40,000,000, and the individual States full $20,000,000. A debt of more than $70,000,000 lay upon the shoulders of an exhausted people. Each State exercised the right of imposing duties upon imports and exports, making their paper money a legal-tender, and imposing taxes. The semblance of a national government which the Articles of Confederation presented, was only a ghost, unsubstantial and powerless. The public credit was at zero, and the individual credit was very low. The collection of debts had been suspended during the war, and now the courts were crowded with litigants. There was confusion, and doubt and exasperation everywhere; and rebellion and secession were ready for open demonstration in many places.

There appeared ominous signs of an impending destruction of the political fabric which had been reared by Washington and his compatriots. The idea of forming two or three distinct confederacies took possession of the public mind. Western North Carolina revolted, and the new State of Franklin was formed by the insurgents. A portion of south-western Virginia sympathized in the movement. Insurrection against the authorities of Pennsylvania appeared in the Wyoming valley. At Portland, a convention deliberated on the expediency of forming the Territory of Maine into an independent State. An armed mob surrounded the legislature of New Hampshire, and demanded a remission of taxes; and in Massachusetts, Daniel Shays, who had been a
captain in the Continental army, placed himself at the head of a large body of armed insurgents, and defied the government of that State. The moving cause of all these demonstrations was resistance to taxes. The remedy for all these evils was found in the Constitution framed in 1787, which converted the League of States into a concrete and powerful nation.

Meanwhile the commerce of the United States, ready for a bounding career, was depressed and shackled. The League had been unfortunate in attempts to establish commercial relations with foreign countries, especially with Great Britain. At the conclusion of peace the Americans indulged in pleasing hopes of a profitable commercial arrangement with that country, for the liberal ministry under the Earl of Shelburne, had devised generous measures toward the people of the new republic. William Pitt, son of the great Chatham, then only twenty-four years of age, was chancellor of the exchequer, and clearly perceiving the value to Great Britain of friendly relations with the government of the United States, introduced a bill into Parliament for the regulation of commerce between the two countries, by which trade with the West India islands and other colonial possessions of the crown would be thrown open to the enterprise of the merchants of the United States. American commerce lifted its head in hope.

But this measure, involving a powerful element of solid peace and harmony between the two governments, was destined to fail. There seemed not to be practical wisdom enough among British statesmen to perceive the mutual advantage. The blind and selfish shipping interest, still potential in Parliament, opposed it; and the Shelburne administration did not survive the proposition a month. North and Fox, Burke and Cavendish, Portland and Stormont, who had differed widely, astonished everybody by coalescing, and forming a new ministry, opposed to the liberal views of Shelburne and Pitt. They refused to regard the United States government as a friend and equal, and inaugurated a restrictive commercial policy, assuming the offensive position of lord and master in the presence of vassals and slaves.

There was a show of reason for this assumption, for it was plainly perceived that the League of States did not constitute a nation. There were such evident elements of dissolution in that compact, that the prophecies of refugee Tories in England that the disorganized fragments of the inchoate nation would soon be seeking annexation to the British empire, were accepted as truths by British statesmen. Lord Sheffield, in a formidable pamphlet, expressed the views of the ruling class in England. He declared his belief that ruin would soon overtake the League, because of the anarchy in which the States were involved in consequence of their independence. He advised his countrymen to regard them as of little account as a nation. "If the American States," he said, "choose to send consuls, receive them, and send
a consul to each State. Each State will soon enter into all necessary regulations with the consuls, and this is the whole that is necessary."

That pamphlet seems to have given direction to British legislation, and bias to the British mind concerning the weakness of the League. It was followed by Orders in Council by which American vessels were excluded from the British West Indies; and the staple products of the United States were not allowed to go to Great Britain, except in British vessels. The General Congress asked the legislatures of the several States to give them power for fifteen years, by which they might compel England to a more liberal course, by countervailing measures of prohibition. The jealous States refused, and the country was flooded with British goods, to the detriment of the whole people, while American vessels were compelled to go to England in ballast, in order to bring back freight.

John Adams was sent as minister of the United States to England, early in 1785. He was politely but coldly received by the government and the people. When he proposed to have the navigation between all of the possessions of the British crown and all the territories of the United States placed upon a basis of perfect reciprocity, the offer was not only rejected with scorn, but the minister was given to understand that no other, in relation to trade, would be entertained by the British government. When he recommended his own government to pass countervailing navigation laws, he was met by the fact, that it had no power to do so. Finding his mission fruitless, Mr. Adams returned home. The English government, considering the League as only a fifth-rate power, refused to send a resident minister to the United States, or yield one iota of its tyrannical commercial strength.

The scene soon changed. Wise and patriotic men met in convention in Philadelphia, in the summer of 1787, and proposed a new constitution of government for the United States. It was adopted, and in the spring of 1789, the nation which it created, began its career. It attracted the profound attention of the statesmen and governments of Europe. It was perceived that the commerce, diplomacy and dignity of the United States were no longer at the mercy of thirteen distinct and clashing legislative bodies, but that they were guarded by a central power of wonderful energy. England, France, Spain and the Netherlands hastened to send representatives to the Republican Court, and Great Britain soon became a suitor for that reciprocity in commercial transactions which, when asked for by the Americans, she had refused with the tone of a haughty master, able and willing to dictate terms. The Americans dealt generously with the British, then, yet it was not until 1816, after the second war for independence with Great Britain, that reciprocity treaties fairly regulated the commerce between the two countries.
The Congress now possessing ample powers to levy taxes and to regulate the commerce of the country, domestic and foreign, proceeded under the wise leadership of Alexander Hamilton, the first Secretary of the Treasury of the new nation, to the delicate and important task of laying the foundations of the financial and commercial policy of the United States. That policy was defined in his report in December, 1791, on the manufactures of the country, in which he proposed a tariff for revenue so high that it would operate practically as a tariff for protection. It was not, however, until 1816, that a tariff was established avowedly for protection.

Up to that time there had been twenty-five acts in which tariffs had been established, all for revenue; in the spring of that year the first of a series of tariffs for the protection of American manufacturers was established under the sanction of President Madison. It was the progenitor of all the subsequent protective tariffs, until toward the close of the administration of John Quincy Adams, the policy of imposing heavy duties upon foreign articles of the same kind manufactured in the United States, assumed the shape of a settled national policy which was denominated The American System.

This policy took its most conspicuous shape in the tariff act of 1828, which was specially designed for the protection of the woolen and cotton manufacturers. It was very popular, of course, with the manufacturing classes of the North, and it was very unpopular with the cotton-growers of the South. It was lauded as wise and just by the former, and denounced as unjust, oppressive and unconstitutional by the latter. The feeling of opposition increased in intensity every day in the cotton-growing States, and resulted in 1831 and 1832, in the dangerous movements in South Carolina, known in our history as Nullification. Some compromise measures adopted by Congress, allayed a fearful rising storm.

The financial and commercial policy prepared by Hamilton, and adopted by Congress, soon restored public credit, and it has remained the general policy of the country ever since. The commerce of the United States was placed on an equal footing with that of the most favored nation on the face of the earth. Custom-houses were erected and equipped with implements and men; armed "revenue cutters," as certain vessels are called, were authorized by Congress, to enforce the tariff laws; a national mint for coin ing money, was created; a post-office system was arranged; a national banking house was founded, and other regulations were adopted for the wise administration of public affairs.

It may be properly remarked here, in passing, that the operations of our General Post-Office at the seat of government, which is intimately connected with our commercial system, exhibits in a most remarkable degree, the progress of our country during the last one hundred years. By a resolution of the Continental Congress, passed on the 26th of July, 1775, Dr. Benjamin
Franklin was appointed Postmaster-general of the United Colonies, with a salary of $1,000 a year for himself, and $340 a year for a Secretary and Comptroller, with power to appoint such, and as many deputies throughout the colonies, as he "should think proper and necessary."

The Postmaster-general was directed to establish a line of posts from the present Portsmouth in New Hampshire, to Savannah in Georgia; and to allow to the deputy-postmasters, in lieu of salary, and all contingent expenses, twenty per cent. on the sum they should collect and pay into the general post-office annually, when the whole was under $1,000, and ten per cent. for all sums above $1,000 a year.

Dr. Franklin had been Deputy Postmaster-general for the colonies under royal rule, but was spitefully dismissed from office in 1774. The disorders in America soon afterward broke up the colonial postal system, but a germ had reappeared before the appointment of Franklin by the Congress. William Goddard, an enterprising newspaper publisher in Baltimore, had, with the co-operation of the New England provinces, established a postal system there, as early as the period of the battle of Bunker's Hill in June, 1775. Post-offices had been established, with regular rates of postage, and post-riders were employed. This movement caused the action in Congress in July following.

Dr. Franklin entered upon his duties with his usual skill, method and vigor. He sent a circular letter on the subject of a postal system, throughout the colonies. Upon it was a rude figure of a post-riding on horseback, and this was the original of the same device engraved on the seal of the Post-Office Department in 1791, and which it yet bears. By the early autumn of 1775, a continuous post route was established from the Kennebeck river on the north-east, to the Savannah river on the south, with several cross-routes to the mountain ranges in the interior. In colonial times the official frank of the sage, was "Free, B. Franklin." He now changed it to "B. Free, Franklin," and so conveyed an injunction of universal application among his countrymen.

Franklin held the office a little more than a year when, late in October, 1776, he sailed for France on a diplomatic mission. His secretary, during about fifteen months, had filled only about two quires of foolscap paper in a three-quire blank-book, with the entire records, financial and otherwise, of the General Post-office Department. That little book may now be seen at the General Post-Office in Washington city, in contrast with the immense ledgers which are filled every month with the records of the same department. I know of nothing in existence that so palpably, at a glance, marks the progress of our country during the intervening century, as that little three-quire book two-thirds full of entries, in the midst of the great rows of ponderous account-books in the same department to-day.
When Dr. Franklin left the office of postmaster-general, in the fall of 1776, the whole number of post-offices in the United States was 75; the whole number in 1875 was about 35,000.

The entire length of post-routes in 1776 was 1,875 miles; in 1875, the entire length was 277,873 miles. Of this number, over 70,000 miles of travel were by railroad, and nearly 16,000 by steamboat, while the other routes number 192,000 miles. The entire length of the transportation for a year, was 133,822,216 miles, and the cost of the same, for the year, was $15,353,375.

The entire receipts of the Post-office Department, for the fifteen months ending in the autumn of 1776, were $27,900, and the expenditures were $32,142; an excess of expenses over the income, of $4,242. In 1875, the annual receipts of the Post-office Department were $26,671,218, and the expenditures were $33,611,309; an excess of expenses over the income, of about $6,000,000. Included in the receipts were about $6,000,000 of grants from the national treasury, for special purposes.

The General Post-office Department issues postage stamps, stamped envelopes and wrappers, and postal cards. The whole number of stamps issued during the year ending with June, 1875, was 682,342,470; of newspaper and periodical stamps, 2,209,215; of plain stamped envelopes, 72,285,150; of request stamped envelopes, 54,631,000; of postal cards, 107,616,000; of official postage stamps, 18,495,940, and official stamped envelopes and wrappers, 12,845,000. The total value of these articles was $25,477,511.

The total number of letters of all kinds, received during the year, at the Dead-Letter office, was 3,628,808, an average of 11,878 for each working day. Of the whole number, 31,779 contained $61,769 in current funds; 14,225 contained commercial paper to the nominal value of $2,997,847; 135,027 contained jewelry, samples of merchandise, photographs, postage and revenue stamps, receipts, bills of lading, and souvenirs of great variety; 214,119 were foreign letters, which, under the provisions of the postal conventions were returned to the countries of origin, unopened; and 3,233,668 contained nothing of value. During the year, 5,428 applications for suposed lost letters, were received, and in 1,950 cases the letters inquired for were found and delivered.

A few years ago the "money-order system," as it is called, was engrafted upon the postal service. The whole number of money-order offices in operation, at the close of June, 1875, was 3,069. The number of domestic money-orders issued during the year, was 5,006,323, the aggregate value of which amounted to $77,431,251. The number of such orders paid was 4,932,747, amounting in value to $76,865,333. The total amount of fees received by postmasters for the issue of domestic money-orders and for
premiums on drafts, was $494,717, and the expenses, such as commissions and allowances to postmasters and incidental expenditures, was $374,575; making an excess of receipts over expenditures, of $120,142.

The total number of letters exchanged with foreign countries, during the year, was 25,135,581. Of this number, 12,854,333 were sent from, and 12,281,248 were received in the United States. The total postage on the letters exchanged with foreign countries, amounted to $1,713,766.

In 1875, a new impetus was given to the railway postal service, by the establishment of fast mail trains. These are railway post-office cars, in connection with passenger trains. They are now transported at greater speed than was ever before attained. Between New York and Chicago is a postal railway-train under the entire control of the Post-office Department, carrying no passengers. The passage between the two cities as we have observed, is made in twenty-seven hours.

There is only one line of steamships (the American, of Philadelphia), carrying the flag of the Republic, employed in conveying the United States mails across the Atlantic; and none whatever to South America. This is a fact, as the Postmaster-general in his last annual report remarks, that "is humiliating to the just pride of every American citizen . . . . As a matter of national pride, and as an aid to the revival of American commerce, and as a means for supplying an efficient steam marine, available for immediate use by the government in case of war, provision should be made for the transportation of our mails on important ocean-routes in steamships officered and manned by our own citizens, and sailing under our own flag."

The operations of our postal system are of vital importance in the prosecution of our commerce, foreign and domestic; and the facilities afforded by cheap postage are of incalculable benefit to the business interests of the country. The figures given above show the vastness of these operations, and afford an idea of their value.

We have remarked that the country was flooded with foreign goods, immediately after the close of the Revolution. The excess of imports from over the exports to Great Britain during the first two years after peace came, furnishes a reason for the distress and embarrassments that prevailed. The imports during these two years were about $30,000,000, or ten dollars a head for every inhabitant of the United States (Indians excluded), while the exports did not exceed $9,000,000. And the transactions of every year from 1784 to 1790 inclusive—seven years—show our annual importations to have been largely in excess of our exportations, excepting in 1788, when they were very nearly equal in value. The exportations to Great Britain, in 1784, amounted to $3,517,000, and the importations from that country amounted to $18,352,000. In 1790, the exportations amounted to $5,955,000, and the importations to about $17,159,000.
In 1787, the French government placed American commerce on an equal footing with its own, and American products were admitted into French ports free of duty. This stimulated agricultural industry and the shipping trade in this country; and the exports to France, in 1788, were marvellous in amount, when we consider that the products were all drawn from the narrow selvedge of land along the Atlantic coasts back to the mountains, by a sparse population. These exports were 246,480 tierces of rice from the Carolinas and Georgia, and 140,959 barrels of flour, 3,664,176 bushels of wheat, 558,891 bushels of rye, and 520,262 bushels of barley from the Middle States and New England.

Political affairs in Europe now favored American commerce. The French Revolution began, and a result was war between France and England. A failure of the harvests in Europe, called for large exportations of bread-stuffs from America, and American ships, being neutral, soon monopolized almost the whole carrying trade on the Atlantic ocean. American ships carried food to England and to Western Europe, and freighted goods between French and other European ports and the West Indies, for it was not safe for French merchantmen to make the voyage in the face of English cruisers.

The Americans, as neutrals, were enjoying a most extensive and profitable carrying trade, when the British government inflicted a severe blow against their commercial prosperity. The "law of nations" laid down by Great Britain to please herself, in 1756, deciding that "no other trade should be allowed to neutrals with the colonies of a belligerent in time of war than what is allowed by the parent State, in time of peace," was put in force. This was in direct opposition to the "law of nations" laid down by Frederick the Great at the same time, and adopted by the Armed Neutrality in 1780, that "free ships make free goods."

The revival of this law was aimed directly at France, the weaker naval power, which, unable to maintain her trade with her West India islands, had, as we have seen, opened her ports to the neutrals. To destroy this lucrative trade of neutrals, and to starve France, the British issued an Order in Council, in the summer of 1793, directing that all vessels laden wholly or in part with bread-stuffs, bound to any port of France or places occupied by French armies, should be carried into England, and their cargoes either disposed of there, or security given that they should be sold only in ports of a country in friendship with Great Britain.

Under this order and a secret one afterward issued, many American vessels ignorant of the measure, were captured by British cruisers. At the same time the British government assumed the right to enter the vessel of a neutral, search for deserters, and if found, to take them from the ship and impress them into the naval service of Great Britain. Under these orders, and with that assumption of power, the Americans were treated with inso-
American merchants were continually robbed by British cruisers, and war between the two nations seemed inevitable. President Washington sent John Jay on a peaceful mission to Great Britain, and he negotiated a treaty that averted war. France was then governed by political madmen, who were offended at the United States for making a treaty with the enemy of France; and French cruisers seized American merchantmen. American commerce was frightened from the open sea. The governing power of France, known as The Directory, treated the American government, in the person of its envoys, with great discourtesy and insolence, and war between the two governments had begun on the ocean. Bonaparte, who, by usurpation had become chief ruler and real autocrat of France, acted more wisely and justly, and in the year 1800, all difficulties between that country and the United States, were amicably adjusted.

Meanwhile American commerce had suffered in another direction. It had made its way into the Mediterranean sea. There our ships were met by North African sea-robbers, who not only seized the merchandise, but held the seamen in captivity in order to procure ransom money. President Washington called the attention of Congress to these evils, as early as 1790, and a commission was sent to the Dey of Algiers to treat with him upon the subject, when that semi-barbarian ruler said: "If I were to make peace with everybody, what should I do with my corsairs? what should I do with my soldiers? They would take off my head for the want of other prizes, not being able to live on their miserable allowance."

Governed by such ethics, the Algerine allowed his corsairs to depredate upon American commerce on the open sea. This they were enabled to do, without the restraining power of the Portuguese, which the British, by a secret treaty, had paralyzed. For several years the Portuguese had been at war with Algiers, and her fleet confined the pirates to the Mediterranean. Portugal had asked Great Britain to aid her in effecting a peace with Algiers, and the former, seeing a chance to injure France, consented to do so.

The British agent at the court of the Dey was instructed how to act in the matter. Without the authority of Portugal to act in her behalf, this agent concluded an arrangement with the Algerine for a truce between the two governments, for one year, with the extraordinary stipulation that the Portuguese government should not afford protection to any nation against Algerine cruisers. This truce was immediate in its operations. The robbers were released, and at once pounced upon ships outside of the straits of Gibraltar. The Bey of Tunis sent out corsairs to join those of Algiers, and a considerable pirate fleet roamed the Atlantic near the European coasts.

The Americans were then without a navy to protect their commerce;
but these events turned the thoughts of our statesmen to the absolute necessity of creating one. There existed only the mere semblance of a navy—the ghost of the Continental marine establishment, that did excellent service during the old war for independence.

A navy is the bulwark of a nation's commerce. The birth of ours was in the autumn of 1775. Its genesis affords an interesting chapter in the history of the progress of the last one hundred years.

When the war for independence broke out between the American colonies and Great Britain, the latter then the most powerful maritime nation on the globe, an attempt of the colonists to combat with the Mistress of the Seas appeared like madness. Yet it was made. Coastwise commerce had produced many expert American sailors, and ship-building, as we have seen, was an active American industry. It was therefore determined to have a Continental navy as well as a Continental army; and four months after the latter was organized at Cambridge, the Congress Resolved, "That a swift-sailing vessel, to carry ten carriage guns, and a proportionate number of swivels, with eighty men, be fitted, with all possible dispatch, for a cruise eastward, for intercepting such transports as may be laden with war-like stores and other supplies for our enemies, and for such other purposes as the Congress shall direct. That a committee of three be appointed to prepare an estimate of the expense, and lay the same before the Congress, and to contract with proper persons to fit out the vessel."

That was the fiat for the erection of an American Navy, a century ago. Already a naval engagement—the first in the war—had occurred off the New England coast. A British armed schooner with two sloops, were employed at Machias, in procuring lumber, when the news of the skirmishes at Lexington and Concord reached that far Eastern sea-port. A party of young men was formed at Machias, for the purpose of capturing the schooner. While her officers were on shore in attendance upon public worship on the Sabbath, these young men seized one of the sloops, armed it, chased the war vessel out of the harbor, and after a severe action outside, in which about twenty persons on each side were lost, the British schooner, named Magaretta, was compelled to surrender.

The commander of the victorious little vessel was Jeremiah M. O'Brien, a brave young man who, encouraged by this success, cruised with the captured schooner and took two English vessels, making prizes of their crews. They were taken to Watertown, in Massachusetts, where the Provincial Congress of that colony were in session. That body commissioned O'Brien a captain, and gave him employment. His exploits exasperated the British, and in retaliation they burned Falmouth, now Portland, in Maine.
Late in 1775, the Provincial government of Massachusetts established a board of admiralty, and passed an act for the fitting out of armed vessels of marque and reprisal, and for establishing a court to try and condemn captured vessels of the enemy. In this Massachusetts took the lead of the other colonies. In a letter written on the day after the action of the Provincial authorities, Washington called the attention of the Continental Congress to the subject, and this led that body to other action concerning the establishment of a navy.

Washington, then commanding the army before Boston, had fitted out five or six armed vessels in the waters that encompassed that city, and these were cruising on the waters of New England, as privateers. The commander-in-chief established the following rule for the division of captured spoil:

"A captain commanding, six shares; first lieutenant, five; second lieutenant, four, surgeon four; master, three; steward, two; mate, one and a half; gunner, one and a half; boatswain, one and a half; gunner's mate, one and a half; sergeant, one and a half, and privates, one." This method of distributing the prizes was afterward confirmed by the Congress.

On the day when the Congress ordered the naval vessel to be fitted out, appeared the germ of our Navy Department, in a Committee appointed to direct marine affairs. On the 30th of the same month (October), it was resolved to fit out two more vessels, one of 20 and the other of 36 guns; and not long afterward an act was passed concerning the capture and disposition of all vessels of war employed against the United Colonies. This was followed, at about the middle of December, by an order issued by the Congress for the construction of thirteen more armed vessels, five of 32 guns; five of 28 guns, and three of 13 guns, to be ready for sea by the first of March following. One of the thirteen new vessels was ordered to be built in New Hampshire, two in Massachusetts, one in Connecticut, two in Rhode Island, two in New York, four in Pennsylvania and one in Maryland.

The Committee to whom the whole subject of construction was referred, reported that the average cost of the ships would be about $60,000 each, and that the materials for the same and for their equipment, might all be obtained in the colonies, excepting the articles of canvas and gunpowder.
The Congress took immediate measures for procuring these articles; and, as we have seen, powder-mills were established. They had already fixed the pay of the inferior navy officers as follows: midshipmen, $12 a month; armorer, $15; sail-maker, $12; yeoman, $9; quartermaster, $9; quarter-gunner $8; cook, $12; and coxswain, $9.

The following year the pay of the officers of the higher grades was fixed as follows: of ships of ten and twenty guns, captain, $48 a month; lieutenant, $24; masters, $24; surgeon, $21.66; and the lower grades as before. Of ships of twenty guns and upward, captain, $60 a month; lieutenant, $30; master, $30; surgeon, $25; and chaplain, $20. Commanders were allowed four and five dollars a week for subsistence, and others four dollars a week for the same purpose, when ashore.

Toward the close of 1775, the Naval Committee was remodelled, and made to consist of one member of Congress for each of the thirteen colonies. They possessed very little executive power. Naval subjects were generally referred to them for examination. They reported to Congress, who gave them instructions how to act. They appointed all officers below the rank of third lieutenant, and had the control, under the direction of the Congress, of all the naval operations. But their lack of professional knowledge caused many and vexatious mistakes; and the Congress finally resolved to select three persons, well skilled in marine affairs, to execute the business which had been intrusted to the general committee.

These experts composed what was termed "The Continental Navy Board, or Board of Assistants of the Marine Committee," which remained in active operation until the autumn of 1779, when a "Board of Admiralty" was established, composed of three Commissioners not members of the Congress, and two members of that body. This board was subject, in all cases, to the control of the Congress. There was a secretary who performed the greater share of the actual business of the board. The head-quarters of this Navy Department was at Philadelphia, then the seat of the National Government.

In 1781, another change took place, when General Alexander Macdougal, of New York, was appointed "Secretary of the Marine," or Secretary of the Navy, under the old Confederation. A few months afterward, Robert Morris, the distinguished financier of the Revolution, was appointed a general "Agent of Marine," and an admiralty seal was adopted, composed of an escutcheon with a chevron of stripes alternate red and white, an anchor below, and a ship under full sail, as a crest.

In 1776, the Congress fixed the relative rank of officers in the Army and Navy as follows: an admiral was equal in rank to a general; a vice-admiral to a lieutenant-general; a commodore to a brigadier-general; the captain of a ship of forty guns and upward, to a colonel; captain of a ship of ten to
twenty guns, to a major; and a lieutenant in the navy was equal to a captain in the army. Ezekiel Hopkins, of Rhode Island, was appointed commander-in-chief of the navy, and was our first commodore, with John Paul Jones as his chief lieutenant; and the first naval squadron of the United States that went to sea on a cruise, started from the Delaware river in February, 1776. It was composed of the Alfred (the flag-ship), of 28 guns; the Columbia, 28, commanded by Abraham Whipple; the Andrea Doria, 14, Captain Nicholas Biddle; the Sebastian Cabot, 16, Captain John B. Hopkins, and the Providence, 12, Captain Hazard.

John Paul Jones first raised the American ensign over a ship-of-war, by running it to the mast-head of the Alfred, in December, 1775, when Hopkins' squadron lay in front of Philadelphia. That ensign was the flag in common use among the soldiers of New England, with a pine tree in the centre of a plain white ground, and bearing the words—Liberty-Tree—Appeal to God. The Union flag of thirteen stripes, alternate red and white, which was adopted by the army at Cambridge, and was displayed for the first time on the 1st of January, 1776, was raised over the Alfred when she sailed from the Delaware, in February. On it was a representation of a rattlesnake with the significant words, Don't tread on me!

Such was the beginning of the United States Navy a hundred years ago. The government vessels and privateers did good service during the war for independence. Privateering, although it is only legalized piracy, was regarded as honorable, if confined in its operations to the property of the belligerents. Robert Morris engaged extensively and profitably in the business; and Washington was, at one time, part owner of a privateer with his step-son, John Parke Custis.

After the war there seemed to be little use for a navy, and it was neglected. In the organization of the Executive Department of the new government, there was no provision made for a Naval bureau, the functions of the Secretary of the Navy being performed by the Secretary of War. This indifference continued until 1793, when depredations upon American commerce by Algerian corsairs became, as we have seen, more alarming than ever.

Congress was now aroused to a sense of the importance of providing protection to American property afloat. In the spring of 1794, that body appropriated almost $700,000 for the purpose; and President Washington immediately proceeded to put the act in force. Congress authorized him to provide by purchase or otherwise, several vessels, and man and equip them. He commissioned captains and superintendents, naval constructors and navy agents, six of each, and ordered the construction of six ships. Before these were completed, the United States adopted a measure of humanity which other European nations had been compelled to do, and made a treaty with the Dey of Algiers, by which an annual tribute was to
be given him for the redemption of captives. This was humiliating, but it seemed unavoidable. This treaty was made late in 1795, when work upon the naval vessels was suspended.

The folly of this suspension was soon made apparent when the officers of British cruisers boarded our merchant vessels, took from them seamen under the often false pretext that they were deserters, and impressing them into the British service. Then the French cruisers depredated upon American commerce under the sanction of a barbarous decree of the Directory, which was almost tantamount to a declaration of war. It was issued in May, 1797, and authorized the capture of American vessels under certain conditions, declaring that any American found on board of a hostile ship, though placed there without his consent by impressment, should be hanged as a pirate. So American seamen, continually liable to impressment by the British, were to be subjected to a pirate's fate by the French! No wonder that American commerce withdrew from the ocean for awhile.

In this state of our foreign relations, Congress directed three of the six frigates ordered in 1794 to be completed, launched, and put into commission; and before the close of the year the United States, 44, Constitution, 44, and Constellation, 38, were ready for sea. The Constitution, which won many a victory on the sea, is yet afloat, and lies in the Delaware at Philadelphia, a notable part of the grand Centennial Exhibition. Many years ago, the Secretary of the Navy ordered her to be broken up, and her timbers to be sold, but she was saved by the vehememt remonstrances of patriotic American citizens. Among the most powerful of these protests, was the following stirring poem by Oliver Wendell Holmes:

“Ay, tear her shattered ensign down!  
Long has it waved on high,  
And many an eye has danced to see  
That banner in the sky.  
Beneath it rung the battle-shout,  
And burst the cannon's roar;  
The meteor of the ocean air  
Shall sweep the clouds no more.  

“Her deck once red with heroes' blood—  
Where knelt the vanquished foe,  
When winds were humming o'er the flood  
And waves were white below—  
No more shall feel the victor's tread,  
Or know the conquered knee;  
The harpies of the shore shall pluck  
The eagle of the sea!”
In 1798, ample provisions were made on sea and land for war with France. A Navy department was created, and in April that year, Benjamin Stodert, the first secretary of the navy, entered the cabinet as a minister. A speck of war, as we have observed, occurred on the ocean between the vessels of the two nations, and peace was secured by the exercise of the wisdom and justice of Bonaparte.

With the opening of the present century the insolence of the piratical powers on the African shore of the Mediterranean, became unbearable. When Bainbridge went to Algiers with tribute money, and was ordered by that ruler to take a semi-barbarous ambassador to Constantinople, in his ship, he refused, whereupon the Dey said: "You pay me tribute, by which you become my slaves, and therefore I have a right to order you as I think proper." Under the guns of heavy batteries, Bainbridge was compelled to comply with the demand. Not long afterward Commodore Preble was sent to the Mediterranean with a squadron, to humble the pirates, for his government had determined not to pay tribute any longer. He accomplished his errand.

American commerce, long depressed, was reviving, when the British government, by an Order in Council, issued in May, 1806, declared that all the ports of Europe, from the Elbe to Brest, were in a state of blockade. This was an absurd, but an effectual order. Great Britain sent no ships to maintain a blockade at these several ports, but her numerous cruisers frightened away commerce. American commerce with these ports soon ceased, and that of the world was paralyzed by events that followed.

Bonaparte had become "Napoleon the First, Emperor of the French," and from Berlin he issued a decree, in November, 1806, which declared all ports of the British islands to be in a state of blockade. This was intended as a blow at the maritime prosperity of England, and was the beginning of the famous "Continental System" of the Corsican usurper, designed chiefly for the ruin of England. The latter, by an Order in Council, in January, 1807, prohibited all coast trade with France; and so these desperate gamesters played with the world's peace and prosperity, unmindful of humanity or justice.

In spite of pacific attempts on the part of our government to put an end
to these ungenerous measures, American merchantmen were continually seized by the British and French cruisers, and American commerce dwindled to a domestic coast trade. Our navy was insufficient to protect our commerce on the broad ocean. Swarms of gun-boats, which Congress had authorized for the purpose, were properly ridiculed, for they did not afford an efficient coast-guard. The mercantile interest in the United States, then becoming powerful, appealed to the government for redress. The most bitter feeling against Great Britain everywhere prevailed, because she had inaugurated these destructive measures, and because she persisted in a practical assertion of her right to search our vessels for deserters, and when found to take them away.

During this long period of successive excitements, and disturbances of commerce, the American ship owners contrived to do a large and profitable carrying trade between this country and Europe, and commercial operations steadily increased from year to year, both in the matter of exports and imports. The high prices of food in Europe most of that time, on account of wars, had caused large exportations of the surplus of our agricultural products, as well as the winnings from the fisheries, and yet the value of our imports continually exceeded that of our exports, from the year 1790 to the year 1807, inclusive.

The domestic and foreign exports from our country, in 1790, were valued at $20,205,000, and the imports at $23,000,000. In 1795, the exports were $48,000,000, and the imports nearly $70,000,000. In the year 1800, the exports were $71,000,000, and the imports were $91,253,000. In 1807, the exports were $108,340,000, and the imports were $138,500,000. It will be perceived that the importation of goods rose, from year to year, from $23,000,000 in 1790, to $138,500,000 in 1807—a period of eighteen years, while the exports, in the same time, had risen from $20,205,000 in 1790, to $108,340,000 in 1807. During that time, the tonnage of our carrying trade had increased from 474,374 in 1790, to 1,268,548 in 1807.

In considering the excess of imports over our exports at that time, we should remember the fact that a large quantity of foreign merchandise imported was re-exported. In 1807, our domestic exports amounted to nearly $49,000,000, and our foreign exports to almost $60,000,000. At that time, the carrying trade between the countries of Europe and their colonies was conducted almost wholly by American ships, which, for the chance of making enormous profits, risked capture in running the inefficient blockade of ports. This business formed a very large item in the statistics of our carrying trade at that time. It had so increased the tonnage, that the capital of $15,000,000 employed in shipping in 1790 had, in 1807, increased to $50,000,000.

The wealth of our country was rapidly increased by this foreign trade,
which formed one-half of the whole commerce of our people, and yielded to our government an abundant revenue. The fisheries were flourishing; agricultural pursuits were prosperous; manufactures began to assume conspicuous proportions, and cotton-growing was raising the Southern States from great depression, when a period of commercial disaster, that lasted several years, began.

Late in 1807, a British Order in Council was issued, forbidding neutrals to trade with France or her colonies, except on paying tribute to Great Britain. Napoleon retaliated by issuing a decree from Milan, a little more than a month later, forbidding all trade with England and her colonies, and authorizing the confiscation of any vessel found in his ports which had submitted to English search or tribute. These orders and edicts were destructive of the principal part of the foreign commerce of the United States.

In this critical state of affairs, the President of the United States, in a confidential message, recommended Congress to pass an act, levying a commercial embargo. It was done on the 27th of December, by which all American and foreign vessels at our ports were detained, and all American vessels abroad were ordered home immediately, that the seamen might be trained for the war which now seemed inevitable. So the chief commerce of the world was brought to a full stop.

This embargo law produced widespread distress in our country, especially in commercial communities, yet the great body of the people patriotically sustained it. It spread ruin throughout the shipping interest; and finally, as it failed to obtain from England or France any recognition of the rights of Americans or of neutrals, it was repealed on the first of March, 1809. At the same time Congress passed a law forbidding all commercial intercourse with France and England until the "orders" and "decrees" should be repealed. This was the only safe resort, in retaliating, for a nation like ours, then without a navy to contend with either England or France on the ocean.

War between England and the United States soon compelled American commerce, and almost every other industry, excepting textile and some other manufactures, to face ruin and privation for some years. Yet the struggle resulted in vast benefit to the nation. It was really a second war for independence, on the part of the United States, and they gained a glorious victory. All that was contended for by the Americans was not obtained, but much of solid and permanent value was won. Great thralls were broken. The Mistress of the Seas saw with amazement that her despised daughter had become her powerful rival. European monarchs saw that the young Republic had grown into such sturdiness in twenty-five years, that it would not be safe to interfere with the freedom of its commerce. Its navy, though small, had convinced the most skeptical that
American built ships were better constructed for staunchness and speed than any others, and that American seamen were unrivalled in skill and prowess. Europe was astonished, England was mortified, and the people of the United States were jubilant.

For awhile, American commerce and all other industries here had to bear the heavy burden of the consequences of war. Irredeemable paper currency flooded the country when peace came. The national debt, amounting, after the consolidation in 1790, to a little more than $70,000,000, was now more than $127,000,000. Our manufactures were paralyzed by a flood of importations, amounting, in 1816, to $147,000,000, but giving a revenue to the national treasury of over $36,000,000. Our agricultural products no longer found a remunerative sale in foreign markets, for wars had ceased abroad, on the final downfall of ambitious Napoleon, and generous crops had rewarded the labor of the husbandman in Europe. Our ships lay idle at their docks, for the large foreign carrying trade, in which the vessels of the United States had engaged before 1809, was lost forever, the nations of Europe having resumed it.

But there was soon a rebound. The recuperative energies of our people have always been remarkable. The business of the country underwent a readjustment. In New England, in which capital had been chiefly employed in commerce, navigation, and the fisheries, manufactures became a favorite pursuit, under the fostering and stimulating influence of a higher tariff, established in 1816, and made still higher two years later. The surplus products of the country, which had accumulated during the war, found fair markets abroad, and the proceeds liquidated debts. The paper currency was contracted and restored to a specie basis. Cotton had become the staple of the Southern States, and found a ready sale, and the activity of the people during the five years immediately succeeding the war, brought the business of the country to the dawn of a day of prosperity, in 1820.

At that time, thirty years after the founding of the nation, the population of the republic had increased 125 per cent. Five States had been added to the Union of commonwealths, and to its taxable property about 25,000,000 acres, the value of which had increased five-fold. Its manufactures had increased ten-fold, their annual product being then (1820) estimated at about $53,000,000 in value. The tonnage had increased three-fold; the national debt had dwindled from over $127,000,000 to less than $92,000,000, and in 1835 it was totally extinguished; the annual revenue averaged $17,000,000, and the amount of banking capital of the country had increased from $3,000,000 to $137,000,000.

Such was the general condition of our country five years after a war with the most powerful maritime nation on the globe. The foundations of its wealth, prosperity, and strength, were Agriculture and Commerce, aided by
A FEVER OF SPECULATION.

Manufactures, all of which were vivified and stimulated by the sunbeams of peace. For ten years the country was prosperous. We were at peace with foreign nations, and had made commercial treaties of great value. The high tariffs made the national revenue sufficient to enable the government to pay, each year, about $7,000,000 of the national debt. The currency was stable, and the future appeared rose-colored.

Then came the disturbances occasioned by Nullification, already alluded to; a war of the President against the United States bank, which resulted in the death of that institution; the stimulation of an inordinate spirit of speculation by placing the public funds in State banks to be loaned to individuals, and the creation of new banks all over the land. These things involved the business of the country in meshes of difficulty that caused widespread disaster.

That fever of speculation which ran wild through the land from 1835 to 1837, was a rare phenomenon in the business world. The people of the United States seemed to be actually mad for two years. Lenders and borrowers were equally reckless. Almost unlimited credit prevailed. The "deposit banks" afforded the means for almost everybody to procure loans for speculative purposes. Trade, especially in the Western country, became extraordinarily active, and at every point on the waters, where it seemed favorable for trade, land advanced in value very rapidly. Many men made large fortunes by this rise, in the sea-board cities and in many interior localities, and all over the Union, speculation in "village lots" became a mania. Land changed owners very rapidly, and the buyer of to-day, who became a seller to-morrow, found himself, a poor man this morning, a rich man to-morrow morning.

A serious consequence of this maddening fever of speculation was the neglect of productive industry and increase of luxuries. Numerous fortunes made by these means and the expectation of fortunes, led to extravagance in living, and thereby the real wealth of the country was diminished, by the double process of lessened production and increased consumption. The candle of prosperity and material strength was thereby burned at both ends and its consumption was rapid.

Commerce at that period, was the sure indication of the ruinous process in operation. In the decade from 1820 to 1830, the excess of importations over exportation, had been about five per cent.—not an indication of unhealthiness in the business affairs of the country; but from 1830 to 1840, the imports exceeded the exports, full twenty per cent., although the exports were valued at inflated prices, and more than they would fetch, as a rule, in a foreign market. For example: cotton, a staple production of our country and then the largest item in our exports, might be valued here at sixteen
cents a pound, and receive an advance in England, of ten or twelve cents a pound, but it might not sell there for more than ten or eleven cents.

The goods imported from England on long credits, were purchased for the importers by rich houses in London, who, by the indulgence of the Bank of England, were enabled to give even longer credits to their American customers. These goods were sold by our importers to jobbers and through auction houses, on long credits, the notes given for them being made payable to local banks in all parts of the country, for the establishment of which $200,000,000 had been sent from the East to the West. These were banks of issue and discount, and their promissory-notes were loaned to the purchasers of goods. So the huge credit system entered into the vital circulation of the business of the nation. The importer sold on credit to the country merchant, and the capitalist sent money to establish banks to loan money to the country merchant to enable him to pay his notes to the importer. With this money the latter bought bills of exchange, which, while the tide was at flood, was in favor of America.

While this stream of credit was uninterrupted, trade was brisk, the shipping interest was prosperous, prices ruled high, luxury abounded, and nobody seemed to have discernment enough to see the undercurrent of disaster that was surely wasting and undermining not only the absurd credit system, but the real prosperity of the nation. Even our government, for awhile, fostered speculation in land, by selling enormous quantities of its unoccupied domain on credit.

At this juncture nature and government policy almost simultaneously combined in pricking the bubble of speculation. For several years the crops in Great Britain had been abundant; now they failed, and in 1836, it became necessary to import corn for cash. The capital of England which had been loaned all over the world, was greatly exhausted, and the Bank of England, finding exchanges running higher and higher against that country, began to contract its loans, and admonished the American houses to curtail their credits. At about the same time the famous "specie circular" was issued from our Treasury Department, (July, 1836), urging all collectors of the public revenue of every kind (that from the sale of lands included), to receive nothing but gold and silver in payment.

So it was that from the parlor of the Bank of England, and the Treasury of the United States, went forth, at the same time, the appalling fiat to the ears of debtors, Pay up! The whole line of the credit system from the Bank of England to the merchant and his customers on the farthest verge of civilization in Western America felt the cold chill of approaching death. In the spring of 1837, the pressure was so great, that American houses in London failed for many millions of dollars, and every bank in the United States suspended specie payments. They resumed in 1839.
Meanwhile the United States Bank which had been allowed to die by limitation of its charter, and which had been recreated by a charter obtained from the State of Pennsylvania, had been playing a desperate financial game, until the autumn of 1830, when it failed, and went into liquidation. More than its whole capital had been lost. With it tumbled down a large portion of the banks of the country, and general liquidation followed. Several hundred banks were swept out of existence; and in 1841, Congress passed a general bankrupt law to relieve bankrupt individuals. That law so relieved 39,000 persons from debts amounting in the aggregate to $441,000,000. The banks that were liquidated had an aggregate capital of $200,000,000. States, also, became bankrupts, to the aggregate amount of $100,000,000. Undoubtedly the whole amount of hopeless debts legally discharged by the law and by private agreements—in other words the losses—amounted to more than $1,000,000,000.

During that decade of speculation the population of the country steadily increased. A stream of emigration from abroad continually poured into our country, in varying volume from year to year, the lowest number being 22,000, and the highest 84,000, and making an aggregate in the years from 1830 to 1840, inclusive, of 600,000 persons. Of these, a greater number were from the British isles. These had brought with them substantial wealth in money and muscle, and they formed a considerable force in the process of recuperation after the dismal period of the opening of the decade from 1840 to 1850.

That period did open most dismally to the superficial observer, but the acute political economist saw in the deep depression, the shrinkage of fictitious values and the prevailing necessity for frugality, hopeful signs for the future. The tariff, which by the compromises made in 1832, to quell the discontent of the cotton planters, was gradually declining to its lowest prescribed point of twenty per cent., and the revenues did not meet the expenses of the government. Our public credit was so low, notwithstanding we had no public debt, that United States six per cent. bonds were utterly unsalable in Europe. That discredit was owing chiefly to the fact, that a large amount of the stock of the defunct United States Bank and the bonds of some of the States which had failed, (and which those States had repudiated,) were in the hands of European capitalists; also that the bankrupt law had wiped out many heavy debts owed by Americans to foreign merchants.

In order to carry on the government, an additional tariff for revenue was imposed. New channels of trade were opened, and the failure of the potato crops in Ireland, and short cereal crops in England and on the Continent in 1845 and 1846, greatly increased our exportations and our carrying trade. Because their shipping was inadequate for the transportation of food from the United States, the navigation laws of Great Britain, France, Holland,
and Belgium, were suspended, and American vessels were allowed to enter their ports freely. The corn-laws in England were nearly abrogated, and the exports of our agricultural products became very large. Our domestic exports, which amounted in 1841 to $105,000,000, were valued at $130,000,000 in 1847. Much of the farm productions came from the rapidly developing Western States, through the Erie and other canals, and a few railways that then penetrated those remote regions.

That decade closed with the extraordinary event of the finding of gold in California, and the flowing of a vast tide of emigration to the Pacific coast. Almost simultaneously, gold was discovered in far off Australia. Some capital went there from America, but much more went to California, to be returned in gold-dust or bullion. The emigration to the shores of the Pacific gave a notable impetus to commerce. The transportation of thousands who went there, made the passenger traffic brisk, and the food and clothing for their use formed a vast increase in the carrying trade of the country. At the same time, the stream of emigration to the United States which began to flow much more strongly in 1846, when 152,000 aliens reached our shores from abroad, constantly came with ever increasing volume until 1854, in which year the number of arrivals was 428,000; the largest number that ever arrived in one year, until 1873, when the number was 473,000.

The decade ending in 1860, was one of great commercial activity. It was one in which the traffic with the Pacific coast was created, and new avenues of trade with distant lands, were opened. A very large amount of goods were shipped from our ports to Australia, and as we have observed, a far larger trade was carried on with California. Labor being in great demand here at remunerative prices, while food was dear and wages were low in Europe, attracted emigrants.

From 1850 to 1860, we built and equipped 20,000 miles of railroads, at a cost of full $720,000,000. The capital for this industry, was drawn chiefly from Europe, in the shape of money and iron, and from the Eastern States, in the form of subscriptions to stock and bonds. The construction of these railways, as well as the prosecution of other enterprises in our country, attracted laborers from abroad. These emigrants each brought with them an average of say eighty dollars in gold, and the total number who came from 1850 to 1860, inclusive, was 2,598,000, bearing with them an aggregate money capital, for use here, of about $188,000,000.

Efforts have been made to ascertain the capital value of the average emigrant who comes to our shores, as a producer. That eminent statistician, Edward Young, Ph. D., the chief of our National Bureau of Statistics, Commerce and Navigation, computes it at $800, not counting the money he brings with him, which, he calculates, is spent by the emigrant in preparing
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to become a producer. If then, we take the number of aliens who have come to our shores since the taking of the last census, in 1870, amounting to 1,811,309, we have an aggregate sum of $1,449,047,200 added to our wealth within the last five years, by emigration alone. It is estimated by Dr. Young, that previous to 1870, there have been added to our wealth, from the same source, $6,243,880,800; making a total increment by emigration, of $7,693,028,000.

This stream of wealth flowing to our shores continues. The largest emigration we have ever had in one year, was in 1873, when 473,141 aliens came to our land, adding to its capital $338,512,800. Dr. Young justly observes: "It is impossible to make an intelligent estimate of the value to the country, of those foreign-born citizens who brought their educated minds, their cultivated tastes, their skill in the arts, and their inventive genius. In almost every walk of life their influence has been felt. Alike in the fearful ordeal of war and in the pursuits of peace, in our legislative halls, and in the various learned professions, the adopted sons of America have attained eminence. Among the men who rendered timely aid to our country during the late war, it may seem invidious to mention a single name except for the purpose of illustration. In the year 1839, there arrived at the port of New York, in the steamship British Queen from the port of London, a Swedish immigrant, better known as Captain John Ericsson. What was his value to the country as estimated on the 9th of March, 1862, [when his Monitor attacked the Merrimac]? Was it eight hundred, eight hundred thousand, or eight millions of dollars?"

Dr. Young says: "As regards nationality, more than one-half of those who have thus far arrived in the United States are British, and come from the United Kingdom, or from the British possessions of North America. These speak our language, and a large part are acquainted with our laws and institutions, and are soon associated with and absorbed into our body politic.

"The German element comes next, and embraces nearly two-thirds of the remainder, being at once an industrious and an intelligent people, a large proportion settling in rural districts, and developing the agricultural resources of the West and South, while the remainder, consisting largely of artisans and skilled workmen, find profitable employment in the cities and manufacturing towns.

"The influx of Scandinavians, who have already made extensive settlements in the North-western States, constitutes a distinctive feature of the movement, and though but a few years since it received its first impetus, it is already large and rapidly increasing. Industrious, economical, and temperate, their advent should be especially welcomed.

"Asiatic immigration, whatever views may be entertained of its influence
upon our industries and customs; has not yet reached such proportions as to excite alarm in the most apprehensive, and falls far short of what has been represented, never having reached, in a single year, the number of 15,000, forming only about four per cent. of our total immigration. So small a number can easily be absorbed into our population of 40,000,000, and no injury result, if the movement be confined to voluntary immigration. A peculiarity of the Chinese immigration is the small number of females, not exceeding seven per cent. of the whole, a fact which seems to preclude a large increase of the pure race.

"The Latin nations contribute very little to our population, and the Slavic still less, while to-day, as from time immemorial, the different branches of the great Teutonic trunk are swarming forth from the most populous regions, to aid in the progress of civilization.

"While a brief review of the ethnic derivation of the millions who have transferred their allegiance from the Old World to the New, exhibits a favorable result, other elements of their value to this country require consideration. The wide contrasts between skilled and unskilled labor, between industry and laziness, between economical habits and unthrift, indicates a marked variation in the capital value of the immigrant to this country. The unskilled laborers, who at once engage in subduing the forests, or cultivating the prairies, are of far more value to the country than those who remain in the large cities."

It is estimated that sixty per cent. of all the emigrants who arrive, are in the prime of life, and ready to enter at once into their several industrial pursuits.
CHAPTER XXX.

At the opening of the decade ending in 1870, the population of the United States was about 31,500,000. Our total foreign and domestic exports, in the year ending with June, 1860, amounted to $410,500,000, and our imports were $444,500,000. In that year we exported $78,500,000 in specie and bullion, and imported about $7,000,000.

During the remainder of 1860 the business of the country was seriously disturbed by gloomy forebodings, for the rumblings of a gathering tempest in the political firmament were heard approaching nearer and nearer. It burst in fury upon the country in the spring of 1861 in the form of a terrible civil war that lasted more than four years. Privateers, sent out by the enemies of the Republic, drove American commerce into foreign bottoms; and the business of ship-building, excepting for war purposes, was greatly depressed. The ports of the Southern States, the people of which were in arms against the government, were closely blockaded by our national vessels, so soon as competent squadrons could be fitted out. Our little navy was much scattered when the war began, but before the close of 1861 nearly 140 armed vessels were put in commission and were on duty.

The staples of the South—cotton, tobacco, and sugar—found no outlet to the sea excepting in blockade-runners, that came in swarms from British ports, supplying the Confederates with arms, ammunition, and clothing, and carrying back return cargoes of cotton, and so prolonging the war. Enormous profits were made by this perilous traffic, but these were more than equaled by the losses sustained in the capture of these vessels by our vigilant cruisers. Blockade-running proved, in the end, to be a disastrous business for those engaged in it. The British were very conspicuous in giving aid to the Confederates in privateering and otherwise during the war, for which offence, as we have observed on page 24, their government paid a heavy penalty.

At the beginning of our Civil War emigration to our shores was checked for awhile. In 1860 the number of arrivals was 153,640, but in 1861 the number was only 91,920. The next year the emigration was about the same; but in 1863 it marked a higher figure than in 1860, being 176,282. The last
year of the war (1865) the number rose to 249,000, and the next year it ran up to 318,500.

We have observed that the greatest number of arrivals of aliens, in one year, was in 1873. Then the "panic" produced great depression in business in this country, a condition which still continues. In consequence of this there has been a strong reflux tide, increasing in volume every year. In 1874 it was 72,346, and in 1875 the number was 92,754. As there is extreme depression in business abroad, and as we have signs of returning activity here, we may fairly expect that before long the tide of immigration will again flow in full volume.

After the war our commerce began to assume its accustomed activity; but ship-building continued a depressed industry for several years. The carrying trade, which had taken refuge in foreign bottoms, seemed loth to return; and in 1875 seventy-four per cent. of our foreign trade was carried in foreign vessels. But with the revival of the coast trade with the Southern States the ship-building industry revived, and in 1870 it reached about the amount of production which it had attained in 1869, or the close of the decade before the Civil War. In the latter year there were 1,153 vessels built, having an aggregate tonnage of 214,096; in 1870 there were 1,106 vessels built (forty-seven less than in 1869), with a tonnage of 216,961, or almost 3,000 tons more than in 1869.

The number of vessels built in 1874 was 2,147, having a tonnage of 432,725—a larger amount than the production of any year since 1855, and 52,000 tons more than were built in Great Britain in 1873. It exceeded that of 1873 in this country by 73,479 tons. There were 291 vessels built in the State of Maine alone in 1874, with an aggregate of 132,390 tons. The increase in tonnage built in the United States in 1875, over the product of 1874, was 141,878. This is an encouraging exhibit.

Our fisheries form a large item in the list of our industries and in the statistics of our commerce. The whale fishery is not so extensive as formerly, owing chiefly to the universal use of the products of petroleum for purposes of illumination and lubrication. The value of the products of our whale fisheries in 1875, such as oils, whalebone, ambergris, et cetera, was $2,841,000. That of all other fisheries was $10,747,500, making a total of $13,588,500. This includes 1,090,951 gallons of sperm and 1,414,186 gallons of whale oil, and 328,217 pounds of whalebone.

The cod fisheries yielded 756,543 hundred weight, cured, valued at $3,664,496; the mackerel fisheries gave us 527,633 hundred weight, cured, valued at $2,655,623, and the herring fisheries 124,215 hundred weight, cured,
Our trade with Great Britain.

Our oyster fisheries yielded 21,870 bushels, valued at $16,725. The guano gathered from the American islands in 1875 amounted to 7,269 tons, valued at $122,000.

By the purchase of Alaska from Russia, in 1867, for the sum of $7,200,000 in gold, we have acquired an important seal-fishery. The Alaska Commercial Company of San Francisco, according to official reports, supply eighty per cent. of the fur of seals killed in the world, and therefore have a virtual monopoly of that trade. Fashion has so popularized seal fur that within four years the price of that commodity has risen 100 per cent. It is said that the seals are so prolific that, notwithstanding the large number killed every year, the number of their rookeries increased, in 1875, over one-third. The young seals, from one year old up to four years of age, have increased over one-half. It is the opinion of experts that 5,000 more seals might be captured annually without detriment to their rookeries.

As in colonial times, so now, the trade between the United States and the United Kingdom of Great Britain and Ireland constitutes much the larger portion of our foreign commercial operations. It exceeds that between any other two nations in the world. According to the report of the Bureau of Statistics, Commerce, and Navigation, it is two-thirds greater than that between Great Britain and France, although the population of the latter country is nearly equal that of the United States. It is double that between Great Britain and British India, and is five times as great as that between the United States and any other nation. The trade between France and Germany, and that between Germany and Austria, although these densely populated countries adjoin each other, is much less than that between the United States and Great Britain.

It appears that of the aggregate amount of our exports and imports to and from all nations, five-twelfths are with Great Britain; and of the total British exports and imports, one-sixth are with the United States.

The commercial revulsion which we are now passing through, has produced a violent disturbance of our trade with England. In 1872, our imports to Great Britain, stated at their declared value in our paper currency, amounted to $248,772,324, and our exports were $261,444,251; an excess of exports over imports, of $12,671,727. In 1873, our imports were $237,298,208, and exports $312,347,848, being an excess of exports over imports of a little more than $75,000,000. In 1874, our imports amounted to $180,042,813, and our exports to $341,024,049; an excess of exports over imports of about $161,000,000. In 1875, our imports amounted to $155,297,944, and our exports to $313,541,849; an excess of exports over imports, of $158,243,905. This statement excludes the transactions in specie and bullion, and also of foreign goods re-exported. The imports are given in gold values.

It is certain that the year ending with June, 1876, will show a further...
decrease in our imports from Great Britain, while our exports will probably not vary much from last year. Wheat, Indian corn and other products of our country, shipped to Canada from our lake ports, should be reckoned among the exports to Great Britain; and the imports from that country include some of Asia and Continental Europe. A considerable quantity of cotton exported from this country to Great Britain is re-shipped to the Continent. After taking all of these things into consideration, it appears that not less than nine-tenths of the goods embraced in the commercial tables, are consumed in the country to which they are sent, and produced by the country sending them, excepting the precious metals. This one important production of our country, is distributed by Great Britain, chiefly in the form of coin, to the nations in which there exists a demand for gold and silver currency, on the Continent, in the East Indies, China and Japan.

The above statement shows that within four years our imports of merchandise from Great Britain, had fallen thirty-seven per cent. in value, and will probably be stated at fifty per cent., or one-half at the close of June, 1876. Our exports will doubtless be full as much as in 1875. This state of things indicates a wise economy in expenditures among our people; but the question arises, Will it be permanent? No doubt much of this economy is compelled by circumstances, and is not voluntary; and we may fairly expect (drawing our conclusions from the natural tendency of civilized society), that a season of prosperity will be followed by a season of extravagant expenditure. But with our superior facilities for raising bread-stuffs, the development of our mineral resources, and the increase of our various manufactures, we may reasonably expect that in all the future, the balance of trade with foreign nations, will be permanently in our favor—that our exports will continue to exceed our imports. Our tariff for revenue will have to be modified, for our customs receipts are decreasing annually. In 1872, the customs receipts were $216,370,287; in 1873, they were $188,080,523; in 1874, they were $163,103,834, and in 1875, they amounted to $157,167,722. Probably this year they will barely reach $150,000,000. The reduction of our imports seriously affects, not only the manufacturers and merchants of England, but its carrying trade. In the month of April, 1876, notwithstanding the near approach of the opening of our Centennial Exhibition, several of the finest steamers on the Liverpool route were withdrawn.

It has been estimated that the number of sea-going vessels that convey the world's commerce, is 62,777, of which number, 33,106 belong to Great Britain and the United States, and that these two Anglo-Saxon nations carry sixty-six per cent. of the world's aggregate tonnage,—England alone representing one-half of the grand total of 18,689,396 tons. Her recent purchase of the Suez canal, gives her a vast and controlling commercial advantage in
Europe and Asia. To compete with her for the commerce of the teeming Indies, China and Japan, we must build the projected canal across the isthmus between the waters of the Atlantic and Pacific oceans.

Our inland commerce and navigation are of vast importance to our people, not only in a pecuniary, but in a social and political point of view, for it is the cement of a nation like ours, made up of municipally independent commonwealths. One of the chief bonds of union between the northern and southern sections of our Republic, is the Mississippi river and its tributaries (for that river can not be divided), and the commerce that floats upon their bosoms.

Our internal trade was carried on, a hundred years ago, chiefly upon pack-horses or mules, and in settled districts in wheeled vehicles, on the land; and in canoes, batteaus, and sloops, on the lakes and rivers. Since that time the art of transportation has been almost a new creation in our country. The roads over which the inhabitants then carried their products for exchange were rude compared to our most common highways now. On the frontiers, the Indian trail or the trader's bridle-path constituted the chief routes of travel, and these often lay among great perils. The pioneer of the wilderness to-day may, from his experience, have an idea of the wretched state of land travel, excepting here and there in old settled districts, a century ago.

Although, at the present time, a great portion of the civilized world is without good roads (Russia, with over 83,000,000 inhabitants, has few good roads), the art of road-making is by no means a modern one. Highways—"the King's highways"—are spoken of in the Bible; and the ancient Greeks and Carthaginians paid great attention to them. The Roman Empire was intersected by admirable military roads, graded and paved; and the Incas of ancient Peru caused great highways, twenty feet broad, to be constructed along the lofty summits of the Andes, in some places more than 12,000 feet above the sea. Tunnels were cut for leagues through rock, and immense viaducts of perfect masonry were thrown over deep mountain gorges. Humboldt, who beheld remains of these great roads, says nothing built by the Romans, which he had seen in Europe, surpassed them in the magnificence of the engineering and the perfection of the construction. It was over the higher of these lofty roads that Pizarro marched, with his little corps of cavalry and handful of infantry, for the conquest of Peru, 350 years ago. That road was from 1,500 to 2,000 miles in length. No attempt to make good roads in England occurred until late in the seventeenth century. So late as 1770, says Arthur Young, the road between Liverpool and Manchester was a perilous one to travel, on account of its wretched condition.

The English-American colonists, as we have observed carried on most of their transportation on pack-horses and mules. After the old war for inde-
pendence, as emigration toward the mountains and beyond spread population and cultivation in that direction, a few good roads were constructed, partly for the general convenience of the inhabitants, but specially as postroads for the transmission of the mails.

The post routes in the United States, as we have observed, extended only about 1,800 miles at the beginning of the national career of the Republic in 1790. The general government afterward took a conspicuous part in the building of great highways, in imitation of the old Romans. The most important of these undertakings at first, was the building of a road from Baltimore, by way of Cumberland, which crossed the Ohio river, and extended westward through Ohio, Indiana, and Illinois, to St. Louis. For this purpose Congress made annual appropriations. Other great routes for national roads were projected, notably one between Washington city and New Orleans; while the United States troops, in time of peace, stationed on the frontiers, were employed in building highways and bridges.

In 1811, the post-roads had been extended over 37,000 miles. This fact implies extensive road-building, especially in the older States. Many of the individual States followed the example of the general government, and contributed from their treasuries to the construction of highways; and the increasing demand for good roads caused the formation of turnpike companies in all the States. Laws have been enacted by the States compelling the inhabitants to keep the highways in order, under the direction of commissioners in each town or precinct, who give directions to overseers of districts. This system is enforced by assessments of labor or money, and, as a rule, it secures good public roads.

The turnpike companies generally had excellent roads, for the expenses of which, and for profit, they were authorized to collect tolls at gates placed across their highway at certain distances apart. Some of these companies, within the last forty or fifty years, covered their roads with planks, but this process has been abandoned as a failure. Others have macadamized their roads, a process invented, and first put into operation on roads in England, by J. L. Macadam, a Scottish engineer, who died in 1836.

The process of macadamizing consists of covering the road-bed with stones broken into angular pieces about the size of a pigeon's egg, which, under the pressure of wheels, will, in time, combine into a compact mass, excluding all water, and consequently not subject to the action of frost, and becoming as solid as the original rock. These are, undoubtedly, the best roads that can be made for most conditions of service. Macadamizing was first introduced into this country in 1820. It was readily adopted in England; and a few years after its introduction there, out of the 25,000 miles of public roads in Great Britain, nearly seven-tenths were macadamized.

One of the oldest and best of the macadamized roads in this country, is
that which traverses the magnificent Shenandoah Valley from Harper's Ferry to Staunton. I passed over it at the close of the late Civil War, and found, notwithstanding the Confederates had, on some occasions, dragged locomotive engines over it, its hard bed was almost totally uninjured.

The highways built by our government, were of great value in the development of internal commerce. They were in different sections from Maine to Arkansas and Florida, and with their construction was connected the task of removing obstructions from rivers, and otherwise improving navigation. When the government had spent about $30,000,000 on these internal improvements, the subject became a political issue, it being contended by one party that the national government had no constitutional power to construct any but strictly national works, and the system was brought to an end, after President Jackson's veto of the Maysville road bill.

At that time steamboats and canals were superseding the heavy wagons and the post-coaches, as vehicles of commerce and passenger traffic; and, these, in turn, were succeeded by railways, which now, on account of their speed and directness of course, have become the great carriers of the mails and of our inland traffic where they exist. There were, in 1875, 8,283 public mail-routes, of which 871 were railroad. The length of the railroad routes was 70,083 miles, and the annual transportation was 75,154,910 miles. The length of the steamboat routes was 15,788 miles, and the annual transportation was 3,958,852 miles. Other routes had an aggregate length of 192,000 miles, and the annual transportation was 54,768,454 miles. The transportation in a year, of the mails by railway, amounted to 16,487,604 miles over all other methods.

Long before the government began to build roads for the benefit of the people, public attention had been called to canals as auxiliaries to navigable streams in facilitating inland commerce; for wise men saw all around them a wonderful field for the development and growth of such commerce. The roads of the country were so wretched, that such ones would not be tolerated anywhere in our land, at this time; and steam was unknown as a power for producing locomotion.

The rise and progress of our canal system, and its value in building up the wealth of our nation in the earlier years of its existence, is an interesting subject. There can be, I think, no doubt, that to General Philip Schuyler, a descendant of Hollanders, is justly due the credit of being the originator of the system in this country.

So early as 1761, when Schuyler went to England, to settle the accounts of General John Bradstreet, the colonial quartermaster-general, with the British government, he visited the famous canal which the Duke of Bridgewater had just completed, by which the coal mines of Worsley were connected with Manchester. He saw the aqueduct over the Irwell, which
Brindley had lately finished, by which vessels crossed that stream at an elevation of about forty feet. He was deeply impressed with what he saw, and gathered much information concerning the construction of locks, et cetera. He pondered the subject after he returned home, and it was a topic for correspondence between young Captain Schuyler and Professor Brand, of London.

Some time before the breaking out of the war in 1775, Schuyler had conceived the idea of connecting the waters of Lake Champlain with the Hudson river at tide water, and had spoken much on the subject to intelligent men. He had studied the matter thoroughly as early as 1776. When the commissioners of Congress—Franklin, Chase and Carroll—were on their way to Canada, in April that year, they were the guests of Schuyler, and Mr. Carroll wrote in his note-book: “General Schuyler informed me that an uninterrupted water carriage between New York and Quebec might be perfected at fifty thousand pounds sterling expense.”

The reports that came to this country, from time to time, of the success of the Duke of Bridgewater’s canal, kept the topic active in Schuyler’s mind until the war broke out, and he became deeply engaged in the contest. When that war was ended, the people of the country were too much impoverished to attempt any great internal improvement, and the project in Schuyler’s mind was held in abeyance several years. It was only alluded to in his correspondence during the Revolution, and a few years afterward. He evidently communicated his ideas to Gouverneur Morris, as early as the summer of 1777, when that gentleman was at Schuyler’s head-quarters at Fort Edward.

Meanwhile the active-minded Elkanah Watson had become interested in canal projects. In 1785, he visited Mount Vernon, where he found the mind of Washington engaged in a project for connecting the waters of the Potomac with those west of the Alleghany mountains, by a canal, in order to divert the extensive fur trade from Detroit to Alexandria, which was then almost exclusively enjoyed by Montreal. Watson was allowed to copy Washington’s notes and estimates; and he became, as he said, a “canal disciple of Washington.”

Three years afterwards, Watson made a journey to Fort Schuyler (now Rome, N. Y.), then the head of bateau navigation on the Mohawk river. While there he conceived the idea of producing a water communication between the Hudson River and Lake Ontario, by means of a canal from Wood Creek to Oneida Lake, into which it flowed, and thence down the Onondaga river to Oswego, on Lake Ontario. On his return to Albany, he seems to have conferred with General Schuyler on the subject; and when, soon afterward, Mr. Watson became a resident of Albany, he and the general seem to have fully discussed the subject of both a northern and western canal.
Watson made other journeys up the Mohawk to gather up facts, and in the autumn of 1791, in company with three other gentlemen, he penetrated the country as far as Seneca Lake. On his return he digested the facts he had collected, and published them in pamphlet form, after submitting it to General Schuyler in manuscript. The latter was then a very influential member of the Senate of the State of New York, and he laid the subject before that body. Early in 1792, the Legislature of the State passed an act by which two companies were chartered, under the respective titles of Western Inland Lock Navigation Company, and Northern Inland Lock Navigation Company.

General Schuyler showed his faith in the projects by subscribing largely to the stock of each; and when the companies were organized, he was chosen president of both, with Thomas Eddy, a Quaker, as treasurer of the Western Company. Schuyler entered upon his duties with great zeal, and, accompanied by Watson and others, he made a thorough exploration of the route from Schenectady to lakes Seneca and Ontario, in 1792. Schuyler's manuscript journal of that period is before me, and attests his thorough attention to the most minute details.

The northern route was also fully explored, from the head of tide-water in the Hudson to Lake Champlain. Work on the Western Canal was begun at Little Falls in the spring of 1793, with about 300 laborers and a competent number of artificers. The work on the Northern Canal was begun the same year, at Stillwater. Mark Isambard Brunel, who, almost fifty years afterward, constructed the Thames Tunnel at London, was first a guest at the table of General Schuyler while engaged in the business of surveying lands for an association of Frenchmen, known as the Casterland Company, and was afterward engaged as an engineer on the Northern Canal. Until a few months before his death, in 1804, General Schuyler was actively engaged in the promotion of these great works of internal improvement.

The Western Canal was never completed according to its original design; but along the same route one far more magnificent was opened for traffic about twenty years after the death of General Schuyler, by which the waters of Lake Erie and the Hudson river were connected. This great achievement was undoubtedly the fruit of a conception in the busy brain of Gouverneur Morris.

In 1795, Mr. Morris visited the Caledonian Ship Canal, then partly constructed, and which is the greatest work of the kind in Britain. It passes through the centre of the Highlands, from Moray Frith on the east coast to Loch Linnhe on the west, a distance of 60 miles, including the three lakes, Ness, Oich, and Lochy, whose combined length is 37 miles. This work was done by the government, and through it now pass, annually, about 2,000 ships of various classes, including steamboats. In his Diary, Mr. Morris,
after mentioning his visit to the canal and its capacity, wrote: “When I see this, my mind opens to a view of wealth for the interior of America, which, hitherto, I had rather conjectured than seen.”

This idea of great artificial water-ways for vessels seems to have had a permanent lodgment in the mind of Mr. Morris. In 1801, a few weeks after his return from a tour in Canada, which was extended to Niagara Falls, he wrote to a friend (Mr. Parish): “In turning a point of woods, the Lake [Erie] broke on our view. I saw riding at anchor nine vessels, the least of them above a hundred tons. Can you bring your imagination to realize the scene? Does it not seem like magic? Yet this magic is but the early effort of victorious industry. Hundreds of large ships will, at no distant period, bound on the billows of these inland seas. At this point commences a navigation of more than a thousand miles. Shall I lead your astonishment up to the verge of incredulity? I will. Know, then, that one-tenth the expense borne by Britain in the last campaign, would enable ships to sail from London through Hudson’s river into Lake Erie.”

This was a distinct foreshadowing of the great Erie Canal, which project he cherished in his mind, and continued to suggest and advocate for several years, until, in 1810, the Legislature of the State of New York appointed a board of Canal Commissioners, of which Mr. Morris was chairman. May not the embryo of that idea have been planted in his mind by reading Joel Barlow’s poem, The Vision of Columbus, published in 1787, or fourteen years before Morris’ letter to Mr. Parish? In that poem these lines occur:

“He saw, as widely spreads th’ inchannelled plain,
Where inland realms for ages bloomed in vain,
Canals long winding, ope a watery flight,
And distant streams, and seas, and lakes unite.

“From Fair Albania, toward the setting sun,
Back through the midland, length’ning channels run;
Meet the fair lakes, their beauteous towns that lave,
And Hudson’s joined to Fair Ohio’s wave.”

The inspiration that caused the utterance of this prophecy doubtless came from the suggestions of Schuyler and Watson concerning the feasibility of connecting the waters of Lake Ontario and the Hudson; yet it seems more like a vision of such connection between Lake Erie and the Hudson. At that time canals, finished or projected, were numerous in England. Before the construction of railways, there were no less than 2,200 miles of navigable canals in Great Britain; and it is said that there is no spot in England south of Durham, more than fifteen miles from navigable waters.

So early as 1774, Washington procured the passage of a law by the legislature of Virginia, for the construction of works from the Potomac to the
Ohio river, by which commerce might flow easily over the mountains between the Atlantic seaboard and the settlements westward of the Alleghanies. His plan embraced canals in connection with the Potomac river, as far as Cumberland, and good roads beyond to the Monongahela and Younghiogheny rivers. The war for independence broke out, and the project was kept in abeyance until its close, when Washington revived it. The States of Virginia and Maryland passed bills which resulted in the formation of the famous Potomac Company, with a capital consisting of 500 shares of £100 each, with powers of enlargement. It was provided that the navigation of the river should be extended by engineering from tide-water to the highest practical point on the North Branch of the Potomac; and the Company were permitted, by their charter, to construct canals and locks as they might think necessary. General Washington was elected the first president of the Company, and filled that office until he became President of the United States.

At the same time when Washington proposed the plan for the improvement of the Potomac, he was compelled, he said, in order to meet the jealousies of the Virginians, to connect with it another for the improvement of the navigation of the James river, to form a water communication between that stream and the Great Kanawha, which falls into the Ohio. The James River Company was formed upon much the same basis as that of the Potomac Company, but neither project was then carried out. Much was expected from these enterprises, and the shares were considered valuable at the beginning.

When, in 1785, the Legislature of Virginia voted by unanimous voice to present Washington with fifty shares in the Potomac Company, and one hundred shares in the James River Company, it was regarded as a munificent donation. Washington, it is known, declined to accept the gift, because, as he averred, he wished to be free to act, and had steadily refused pay for public services; but he asked and obtained permission to appropriate them to a public use. The funds which they secured were given to an academy in Virginia, the foundation of the present Washington and Lee College at Lexington.

Many times the charter of the Potomac Company was extended by the legislatures of Maryland and Virginia, and considerable money was spent, until 1820, when it became evident that the navigation of the Potomac could not be profitably improved. Then a new company was formed, who determined to construct a continuous canal from tide-water on the Potomac at Georgetown to Cumberland, a distance of 184 miles. This was the origin of the Chesapeake and Ohio Canal.

Ten years before Washington proposed the improvement of the Potomac by means of canals, he was one of a company who obtained a charter from
Virginia for the purpose of draining and rendering fit for cultivation the Great Dismal Swamp, lying partly in Virginia and partly in North Carolina. Washington had traversed a portion of that swamp in 1763. In 1784 he revived the project of the canal, not for drainage only, but for navigation between the Elizabeth river, on the shore of which Norfolk stands, with Albemarle Sound, a distance of about thirty-three miles. This canal was finally completed, and is still in use. One certificate of the stock of this canal, originally issued to Washington for $1,000, was sold at auction in Alexandria, in 1825, to Judge Bushrod Washington, for $12,100.

At about the time when Virginia and Maryland were moving in the matter of inland navigation, the legislature of Pennsylvania appointed commissioners to explore routes for connecting the tide-water of that State with the great lakes. These commissioners reported a route by the Juniata, partly by a canal and partly by slack water in the river. Then the Schuylkill and Susquehanna Company was formed. That was in 1789. The next year the Delaware and Schuylkill Company was organized, with a capital of $400,000.

The oldest works of the kind in the United States, made for navigation, are the South Hadley and Montague canals in Massachusetts, undertaken in 1792, by a company, for passing the rapids at South Hadley and Montague Falls, in the Connecticut river. Their united extent is only five miles. The Middlesex Canal, authorized in 1787, and intended to connect Boston Harbor with the Merrimac river at Chelmsford, near Lowell, was not completed until 1804. These works are now abandoned as waters for navigation. In 1802 the Santee Canal, in South Carolina, was finished. With this century began the operation of the canal system in the United States which has worked so beneficently in favor of inland commerce and as an auxiliary to ocean traffic.
CHAPTER XXXI.

The earliest completed of the great canals of our country, and the one which has exerted the most extended influence over the internal commerce of the United States, is the Erie, which is 363 miles long. It connects the Hudson River at Albany with Lake Erie, at Buffalo. Canal Commissioners, as we have observed, were appointed in 1810, with Gouverneur Morris at their head, and the project of uniting the Hudson by canals with Lakes Erie and Champlain, found a no more zealous and efficient champion than De Witt Clinton.

In 1812 Mr. Clinton was appointed, with others, to lay the project of such water communication between the Hudson and the lakes, before the National Government, and solicit its patronage. That government fortunately declined to do so, and the movement was put to rest by the war of 1812-15. That war made the transportation of merchandise along our coasts perilous, and the commercial intercourse between seaboard cities was carried on, in a large degree, by wheeled vehicles. Conestoga wagons were the vehicles of traffic between New York and Philadelphia; and when one of them made the journey of ninety miles in three days, with passengers, it was called the "flying machine." These conveyances were not only slow but costly as vehicles for the transportation of merchandise. It has been estimated that the extra expenses for the coast region alone, so increased, would have paid the cost of a system of internal navigation from Maine to Georgia.

The want of such a system then filled the public mind with desires for it, and at the close of the war was a favorable time to renew the project of connecting the lakes with the Hudson River, not only for securing a safe inland water communication in case of war, but to offer commercial facilities for the population gathering in the Western States. Then Mr. Clinton began his more vigorous labors in favor of the projected canals. Removed by remorseless political proscription from public office in 1815, he devoted his energies to the projects, and in a memorial of the citizens of New York he produced a powerful argument in its favor—so powerful that the people of his State and of other States, alive to the importance of the matter, approved it.

Clinton was elected governor of New York in 1816, and he used all his
official and private influence in favor of the Erie Canal. He saw it begun during his first administration, and it was completed and formally opened by him, with imposing ceremonies, in 1825, when he was again governor of the State. There was a grand aquatic procession from Albany to the sea, when the governor poured a keg of water, brought from Lake Erie, into the ocean, thus wedding the lakes with the Atlantic. It was a nuptial ceremony far more beneficent and grand in its idea than the ancient wedding of the Doge of Venice with the Adriatic.

The Erie Canal was built by the State of New York at a cost of $7,602,000. A greater portion of the country through which it passes was then an uncultivated wilderness. It was, by far, the most extensive public work ever attempted in this country up to that time, and excited universal admiration. Untold wealth has been won for the State and the city of New York by its operations, for over its bosom has floated products of the northwestern States and Territories, valued at billions of dollars. In the year 1872 (before the "panic" depressed business), the value of property transported in that canal (notwithstanding a three track railway is laid parallel with it) was about $168,000,000. The value of all freight that had passed over it from 1837 to 1872, inclusive, was $4,795,215,078.

The Erie Canal has been enlarged, and is now seventy feet wide on the surface, east of Rochester (and larger westward of that city), fifty feet wide at the bottom, and seven feet in depth. There are in New York about a dozen canals, the larger ones of which, besides the Erie, are the Champlain Canal, sixty-six miles in length, and finished in 1822; the Black River Canal, fifty miles long, completed in 1849; the Genesee Valley Canal, 125 miles in length, begun in 1826 and finished in 1861; and the Chenango Canal, ninety-seven miles in length, completed in 1836. The amount of tolls received by the State from all the New York canals, in 1872, was $3,072,411. The total cost for the construction and maintenance of the New York canals to the year 1872, inclusive, was a little more than $89,000,000, and the total receipts from tolls were $97,625,000.

The Delaware and Hudson Canal Company is one of the wealthiest and most successful of the great commercial corporations in our country. It was the pioneer in the development of the coal interests of the Lackawanna Valley, and its early history reads like a romantic legend, beginning with the struggles of the brothers William and Maurice Wurts, of Philadelphia; a little more than sixty years ago, and following it in all its vicissitudes of fortune from its very small beginnings, through great financial difficulties, until the present time, when it ranks among the greater corporations of the world.

The founders of the company were the brothers Wurts, who, for years, struggled manfully against opposition of the most formidable kind, but with
a clear faith that success would finally crown their efforts. The profound ignorance concerning the existence and the value of anthracite which prevailed sixty years ago, enabled them to buy large tracts of land for sums varying from fifty cents to three dollars an acre, which are now worth $1,000 to $2,000 an acre. They opened mines, transported coal to the Delaware or its larger tributaries on sleds drawn by oxen, where, so late as 1820, they first found a market for the product in Philadelphia, and sent it to that city in great arks on the bosom of the Delaware. These expensive vessels were succeeded by rafts of pine logs as a cheaper method of transportation, and in that way much coal was taken to Philadelphia a little more than fifty years ago, where it sold for $10 and $12 a ton on the rafts.

It was soon discovered that apparently inexhaustible beds of anthracite existed in the valleys of the Lehigh, Schuylkill, Susquehanna, and Lackawanna rivers, and that a powerful rivalry for the Philadelphia market would soon appear. Coal had not been discovered in the State of New York, and it was deemed very important that a method of transportation between the coal mines and the Hudson River should be established. It was seen that the Lackawanna coal valley extended nearly forty miles in a northeasterly direction from the Susquehanna—its head waters interlocking with the tributary streams of the Delaware less than a hundred miles distant from the Hudson river.

This important fact caused Messrs. Wurts to conceive the idea of improving the navigation of the Lackawaxen river and the construction of a canal from the Delaware to the Hudson, along the valleys of the Neversink and the Rondout. By this means there would be an uninterrupted water communication between the Lackawaxen and the city of New York, leaving a portage of only nine miles and one-half a mile from the Lackawaxen to the Lackawanna coal mines.

In the spring of 1823, the Pennsylvania Legislature authorized the brothers Wurts to improve the Lackawaxen; and a little more than a month afterward, the Legislature of the State of New York incorporated the Delaware and Hudson Canal Company. The following year the Wurts brothers published a pamphlet containing an estimate of the cost of transporting coal from the Lackawanna mines, (of which they were proprietors), to the city of New York, by the Delaware and Hudson canal, and with it was a favorable report of commissioners under whose direction the route of the canal had been surveyed.

A stock company being incorporated, with a capital of $500,000, a larger field of operations was conceived, and the following spring the capital was extended to $1,500,000, with authority given to extend the canal beyond the limits at first specified. In November the same year, the company, by legislative enactment, were permitted "to employ $500,000 of their capital
in the business of banking; and to establish a banking-house in the city of New York." With these privileges the projectors entered the money market of New York, and laid their magnificent scheme before capitalists.

It was truly set forth in a published address that all the canals in England supported by the coal trade yielded abundant revenues; that the projected canal could transport 300,000 tons of coal a year; and that the company could, by it, secure the monopoly of the enormous lumber business in the region around the upper waters of the Lackawanna, Delaware and Susquehanna rivers, which abounded with forests of white and yellow pine. These advantages, with the banking privileges, caused an eager subscription for the stock. The books were opened early in 1825, the year when the Erie canal was completed, and $1,000,000 were instantly subscribed. The Company was organized, and on the 8th day of March, 1825, the first Board of Managers was elected, with Philip Hone (in honor of whom Honesdale, in Pennsylvania, was named), as the first president.

On the 13th of July, 1825, President Hone and a large number of citizens met upon ground upon the summit-level of the route, forty miles from the Hudson river. There, after an address by the president, and appropriate ceremonies, the first excavation for the canal was made. It was completed from Rondout to Honesdale, a distance of 108 miles, in October, 1828. It had been determined not to construct the canal further than Honesdale, but to connect it there with the mines at Carbondale, not many miles distant, by a railroad, a method of transportation then new and not fairly tried. Then it was (in 1827), that the Company sent Horatio Allen to England, as we have observed on page 193, to purchase materials for the railway, and locomotives for the same. The first coal was shipped from the mines to the canal in 1829.

On the completion of this great undertaking, the Company was compelled to encounter the most violent opposition from interested parties in Pennsylvania. In 1830, a pamphlet of twenty-eight pages appeared, with the startling title: Monopoly is Tyranny! or an Appeal to the People and Legislature, from the Oppression of the Delaware and Hudson Canal Company. It was evidently an appeal against a monopoly by those who wished to enjoy a monopoly. At that very time, the dreadful "tyrant" was so weak that it had thoughts of giving up the ghost. For many years the capital of the stockholders had been out of their hands without any return, and the shares, whose par value was $100 each, could not readily be sold for $70 or even $60 each. So great was the financial pressure, that at one time the Directors of the Company, seeing financial ruin ahead, were ready to vote for a surrender of the charter, and an abandonment of the enterprise. They asked and obtained from the Legislature of New York, a further loan
of $300,000 in 1832, making the whole amount of loans they had received from the State, $800,000. So the corporation was saved.

At that time the use of anthracite was rapidly extending, and the Company began to feel the grateful pulsations of healthful prosperity. From April to December, 1832, 90,000 tons of coal, and more than 3,000,000 feet of lumber, passed over their railway from the mines to Honesdale. From that time to the present, through various vicissitudes of fortune, the Company have gone on in a career of great usefulness and prosperity. Depression in the manufacturing and commercial interests of our country has been felt by the Company, and at times financial pressure has borne heavily upon them; but as the use of anthracite extended to manufactures, to the making of iron, and to steamboat navigation, the product of their vast coal-beds, and the profits of their methods of transporting that product to market, became very remunerative. The Company was enriched, and by their operations, they vastly increased the wealth and comfort of communities with which their business was connected. In 1841, the clear profits were 21 per cent. on their capital, then amounting to almost $2,000,000, and the average price of coal did not exceed $5.50 a ton. The bonds of the Company were all paid in 1843, after which no debt stood against them excepting the State loan.

In 1853, the charter of the Company, given for thirty years, expired. The legislature of Pennsylvania had repealed all special laws concerning that charter, and gave them liberty to do their work in perfect freedom thereafter. They extended their railway from Carbondale to Scranton; and in 1864, the capital stock of the Company was increased to $10,000,000. From time to time they have added to the area of their coal-fields, their last heavy purchase being in the Valley of Wyoming, nearly opposite Wilkesbarre. They bought coal-lands, machinery, houses, et cetera, at a cost of $1,575,000. They have become carriers for other coal companies; and they have, from time to time, increased their facilities for transportation, enlarging their canal in 1844, and again in 1852. The tonnage of their first boats was only 25 tons; their present ones have a tonnage of from 125 to 148 tons.

In February, 1870, the Company leased in perpetuity the Albany and Susquehanna Railroad; and in May, 1871, they took a lease of the Rensselaer and Saratoga Railroad, with its branches. In connection with this road, they have built the New York and Canada railroad, from Whitehall, along the western side of Lake Champlain, in the State of New York, to the Canada line at Rouse's Point. It was completed late in the autumn of 1875, when the officers of the road, and many guests, made an excursion over a continuous line of railroad from New York to Montreal.

An idea may be formed of the vast increase in the business of the Company within a few years, by the statement that in 1860 its productive
Its productive capacity now is 4,000,000 tons a year, and, in addition to its canal, it owns and operates about 700 miles of railway, besides about 200 miles of underground railway in the mines. Its capital stock is now $20,000,000.

Outside of the State of New York there are, in the United States, about 30 canals, of which 14 are in the State of Pennsylvania. These are situated in New Jersey, Delaware, Maryland, Virginia, Ohio, Indiana, and Illinois; and a ship canal around the falls of St. Mary is now in course of construction in Michigan. The longest of these canals is the Wabash and Erie, 374 miles. The Ohio canal, that crosses the State of Ohio from Cleveland to Portsmouth, is 332 miles in length, and the Miami and Erie, that crosses the State from Cincinnati to Toledo, is 291 miles long. The James River and Kanawha, from Richmond to Buchanan, is 196 miles in length. There are five others, each over 100 miles in length.

The immense advantages to trade and to agriculture in the interior which the success of the Erie canal, from the beginning foreshadowed, made a feverish excitement in the public mind for awhile. Notices, similar to the following in the Pittsburgh Gazette, in 1826, appeared in the newspapers:

"Mr. Foster has published in the Greensburgh Gazette, a statement furnished him by a merchant of Meadville, [Pennsylvania] showing the amount which the merchant paid for the transportation of his goods this fall, from Philadelphia, by way of New York, the canal and Erie, to the town of Meadville. The whole cost per hundred pounds was $1.20½! We are now paying three dollars per hundred for carriage in wagons from Philadelphia to this city."

Another newspaper said, in 1825: "It is no fancy tale, that flour manufactured on Lake Erie has been profitably sold in Newbern, North Carolina, for $3.50 per barrel. This flour was transported from the lake to Albany through the Grand canal; thence down the North river to New York, and thence by sea to Newbern. The cost of transportation from the lakes to Newbern, was less than $1.50 per barrel, while that between Raleigh and Newbern (not more than 120 miles), is generally two dollars."

Facts like these caused many projects for other canals to be conceived, some of them reasonable, some of them wild. It was proposed to construct a canal from Long Island Sound to Canada by way of the Connecticut river.
Coal & Iron Exchange,
Delaware & Hudson Canal Company.
another from Boston to Narranganset bay; a third from Providence to Worcester, and at a very early period, a ship-canal across Central America was suggested. The latter project is likely to be carried out before long.

It was clearly seen that canals would produce a great and salutary revolution in transportation. That they did so, a few facts will demonstrate. Before the Erie canal was built, the cost of transporting a ton of merchandise between New York and Buffalo, was one hundred dollars, and the time consumed, twenty days. The transportation of grain between Buffalo and New York, cost three times the value of wheat, six times the value of Indian corn, and twelve times the value of oats. The grain of Western New York, consequently, sought a market in Baltimore by the cheaper method of transportation down the Susquehanna river. Upon the Erie canal a ton of grain has been carried from Buffalo to New York for about two dollars.

The Delaware and Hudson Canal Company, with boats, originally, of twenty-five tons burden, carried coal the whole length of their canal from Honesdale to Rondout, 108 miles, for one dollar.

Look at the commercial aspect of the great lakes, before canals were built. The total length of the five inland seas, is over 1,500 miles, and their aggregate area is about 90,000 square miles. They drain a region estimated to be nearly 336,000 square miles in extent. On these waters, the first American schooner was launched in 1797, but there was no outlet for products, and tonnage increased slowly. Trading with the Indians was the principal commerce, even after a steamboat appeared on Lake Ontario in 1816, and on Lake Erie, in 1819. The principal carrying trade was merchandise taken westward to exchange for furs and peltries that were taken to the Atlantic sea-board.

The opening of the Erie canal in 1825, changed the whole aspect of commercial affairs in the lake regions. Buffalo became a commercial metropolis. White sails dotted the lakes, and the smoke of other steamers soon stretched in serpentine folds along the horizon. Villages and cities appeared. Population increased. Fertile acres at cheap rates, invited immigration from the populous East, and our Western States began their marvelous career. A large population was already there, for the disturbance of trade on the Atlantic coast, by the war of 1812–15, and the depression in all industries connected with manufactures and commerce, which immediately succeeded that war, had caused a large migration to the West, and permanent settlements there.

A fact or two in the history of a single city, will illustrate the wonderful growth of “the West.” In 1860, I visited the earliest inhabitant of Chicago—a city on the western shore of Lake Michigan. That inhabitant was a woman of middle age. She was there with her husband, in Fort Dearborn, in 1831, two years, when commissioners surveyed a few acres there for a vil-
lager. For a whole winter the inhabitants of the fort were compelled to use the greatest economy lest their stock of flour and meal should become exhausted before they could receive a supply from Mackinaw. At the same time the Indians in that neighborhood were dying in companies from mere destitution of food, and they subsisted for weeks on soup made from the bark of the slippery elm, or of stewed acorns.

Forty years afterward, the commerce of the city which had budded and blossomed out of the germ of 1831, amounted, annually, to $450,000,000. It is the greatest grain market in the world; and grain, there, forms the basis of speculation, like the railway or mining stocks in Wall street, New York. There were then fifteen grain-elevators there, with a storage capacity of 12,800,000 bushels, each receiving and shipping 100,000 bushels a day.

In that city, forty years after the supply of a family with flour and meal was a matter of serious consideration, the total value of live stock received in a year, including cattle estimated at $41,000,000, sheep at $950,000, and horses at $250,000, was estimated at more than $75,000,000. A million and a quarter of hogs were packed there that year. That little germ of a village has grown to a city of 300,000 inhabitants in about forty-five years.

The canals bringing products from the interior fed the river sloops and coasting schooners with freights, and the latter greatly multiplied. The sloops were the most convenient vehicles for travellers in the vicinity of rivers and coasts before the introduction of steamboats, especially in the seasons when the roads were in the most wretched condition. Passengers going between New York and the New England coast towns were accommodated in lumber schooners or fishing smacks; and the sloops on the Hudson river were much used for such purposes. In both cases the passengers were required to furnish their own beds and food. There was often much delay in starting, as vessels would wait for a full freight, and no one could tell how protracted might be the journey.

An enterprising sloop captain on the Hudson won fame and blessings, as well as dollars, by sailing a sloop between the cities of Hudson and New York, as a packet for carrying passengers only. He advertised his intentions as follows:

"The owners of this vessel, being desirous to render the passage as short, convenient, and agreeable as possible, have not only taken care to furnish her with the best Beds, Bedding, Liquors, Provisions, etc., but they have been at very great expense and trouble in procuring materials, and building her on the best construction for sailing; and for the accommodation of ladies and gentlemen travelling on business or for pleasure.

"Merchants and others residing in the northern, eastern, or western counties, will find a great convenience in being able to calculate (at home) the precise time they can sail from Hudson and New York, without being
under the necessity of taking their beds and bedding; and those in New York may so calculate their business as to be certain of comfortable accommodations up the river."

Country merchants at that time went to New York only twice a year, as a rule. I have before me the advertisement of a merchant in one of the Hudson river villages, in which he says that, "having spent a fortnight in New York in making careful purchases of goods," he was furnished with "an excellent assortment." Now all this is changed, and merchants living hundreds of miles from a commercial mart, visit such cities many times a year, making their tarryings short. The railway system of our country has produced a radical revolution in our internal commerce.

One of the great canal projects which have attracted the attention of the nations is now under consideration by our government. It is the construction of a ship canal between the waters of the Atlantic and Pacific oceans for the commercial advantages of all nations, and especially of the United States. Such a work, as we have observed, was suggested about fifty years ago. It has been renewed within the last twenty-five years.

An Irish adventurer published a book in 1849, in which he declared that he had crossed and recrossed the isthmus of Darien, and that only "three or four miles of deep rock cutting" would be necessary in the construction of a canal across it. Believing this report (which was a pure fiction), some heavy English capitalists formed a company, with a capital of nearly $75,000,-000, and sent out Mr. Gisborne, a civil engineer, to survey the route. He published a book, with a map of the route from ocean to ocean, and declared that the distance between "tidal effects" was only thirty miles, and the summit level was only 150 feet.

Mr. Gisborne's favorable report attracted the attention of the governments of England, France, United States, and New Granada, and they joined in an expedition for exploring a route for a ship canal across the isthmus.

These explorations were undertaken late in 1853, Mr. Gisborne accompanying the English one. Guided by his maps, and by his professed personal experience, the English and French party set out from the Pacific side, but it soon became evident that they were not in the route described by Gisborne, or that he had never crossed the isthmus at all. It was discovered that the summit level to which he led them was 1,000 feet instead of 150, above tide water. Such discouragements met them at the outset, that after penetrating not more than a half dozen miles, the expedition returned. It is possible that Gisborne crossed by Napipi Valley, and that his book was not the cruel fiction it has been supposed to be. But it led to great suffering.

The New Granada expedition started later, and accomplished nothing; and in January, 1854, Lieutenant Isaac C. Strain, leader of the American
expedition, entered upon the perilous task. Misled by Gisborne's book, they took only ten days' provisions with them. They actually crossed the isthmus, but endured the most horrible sufferings. The practical result of this expedition was the knowledge that the proposed route, which they traversed, was wholly impracticable.

The subject slumbered until the success of the Suez Canal was assured, and aroused our government to a sense of the importance to the commerce of the United States of an inter-oceanic canal across the isthmus of Darien, or that of Tehuantepec, farther north. The fact that other nations were contemplating the construction of a canal there, and might so control a short route between the Atlantic and Pacific, which naturally belongs to the Americans, stimulated our government to immediate action, and in the year 1870, two exploring expeditions were sent out.

One of these expeditions, under Commander T. O. Selfridge, of the navy, was sent to the isthmus of Darien, and the other, under Captain Shufeldt, of the navy, was sent to the isthmus of Tehuantepec. The Mexican government had already made a grant to a company formed by Emilio La Sere, for the construction of a canal across Tehuantepec, but this privilege has been transferred to the Tehuantepec Railway Company.

The report of Captain Shufeldt, and of others who have gone over that route, shows that no extraordinary engineering would be required in constructing a canal there. The route commences about 30 miles above the mouth of the Coatzacoalcos, in the Gulf of Mexico, and after traversing that stream a considerable distance, ascends to a level of about 680 feet. Then it descends to a lagoon on the Pacific coast, having traversed a distance of 120 miles from the gulf to the ocean. It is estimated that sufficient water can be found on the summit to feed the locks necessary for ascending and descending the elevation.

This route is the most northerly that can be selected. The distance between New Orleans and Hong Kong, in China, by it, would be 9,900 miles less than by way of Cape Horn, and over 1,200 miles less than by way of the isthmus of Darien. From New York to Hong Kong, the distance by way of Tehuantepec is 8,245 miles less than by way of Cape Horn, and nearly 1,600 miles less than by way of the proposed Darien route. The distance between Liverpool and ports of Eastern Asia and adjacent islands, would be much shortened by this route.

Three routes were surveyed across the narrow part of the isthmus of Darien by Commander Selfridge. The amount of rock-tunneling required in the construction of a canal was so very great, that Selfridge reported these three routes impracticable. For want of water, a locked canal would be impossible. Selfridge spent several months in explorations of a route by way of the Atrato and Tuyra rivers, when he made an unfavorable report;
but a route by the Napipi river, a branch of the Atrato, afterward surveyed, was very favorably reported. In that report, the Commander proposes to ascend to a summit of 130 feet from the Pacific, by thirteen locks, and from the entrance of the canal on the Atrato, which is there 40 feet above the level at the mouth of that stream, to rise, by nine locks, 90 feet to the same level.

This route, beginning at the mouth of the Atrato, includes 150 miles of river navigation (which requires no improvement), to a point a mile below the mouth of the Napipi; thence through the valley of the latter, nearly due west, it would cross the ridge and terminate at the mouth of the Limon river in Cupica Bay. Eight miles of this route will include three miles of rock cutting, 125 feet deep, and a tunnel of five miles, with a roof sufficiently high to admit the passage of ships with the tallest masts.

It is proposed to make this canal a depth of 20 feet; width, at bottom, in earth, 90 feet, and in rock, 100 feet; at the surface, 120 feet; the sides sloping, in earth, 2 horizontal to 1 perpendicular, and in rock, 1 horizontal to 4 perpendicular. The report, which proposes 22 locks in all, says: "While locks are not a necessity, a moderate number interfere but little with the transit, and reduce greatly the amount and cost of excavation."

The canal would be filled, at the summit, by the Napipi river, distant but a few hundred yards, whose volume, measured at the close of the dry season, when the river was very low, amounted to 510,300 cubic feet an hour. The daily volume of the Napipi, at lowest, would be 12,247,200 cubic feet, and the amount required for all purposes would be 6,780,000 feet, leaving a surplus of 5,467,200 feet. The entire length of the canal would be less than 40 miles, and the estimated expense about $124,000,000. Another route through Lake Nicaragua, surveyed by Colonel Childs in 1850-51, was reexplored recently; also another, through the valley of the Bojaya, a more southern route than the Atrato.

The proposed tunnel on this route would be 9,010 yards in length; 120 feet in height, and 70 feet in width. Commander Selfridge says in his report:

"There appears to be a popular prejudice against tunnels, difficult to understand in the face of the success of the Mount Cenis tunnel, and the undoubted completion [since completed] of the Hoosic tunnel in a couple of years. For though this tunnel is of much greater dimensions, still it is not entirely a tunnel in the tunneler's sense of the term. Bore a hole 15 feet high, and the remainder should be treated as an open cut with the favorable exception of a roof overhead.

"A few years ago such a work would have been an impossibility, but with the modern improvements in drills and explosives, it is a matter of only time and money. With the Burleigh drill, which can bore a two-inch hole
in hard rock a foot in seven minutes, and calculated to be equal to the work of 60 men with the common hand-drill, and with the employment of nitroglycerine or picrate powder, which has an explosive force seven times greater than gunpowder, a condemnation of this line should not be made on account of the tunnel, except on the ground of cost, which is amply met by the small expenditure in other parts of the work.

"In the construction of a canal over any route whatsoever, there will arise great obstacles and delays on account of the very heavy rain-fall, increasing materially the cost of construction, for which no proper estimate can be made. But the Napiipi is free in a considerable measure from this serious inconvenience, for work in the tunnel can be carried on uninterrupted, night and day, in the wet as well as in the dry season."

Cupica Bay, mentioned on the preceding page as the western terminus of the proposed canal, is one of the best anchorages on that coast. Vessels may anchor in any part of Cupica Bay, in a convenient depth of water. The nearest approach to the Napiipi river, is Limon Bay, on the eastern shore of Cupica Bay. The land above it is about 500 feet in height, over which is a waterfall leaping from a height 300 feet. The tide rises in Cupica Bay about 13 feet. Humboldt seems to have been the first to call public attention to the lowness of the land of the isthmus, at this point.
WHILE the public mind, some forty years ago, was filled with projects for extending the canal system, so grandly inaugurated in New York, the great rival in transportation—the Railroad—appeared as such. This, as we have observed, began its career about forty-five years ago, and its growth has been marvellous. Of its rise and progress, we have already taken a brief view; and of the value of that system in extending population into the vast uncultivated regions west of the Mississippi river, and developing their resources; bringing the latter into close commercial relations with the ocean, and the mighty rivers of mid-continent within the suburbs of our Eastern sea-ports: linking the Atlantic and Pacific seas, and forming an important portion of the chain of communication between the commercial centres of the United States and the Asiatic continent and adjacent island-world, every intelligent reader is informed.

When, early in the present century, John Jacob Astor, a native of a small village near Heidelberg, in Germany, (who came to America to better his condition, at the close of our old war for independence,) established a fur-trading station on the Pacific coast near the mouth of the Columbia river, now in Oregon, the wildest visions of theorists did not comprise a dream of the possibility of transportation of men and merchandise from the Atlantic to the Pacific, in the space of a week. Astor had then, what seemed to most men, extravagant and strange ideas of the future. These comprehended a profitable organization of a system of fur-trading, between the great lakes and the Pacific, over a vast region which the then late explorations of Lewis and Long had revealed, by a series of intermediate trading posts and a grand central depot at the mouth of the Columbia river.

Mr. Astor contemplated obtaining one of the Sandwich islands as a station to supply the Chinese and Indian markets with furs sent directly from the Pacific coast. In this gigantic scheme, his patient reliance upon the promises of faith that success in his undertakings would finally be achieved was remarkably illustrated by the fact that he expected nothing but outlay the first ten years, and unprofitable returns the next ten years. He was then about fifty years of age, and looked for the realizing of profits when he should be nearly seventy years of age, at which time he expected his well-
arranged commercial scheme, would yield him an annual return of about $1,000,000. He founded a grand central depot near the mouth of the Columbia river, which place was named Astoria, in his honor. For years he carried on a fur trade in that region, but his magnificent scheme of monopoly was never consummated.

At that time the trade in furs was carried on very extensively and profitably in North America, as it had been for about two centuries. The settlers in the more northern regions of our land, had early discovered the value of the skins of the numerous fur-bearing animals with which the woods and waters abounded; and the French who more readily than all others, assumed the habits of life of the Indians, soon monopolized the traffic with them. They stimulated the savages to the catching of the animals, by trifling remuneration in useful merchandise and trinkets. The French became, not only fellow-hunters and trappers with the Indians, but the pioneers of settlements in the lake regions.

Wealthy and influential men who had influence at the court of Charles II., perceiving the value of the American fur trade, obtained from him a charter, in 1670, which gave them possession of an undefined territory at the entrance of Hudson's straits, not already possessed by those of any other "Christian prince or State." It gave them the monopoly of all trade in those regions. This company, composed of Prince Rupert, the Duke of Albemarle and others, claimed under their grant the whole region between Hudson's bay and the Pacific, and northward to the polar seas, excepting places owned by Russians and Frenchmen.

This was the origin of that vast monopoly, the Hudson's Bay Company. They made settlements on rivers; extended their posts and factories far southward in the British possessions; and they were soon successful rivals of the French for the monopoly of the fur-trade. They swayed imperial rule over a vast region until 1749, when, as their charter had never been ratified by parliament, their exclusive rights were questioned. The courts sustained the Company, and they went forward with their usual vigor, extending their territory and their power.

The enormous profits realized by the Hudson's Bay Company, caused some leading merchants of Canada to organize an association of a similar nature, called the North-west Company, with their head-quarters at Montreal. They carried on these operations with vigor, over a vast field extending to the rivers that flow into the Pacific, where they established factories in 1805. The place of the annual meetings of the active members was at the mouth of the Pigeon river, on the north shore of Lake Superior. This company became a formidable rival of the Hudson's Bay Company, employing Canadian voyageurs and clerks (the latter mostly young men from Scotland), about 2,000 in number. In 1813, they acquired possession of Astoria,
and waged open war with their powerful competitor in the wild regions of our continent.

By an act of Parliament, in 1821, the two companies were consolidated under the title of the Hudson's Bay Company. Their license expired in the spring of 1838, when an extension was granted for twenty-one years. At the expiration of that period, in 1859, that giant monopoly, which had existed for 189 years, and ruled white men and Indians within their dominion with despotic power, and not always, it is claimed, in the interests of humanity, finally expired.

While the English-American colonies remained dependents of Great Britain they derived very little benefit from the fur trade with the Indians, the Hudson's Bay Company absorbing nearly the whole of the traffic; and the contention of the English and French for the trade was a powerful element among the causes that brought about the French and Indian War at the middle of the last century.

In 1762 a fur company was formed in New Orleans. It was chartered by the Director-general of Louisiana, and was headed by Monsieur Laclede, for carrying on the fur trade in the regions of the Missouri river and its branches; and this led to the early settlement of some of our Western territories. The principal establishment of this company was on the site of the present city of St. Louis, and was the foundation of it. There they gathered the furs collected from the region extending eastward to the Mackinaw and westward to the Rocky Mountains. Their treasures went in boats down the Mississippi to New Orleans, and thence to Europe; or up the Illinois river across a portage to Lake Michigan, and by way of the chain of lakes and the St. Lawrence to Quebec. In the pathway of this transportation was planted the seeds of many of our Western settlements, which have grown into great commonwealths.

Mr. Astor embarked in the fur trade as early as 1784, purchasing stock in Montreal, taking it to New York after the treaty of 1795, and shipping from that city to different points of Europe. In this trade chiefly he had accumulated a fortune of $250,000, when he embarked in his scheme for making a grand fur depot on the Pacific coast. He was then competing with the great fur companies of the northwest, under a charter in the name of the American Fur Company, of which he furnished the entire capital. As we have already observed, his establishment near the mouth of the Columbia river was abandoned in 1813, having passed into the hands of the British, to whom it had been sold by a faithless partner. After that Mr. Astor carried on his operations in the region of the Rocky Mountains, with his chief post at Mackinaw.

Besides the fur seals, already mentioned as being abundant on the islands off the coast of Alaska, the sea-otter is found in considerable quantities on
the shores of the Aleutian islands, not far from that coast; and general furs, such as the beaver, fox, marten, and bear, are found in the forests of Alaska. Nearly all of the product of our fur seals is sent to London to be dressed and dyed. The peculiar process there used is kept a secret, and is known only, it is said, to one person in this country, who has a limited establishment in Albany, New York.

As we have observed, the monopoly of the fur-seal trade, off the coast of Alaska, has been granted by our government to the Alaska Commercial Company of San Francisco. The number of seals they are allowed to take each year is 100,000, and only males may be killed. The trade in other furs in that territory is open to competition. The Alaska Company has about twenty ports on the mainland and the islands, and as the demand for that kind of fur is now very great, they derive a large revenue from their operations.

The fur-bearing animals found in Alaska are the seal, beaver, and ermine; the blue, cross, red, silver, and white fox; and the lynx, marten, mink, musquash, land and sea otter, sable and squirrel. The annual fur trade of Alaska, at this time, is estimated at nearly $2,000,000 in value. The chief sources of supply of fur-seal skins are now the islands of St. Paul and St. George, situated about 300 miles from the coast, where they resort in immense numbers from May to November for the purposes of reproduction, rearing their young, and shedding their coats of hair. At that time the shores present millions of these animals.

Almost every part of our country produces some kind of the inferior fur-bearing animals, such as the hare, rabbit, cat, raccoon, skunk, squirrel, wildcat, muskrat, and fox. The raccoons are quite abundant, and their skins are popular in Germany and Russia for coat linings. The beaver has nearly disappeared from our streams, but is found in British America. The skins of the deer, the bison (called buffalo), the bear, and the wolf, tanned with the hair on, are extensively used in this country as lap-ropes, in winter. Immense numbers of the buffalo are annually slaughtered on the vast grazing plains between the Mississippi river and the Rocky mountains. Hitherto they have been hunted chiefly for their hides, the carcasses of some of them being used for food by the Indians. Recently the bones of these animals have been manufactured into fertilizers, and the horns enter largely into the production of combs and handles for knives and forks.

Our internal commerce has wonderfully increased within a comparatively short period, largely in consequence of the policy pursued by our government in having the public domain surveyed and sold to actual settlers. The quantity of these lands yet unsurveyed and unsold, and the amount of sales, have been alluded to on page 123. This system has caused a great expansion of the population, and prevented any part of it, excepting in large towns
and cities, becoming dense, as in many agricultural districts in Europe. This expansion has been favorable to the development of the resources of the country and the increment of the national wealth.

Some of the charters of the original colonies had vague definitions of the western boundaries of the colonies, such as "the South Sea," or Pacific Ocean; and, in time, this indefiniteness led to conflicting claims to territory. After the war for independence, and the establishment of a confederation, causes for such conflicting claims were removed by a mutual cession of the lands to the general government. The national constitution conferred upon Congress the power to "dispose of and make all needful rules and regulations respecting the territory and other property of the United States," and they did so.

To attract settlers to the unoccupied lands was obviously the best policy of the government, that they might become productive. The whole public domain was put under the control of the Secretary of the Treasury at that time; it is now under the control of the Secretary of the Interior. The management of the domain is entrusted to a Commissioner of the General Land Office. These lands are divided into districts, for each of which there is a surveyor-general, a receiver, and a registrar, appointed. When surveyed and mapped into sections, they are sold by the government, at auction, at the minimum price of $1.25 per acre. After a section has been on sale a fortnight, it may be sold in 40 acre lots, at a less price. Originally long credits were given to purchasers, but this led to abuses, and cash is now required on the delivery of the deed or "patent."

Besides the sales of land to actual settlers, large tracts have been given by the government for various public purposes, such as the establishment of industrial colleges, subsidies to aid in the construction of railways; for Indian reservations, et cetera.

Some land sales took place in Western New York in 1797—the first that were sold—for it was some time before the department was fully organized. The first land office was opened in the year 1800, at Chillicothe, in Ohio; and until 1807, nearly all the land sales took place there. Soon afterwards offices were opened in Indiana, Mississippi, and Alabama.

At that time a greater portion of the public domain (the purchase of Louisiana having added immensely to its area) was in the great valley of the Mississippi, extending from the western slopes of the Alleghany mountains to the eastern slopes of the Rocky mountains. Into that region population flowed in a continuous stream, ever increasing in volume; and finally sturdy pioneers, such as had planted the seeds of Territories westward of the Mississippi, went over the lofty ranges and began the peopling of the Pacific slope. These streams of population have been like irrigating rivers, making the wilderness to blossom as the rose. Broad acres of fertile land
have responded to the magic touch of the tiller’s hand, and unfolded their treasures to the sun, for the use of man. Villages and cities dot the valleys and the mountain sides, and their inhabitants hold social intercourse with the regions of the East through the sublime agencies of steam and electromagnetism.

Athwart the pathways of civilization in its westward march, stand the hostile remnants of savage tribes, descendants of the inhabitants of our land when Europeans came, who have been made restless, dissatisfied, suspicious, and revengeful, by the results of unwise statesmanship, and of positive wrong-doing toward them.

During the colonial period, the Indians were regarded as outside barbarians, scarcely worthy of being recipients of Christian charity, and they were feared by all because of their numbers. "And though we know not when or how the Indians first became inhabitants of this mighty continent," wrote the Rev. Cotton Mather, "yet we may guess that probably the Devil [whom he called "the old usurping landlord of America"] decoyed these miserable savages hither, in hopes that the gospel of the Lord Jesus Christ would never come here to destroy or disturb his absolute empire over them."

In the spirit of this opinion we have ever treated the Indians, and have kept them savages. A hundred years ago, they were generally regarded as the natural foes of the Americans, and with this belief the British government employed them to "make war on the defenceless inhabitants."

When the colonies became independent States, the question of the relations of the Indian tribes to the States became a very serious one, yet it does not seem to have been pondered in a truly philosophical and benevolent spirit. Had the founders of the Republic looked upon the Indian as a man as susceptible of cultivation as the savage Britons from whom many of them were descended, and made the barbarian a citizen, amenable, as an individual, to the laws of the land, enjoying the rights and privileges of citizenship, great wrongs, great distresses, and great scandals might have been avoided.

Father Le June, a French missionary in Canada, who had studied the Indians with care, wrote: "I think the savages, in point of intellect, may be placed in a high rank. Education and instruction, alone, are wanting. The powers of the mind operate with facility and effect. The Indians I can well compare to some of our own villagers who are left without instruction. Yet I have scarcely seen any person who has come from France to this country who does not acknowledge that the savages have more intellect or capacity than most of our peasantry."

Charlevoix wrote: "The beauty of their imagination equals its vivacity, which appears in all their discourses. They are very quick at repartee, and their harangues are full of shining passages which would have been
applauded at Rome or Athens. Their eloquence has a strength, nature, and pathos which no art can give, and which the Greeks admired in the barbarians.”

Bishop Whipple, of Minnesota, one of the most earnest and intelligent laborers for the taming and Christianization of the Indians in the Northwest, has recently given an account of the civilization of seventy wild Cheyennes and other barbarians, at Fort Marion in Florida. The officer in charge (Captain Pratt), has treated these Indians as soldiers, drilling them, making some of them non-commissioned officers, and teaching them the rudiments of Christianity. The bishop had an interview with these Indians, by an interpreter, just before his departure, and he gives the following interesting narrative of the work:

"I said to them that I had come to say good-bye; that I felt that it was a remarkable thing that they who lived 2,000 miles south-west, and I who lived 2,000 north-west, should have met at St. Augustine; that I had tried to tell them of Jesus, the only Friend who could save them; and that I wished they would show me their hearts. Old Ne-min-ick arose. He stood a moment silent. You could see that his heart was full. He choked. After a moment he said: 'You may think your words have passed me. They did not go into my ears and go away; they went down, down, to the bottom of my heart. I go to church on the praying day, and when I see the white man kneel I know that he is asking the Great Spirit for himself and children, and then I try to send one little breath to Him, and ask Him that He will have pity on poor me. Your words are good. Since I came here,' (pointing to Captain Pratt), 'this man has only spoken to me good words. He has tried to turn my feet into a good trail, and I am going to try to walk in it till I die.'

"He stood still a moment, and then he threw his arms around Captain Pratt's neck. He kissed him first on one cheek and then on the other. He came to me and threw his arms round my neck, kissed me on both cheeks, and then laid his head on my neck, and sobbed like a child. All the chiefs embraced us, and said Ne-min-ick had spoken their words. And yet men ask," said the bishop, "if the Indians can be reached."

Pages might be filled with similar testimony concerning the susceptibility of the Indian to cultivation; and the history of the Iroquois Confederacy illustrates their capacity for civil government and military organization. But the founders of our nation did not understand the Indian. They considered him incapable of the higher intellectual and moral attainments which would fit him for the exercise of the privileges and duties of citizenship, and they placed him in the position of a foreigner, with whom our government might make treaties. At the same time, the president of the Republic has always officially addressed them as "children," and they have
called him "father"—cant phrases, which seem like bitter irony when we consider how little filial love and respect exists between them.

The theory of Indian sovereignty," says the Commissioner of Indian Affairs (Edward P. Smith) in his last report to the Secretary of the Interior, "has practically placed the Indians to a disadvantage in their relations to the several States where they are found. Being held by the State authorities to be neither citizens nor paupers, nor criminals, nor wards in any sense, they come easily to be regarded on all hands as outcasts and intruders, and a normal prey for anybody strong enough to defraud them."

So it has been from the beginning. By the National Constitution, the Indian was made an alien. In the minds of the people, he was an outcast; and from the earliest periods of our history as a nation—from the conflicts with the savages during Washington's administration, until the fight with the Modocs and frequent "hostilities of the Indians on the Plains," the pages of our annals have been stained with records of wars with this race. Whenever the Indian has shown signs of civilization and a love for the arts of civilized life; when he has become a cultivator of the soil, as did the Cherokee in Georgia, we have driven him from his tilled acres into the wilderness beyond the Mississippi, and compelled him to remain a savage and a hunter.

Made a degraded outcast by injustice and neglect, the Indian is, nevertheless, expected to exhibit the Christian virtues. When he steals cattle and horses from some military post, or attacks an emigrant train or frontier settlement, the Church and State hold up their hands in holy horror, and cry "Savage!" Who has kept the Indian in the savage condition? Let the Church and State answer, for, by their remissness in duty they are largely responsible for his sad situation now.

Let our government cease playing the deceptive farce of treating the Indian as a dignified foreigner, while he is held in contempt; abolish the reservation system; disperse the army of "agents," and "contractors," and abolish the present machinery by which "Indian affairs" are managed and make him a citizen of the State or territory in which he lives, and answerable, as an individual, to the laws, and "Indian wars" will soon cease. The Indian will become a producer instead of a drone or a destroyer, and Christian civilization properly administered, will speedily make him a civilized man, worth as much to the nation as any producing emigrant from abroad.

The more humane policy—the "Quaker policy," as it has been called in derision, which has been in operation a few years, is producing excellent results among the Indians. The Commissioner of Indian Affairs reports great improvements among these barbarians, and says: "The civilization of the Indians is not only entirely possible, but is fairly under way." He reports that out of the entire Indian population within the domain of our
India (278,963 souls), 40,638 men and boys support themselves by the
labor of their own hands, and so are producers! About one-sixth of the
Indian population of our land have become producers! In 1874-5, they
raised in the aggregate 2,575,444 bushels of Indian corn, wheat and other
grains, and 471,630 bushels of potatoes and other vegetables. The fields
under cultivation by individual Indians planting for themselves, aggregated
329,327 acres, a larger area by 12,423 acres than ever before reported, and
nearly 200,000 acres more than were cultivated in 1871; a gain of 119 per
cent. in five years, and over 550 per cent. in ten years. Additional lands
broken and ready for cultivation, in 1875, and ready for tillage this year,
aggregated 23,146 acres.

Five years ago,” says the commissioner, “10,329 Indian families were
living in houses. This year shows 19,902, a gain of 92 per cent. The
number of Indian children attending school was 10,598.”

Surely these figures indicate that our barbarian brethren are capable not
only of civilization, but of becoming orderly and valuable citizens. So well
has the “peace policy” worked under the control of the civil authorities,
that the proposition now heard in certain quarters, to place the Indians
under the control of the military authorities, falls harshly upon the ears of
the Christian philanthropist. In every aspect of the case, outside of the
humanitarian view, it is desirable that the good work of civilization should
go on. The interests of all our industries are involved in the movement,
and especially that of our internal commerce.

The Indian, as a savage hunter, is expensive; as a civilized citizen, he
would be profitable. During the years from 1870 to 1876, inclusive, our
government has been compelled to make appropriations for the support of
the Indians on their reservations, (exclusive of the cost of military move-
ments to keep the wild Indians from “picking and stealing,”) of the large
sum of nearly $44,000,000; and about $39,000,000 of that sum has actually
been disbursed. The commissioner remarks:

“The cost of maintaining all the Indians except the wilder tribes like
the Sioux, Utes, Crows, and Arickarees, will steadily decrease from this
time on until they cease to be any burden to the government; and this not
through any process of extinction, but because of their increasing self-sup-
port in a civilized mode of life.”

In another part of his report the commissioner says: “Before yielding
to any despondency or doubt as to the future, even of the most hopeless
tribe, it is well to recall the fact that only seven years ago the United States
was willing to make any promise to the wild Sioux, whom we did not wish
to fight, if they would allow us to push a railway across their plains toward
the Pacific coast. Five of the wisest and bravest leading generals of the
army did not consider it derogatory to the dignity of the government to
solemnly stipulate, in order to gain this end, that the larger part of Dakota,
Nebraska, and Wyoming, claimed by the savages, should never be trodden by a white man's foot; that military forts and roads should be dismantled and abandoned; that no man wearing the United States uniform should ever be seen within the reservation; the Indians should receive large supplies of rations and clothing, and that these stipulations should never be altered by a subsequent treaty, except on the written assent of three-fourths of the whole male members of the nation.

"The trains on the Union Pacific roads have been running daily undisturbed; the surrounding country has been occupied, while Indian depredations have greatly decreased. The lands in Nebraska are now being occupied by settlers, the Indians have withdrawn their claims; soldiers are to be found in every part of the Sioux reservation, and the present season [1875] has witnessed thousands of miners and "pilgrims" swarming over the Sioux country, and digging into their sacred hills for gold. Yet there has been no fighting, under all this provocation, which, five years ago, would have brought ten thousand painted savages into the field for a war which would not have cost less than $50,000,000. And with any kind and firm treatment which bears a resemblance to justice, there will be no serious contention with this powerful tribe hereafter."
CHAPTER XXXIII.

COMMERCE finds important auxiliaries in Banking and Insurance: in the former as a currency broker in traffic, and in the latter as a repairer of losses that might otherwise be fatal to business prosperity. Banking and Insurance have each different phases of character. Banks have three. There are banks of deposit in which the money of individuals, corporations or governments is deposited for safety and convenience; banks of discount or loan which lend money upon drafts, promissory notes, bonds or other securities; and banks of circulation which pay out their own promissory notes, that may or may not, according to circumstances, be payable in coin on demand. The banks of the United States each generally combine the functions of all three.

Insurance is a contract whereby an insurer engages, for a consideration which is called a premium, to insure a certain party against loss or injury to certain property from causes specified in the contract. Insurance has five distinct phases, namely: fire, marine, life, live-stock and accident. Fire insurance is the insurance of houses or goods against fire. Marine insurance is the insurance of property afloat in the form of vessels or the contents of vessels. Life insurance is an insurance of a person against a certain amount of pecuniary loss supposed to be consequent upon the decease of a certain life. Live-stock insurance is insurance against losses occasioned by the death of horses, cattle, et cetera, from accident or disease; and Accident insurance is an insurance, for a specified time, against pecuniary losses occasioned by a disabling accident of any kind. The insured of this kind, are usually travellers. The latter is a branch of life insurance, and is of recent origin.

The business of a banker or a changer of money, is of very ancient origin —probably as old as currency itself. At first he stood in the streets of Egyptian Thebes, or Athens, as a money-changer, ready to furnish passers-by with any denomination of coin required by traffickers and others. After awhile he took funds on deposit for safe-keeping, and made advances upon merchandise, titles to property, family papers and other securities; and finally he became what we know as a banker. His business was regarded as a very important one, in ancient Greece, and he stood high in credit and in the confidence of the Athenians, and of their government. He lent money and received interest for its use.
Such money-lenders, who took interest, were called usurers, not in the present moral sense of the term. Such lenders are frequently mentioned in the Scriptures; and money-changers were among those whom the Redeemer scourged out of the Temple at Jerusalem. That the business was regulated by law, we are assured by the existence of the State bank at New Illium, in Greece, which existed in the second century before Christ. This institution borrowed money for the State, and paid ten per cent. interest for it.

The most ancient, most noted, and most useful banks in Europe, were those of Venice, Genoa, Barcelona and Amsterdam. The first-named was created by the exigencies of war, the last three were established as auxiliaries of commerce.

The Bank of Venice was the first establishment of the kind in Europe and was founded in the year 1171. The wars in which Venice was engaged exhausted the resources of the State, and the government was compelled to resort to a forced loan from the most opulent citizens to obtain the means for carrying on the wars. A Chamber of Loans was organized, which soon assumed the form under which, as the Bank of Venice, "it was, for many ages, the admiration of Europe, the chief instrument of Venetian finance, and the chief facility of a commerce not surpassed by that of any European nation."

So high was its credit, and so just were the transactions of the Bank of Venice, that, according to an eminent writer on political economy, its credits were at a premium over coins, (which were often clipped and worn), and "no book, speech nor pamphlet have been found in which any merchant or dweller in Venice ever put forth any condemnation of its theory or its practice." One of its peculiarities was that funds once deposited in the bank could not be withdrawn, but were transferable upon their books at the pleasure of their owners. The bank existed, without interruption, until the French army overthrew the republic in 1797, a period of six hundred and twenty-six years.

The Bank of Genoa, (bank of St. George), which was projected in 1345, went into full operation in 1407. For centuries its character was as high as that of Venice. It was pillaged by military invaders in 1746, and again by the French army under Massena, one of Napoleon's marshals, in the year 1800. From these losses it never recovered, and within the last twenty-five years it has ceased to perform the functions of a bank. Its great lock, as we have observed, is now among the collections of the Pennsylvania Historical Society.

The Bank of Barcelona—a Spanish city which ranked among the most enterprising and flourishing in Europe, during the Middle Ages—was established in 1401. At that bank, the negotiation of bills of exchange was first instituted.
In 1609, the Bank of Amsterdam was founded, the primary object of which was to give a standard or certain value to bills that might be drawn on Amsterdam, then a great commercial centre. This was necessary because the coins, worn and clipped, were depreciated. It was a bank of deposit only. There the depreciated coins were received on deposit, and had their value established by weight and fineness. It was not intended to loan the funds of the bank, but the directors did so to the governments of Holland and Friesland, and to the East India Company, to the amount of about one-third of the deposits. This fact became known on the invasion of the French army in 1794, and produced the ruin of the institution.

The Bank of England was the offspring of necessity. It was created in 1694, in the reign of William and Mary. The government found it so difficult to raise money to carry on the war with France, that this method, suggested by William Paterson, a London merchant, was resorted to. Its capital, at the beginning, was £1,200,000, and it lent money to the government at the rate of eight per cent. a year. The government had been paying from twenty to forty per cent. for loans. Within ten days after the subscription books were opened the whole amount of the stock—about $6,000,000 was subscribed. Its present capital is about $72,760,000. This bank continues to be the fiscal agent of the government, and has the entire management of the public debt. It exercises a potential influence over the commerce not only of Great Britain, but of the world.

During our colonial period the imperial government of Great Britain would not allow banking proper to be carried on in the British American colonies; and, as we have observed, only a few coins were minted here before the old war for independence. Some of the colonial governments, however, in great emergencies, became a sort of bankers, issuing bills of credit for specific amounts. The people had commodities which they had produced, but not enough currency to use when extraordinary expenditures were to be met.

The first colonial government that issued bills of credit, or paper currency, was that of Massachusetts. In 1690, when that colony fitted out an expedition to drive the French from Canada, it had no money to pay to the soldiers on their return, and the issuing of bills, in convenient amounts, was authorized by the General Court in the following form:

"No. (919) 20 s.

"This indented Bill of Twenty Shillings, due from the Massachusetts Colony to the Possessor, shall be, in value, equal to money, and shall be accordingly accepted by the Treasurer and Receivers subordinate to him, in all Public paym's; and for any stock, at any time in the Treasury.

"Boston, in New England, February the third, 1690. By order of the General Court."
This was signed by three Commissioners, with the seal of the colony (which was of an elliptical form) attached. The faith of the colony was pledged for the payment of these bills, but they did not draw interest, nor were they convertible into coin. They were merely orders of the colonial government upon citizens for supplies of the army, to be called in by taxes and not to be paid in money. The aggregate amount issued was limited by the sum of the taxes. In order to increase the amount the government compelled creditors to take this paper money for private debts. The injustice of the measure was so conspicuous that the imperial government suppressed it.

Fifty-five years later Massachusetts again became this kind of a banker, by issuing bills of credit to the amount of $15,000,000, to defray the expense of fitting out an expedition against Louisburg. That was in 1745. This currency soon depreciated to eleven for one. The English government sent out nearly $1,000,000 to repay the colony for its expenses in the expedition, and with this coin the Massachusetts government bought up its own promises to pay at eleven for one.

Several of the other colonies followed the early example of Massachusetts. In the space of about eighty years from 1709, New York made thirty-four separate issues of bills of credit. The credit of the State during that period is attested by the fact that the average depreciation of its paper money was only about two to one, while that of the other colonies was considerably more.

Great social and commercial evils attended these issues of paper money. The people all felt the harm; but when, in 1775, the old war for independence broke out, there seemed to be no alternative to the necessity for the General Congress to issue bills of credit wherewith to pay the expenses of the war.

From time to time during that struggle the Continental Congress issued paper money until the amount reached the sum of about $360,000,000. This was called Continental Money, in contradistinction to the colonial emissions. They were made a legal tender, and great dissatisfaction and confusion ensued because of the uncertainty of values. It began to depreciate as early as the beginning of 1777; and at the close of December, 1780, when the amount of unredeemed bills was about $200,000,000, it took $7,400 to purchase $100 in specie. Very soon afterward it became absolutely worthless as currency.

When the National Government went into operation in 1789 the Continental bills were purchased at the rate of $1 for one cent. A similar fate met the State issues. The National Constitution, in order to prevent like evils arising again, prohibited any of the States from ever again issuing bills of credit, or making anything but gold and silver a tender for the payment of debts. When a new emission of bills of credit by the General Govern-
ment was proposed, a rhymer of the day made the "Ghost of Continental money," utter words of warning to the "Embryo" of the new scheme. It said:

"I have lived, to be sure,
Awhile to secure
The rights of a much injured nation;
But I got all my living
By a course of deceiving,
That has sunk me in utter damnation.

You may strive and may tease,
But never will please—
You never will suit and content all:
So stay where you are.
Or alas! you will share
The fortune of old Continental."

When Continental money died, at the beginning of 1781, the important question arose: What shall now be done to carry on the war? Specie had almost wholly disappeared. The credit of the government had been ruined by the depreciation of its paper money and the non-fulfillment of the promises made on its face, which ran thus:

"The United Colonies.

"No. 45511. SIX DOLLARS.

"This bill entitles the bearer to receive SIX SPANISH MILLED DOLLARS, or the value thereof in GOLD or SILVER, according to a Resolution of Congress published at Philadelphia, November 2, 1776."

The important question was answered by the mercantile sagacity of that eminent financier of the Revolution, Robert Morris, then Superintendent of Finance. He proposed to substitute private corporate credit in place of government credit, in the shape of a bank of issue and discount. In May, 1781, Mr. Morris submitted to Congress a plan for such a bank, the principal provisions of which were as follows: That the capital should be $400,000, in shares of $400 each; that each share should be entitled to a vote for directors; that there should be twelve directors chosen from those entitled to vote, who, at their first meeting, should choose one as president; that the directors should meet quarterly; that the board should be empowered from time to time to open new subscriptions for the purpose of increasing the capital of the bank; that statements should be made to the Superintendent of the Finances of America; that the bank-notes payable on demand should, by law, be made receivable for duties and taxes in every State and from the respective States by the Treasury of the United States; and that the Super-
intendent of the Finances should have a right, at all times, to examine into the affairs of the bank.

The Congress approved the plan, and by resolution agreed to support the same in every possible way consistent with the public good; also that so soon as the subscriptions should be filled, and the institution should be organized by a choice of proper officers, that the "subscribers to the said bank" should be "incorporated agreeably to the principles and terms of the plan, under the name of "The President, Directors, and Company of the Bank of North America." This promised act was performed on the 31st of December, 1781, and the bank commenced business in January, 1782, with Thomas Willing, an eminent merchant of Philadelphia, as president. In April following it was incorporated by the State of Pennsylvania. Of its $400,000 capital the government was a subscriber to the amount of $254,000. That bank still exists (under the national system), with a capital of $1,000,000 and a surplus of $1,000,000. It enabled the government to carry on the war to the end.

This was the first bank established in this country. That was ninety-four years ago. The number of banks organized under the national system, and doing business in October, 1875, was 2,087, whose aggregate capital was $504,829,769. They had a surplus of $134,356,076; an outstanding circulation of $318,350,379; individual deposits to the amount of $664,579,619, and of loans $980,222,951. They had of specie, including coin certificates, $8,050,329; legal tender notes, including United States certificates of deposit, $125,268,734, and on deposit with the United States Treasurer, $19,686,669.

Soon after the establishment of the Bank of North America, the Bank of New York was chartered by the legislature of New York, and the Bank of Massachusetts was incorporated, and established in Boston. These three institutions held the entire banking capital of our country until 1791, and were very successful.

The prosperity of these banks suggested to the fertile mind of Alexander Hamilton the establishment of a government bank to aid in the financial operations of the nation. He recommended the measure in his report as Secretary of the Treasury, and a bill for the purpose passed the Senate of the United States, without much opposition. It encountered vehement resistance in the House of Representatives, but finally passed that body in February, 1791. Then President Washington requested a written opinion upon the measure from each member of his cabinet. The Secretary of State and the Attorney-General declared that Congress had no authority to establish such an institution, and that it was unconstitutional. The Secretary of War and the Secretary of the Treasury were of a contrary opinion. Washington coincided with the latter, and signed the bill, so making it a law.

The United States Bank went into operation in 1791, with a capital of
$10,000,000, of which amount the government subscribed $2,000,000, and
$8,000,000 were subscribed by individuals, who gave $2,000,000 in specie,
and $6,000,000 in six per cent. stock of the United States. The charter was
for 20 years, to expire on the 4th of March, 1811. The measure was
very popular, and the shares of the bank rose to 25 and 45 per cent. pre-
mium. It paid a dividend of 8½ per cent. on its capital. A sort of bank-
mania ensued, and these institutions rapidly multiplied. They became
favorites of the people, for they furnished business facilities that were of
great importance to the entire commerce of the country. The simple but
efficient uses of local banks in commercial operations, is clearly set forth by
Mr. Thomas P. Kettell, in the following paragraph:

"Although bank circulation does not, in any degree, create capital, it
supplies the place of the precious metals as currency. If we suppose a
miller wishes to purchase grain, he gets a note or acceptance for sixty days
on New York discounted at a local bank, which pays out to him circula-
ting notes. With these he purchases wheat of the farmer, flours it, and for-
wards it to New York for sale, and the proceeds are applied to the taking
up of his draft that the bank had discounted. In the meantime, the farmer
has paid away the notes he took for his wheat, probably to the store-keeper
in discharge of his bill. The store-keeper has now to remit to New York to
pay a note that falls due for merchandise previously purchased, and fur-
nished to the farmer. To do so, he goes to the bank, and buys of it the
draft on New York that the institution had discounted for the miller. This
he remits to his merchant, who gets it paid from the proceeds of the flour.
The transaction is thus closed, and by it a farm produce has been got to
market, and merchandise, in return, has passed from the manufacturer to
the consumer, effecting an exchange of commodities without the use of any
money at all. The notes that the bank put out on a draft, after performing
the functions of money, returned to it in exchange for the draft, and all
obligations were cancelled. This is the operation of paper when confined
to actual business transactions."

As the time was approaching when the United States Bank would expire
by the limitation of its charter, the local bank interest, combined, produced
a powerful opposition to the rechartering of that institution, on the grounds
(1) that it was unconstitutional; (2) that too much of its stock was owned
by foreigners; and (3) that the State banks better accommodated the public.

The application for a renewal of the bank charter was made to Congress
in 1808, three years before it would expire, and Mr. Gallatin, the Secretary
of the Treasury, reported to Congress in favor of a renewal. Nothing was
then done, and definite action was postponed (although the attention of
Congress was called to the matter from time to time) until a few weeks be-
fore the hour when the bank would cease to exist. By the casting vote of
the Vice-President, George Clinton, the bill for its recharter was defeated, and the bank was compelled to wind up its business. The stockholders received a little more than $108 for each share whose par value was $100.

With the closing of the United States Bank began the erection of a large number of banks incorporated by the several States. Stephen Girard, of Philadelphia, bought the United States Bank and its business, and carried on private banking with a capital of $1,000,000. In the course of four years (from 1811 to 1815), one hundred and twenty State banks were created, with an aggregate capital of $40,000,000, and an estimated emission of notes to the amount of $200,000,000, a large portion of which, in the Middle States, were issued as loans to the government for the purpose of carrying on the war with England from 1812 to 1815. During that war, the unpatriotic action of the Peace Faction, aided by some Boston banks, caused a general suspension of specie payments by the other banks of the Union, and their bills depreciated to 20 per cent. in Baltimore, and 15 per cent. in New York.

The finances were in a wretched state at the close of that war. The bills of the State banks were at a discount of 20 per cent. in Baltimore, in 1816; in Philadelphia 17 per cent., and 12½ in New York. There was very little other currency besides the depreciated paper; and, though Congress had passed a law that gold and silver only should be received for government dues, the government was compelled to receive these bank notes in violation of its own law. This bore with an unequal and unjust pressure, for funds received in one place were more depreciated than in another; and New Englanders, whose currency was sound, bitterly complained of the injustice. There was universal dissatisfaction, and the people clamored for another United States Bank as a cure for these financial evils.

In the spring of 1816, Congress chartered another National Bank, for twenty years, with a capital of $35,000,000, of which amount the United States subscribed $7,000,000, in a 5 per cent. stock. It was provided that the remaining $28,000,000 were to be subscribed for by individuals, companies, or corporations, one-fourth in gold and silver, and three-fourths in the funded debt of the United States, that debt then amounting, as we have observed, to about $127,000,000.

The creation of the National Bank compelled the State banks to resume specie payments or wind up. Many of them were aided in resumption by the great bank, but the weaker ones, after struggling, some of them for several years, closed their doors. Of the 246 State banks, with an aggregate capital of about $90,000,000, in 1816, a very large number were compelled to liquidate. From 1811 to 1830, 165 banks, with a capital of $30,000,000, closed business, and the loss of the government and of individuals by these banks, was estimated at about $5,000,000.
The second United States Bank went into operation early in 1817, with its principal banking house in Philadelphia, and branches in most of the large cities. In it were deposited the funds of the government, the use of which gave the bank great facilities. It soon became powerful as a medium of exchange; and it grew strong and powerful by its connection with the growing business of the country, then conducted very largely upon a system of credits. As the business of the country revived, after the war, and prosperity returned, new State banks were chartered, and became the recipients of the funds of business men in their respective localities. The merchants in cities were continually in debt to the government for duties and taxes, and these they paid by their checks on their local banks.

The United States Bank, managing the funds of the government, was the common recipient of all these checks paid into the public treasury, and so became a continual creditor of the local banks. This gave it a power which might be dangerous. It could always force the local banks to contract their loans by compelling them to pay, thus creating commercial disturbances; or they could permit them to increase their loans by being indulgent in regard to balances.

The United States Bank became a great collector of bills, for its machinery operated with power in all parts of the Union. A New York merchant who sold his goods to store-keepers in all parts of the country, took the notes of his customers made payable at local banks. The great bank could collect these accounts cheaper than any other agency, and its branch in New York was the receptacle of accounts to be collected in other cities. These would be forwarded to the branches of the bank in those cities, and they would notify the merchants of the notes they held against them. The merchants would pay in checks upon the institutions in which they kept their deposits. These checks made the United States branch bank the common creditor of the local banks, whose specie it thus controlled.

The State banks complained loudly of the tyranny exercised over them by the United States Bank and its branches through the power thus acquired, which was really greater than from the use of the public funds. From the beginning there had been a strong opposition to the National Bank; and an effort was made, in 1818, to have its charter repealed, on the ground of alleged mismanagement; now that opposition assumed a strong aspect. There was doubt in mercantile circles of the utility of a change, for the commerce of the country had adjusted itself to the operations of this powerful financial agency.

When General Jackson became President of the United States in 1829, he showed tokens of opposition to a recharter of the National Bank. In his first message he referred to such a measure as having "constitutional diffi-
culties" in the way, and expressed a desire that Congress might take the matter into serious consideration. Committees of both houses reported favorably to a recharter, but the matter rested until the session of 1831-32, when the corporation made an application for a renewal of the charter. A bill was passed rechartering the bank, which was sent to the President on the 4th of July, 1832, for his signature. On the 10th of that month he returned it without his signature, accompanied by a message in which he gave his reasons for disapproval.

An effort was made to pass the bill over the President's veto, but without success. That veto was hailed with much satisfaction in many parts of the country. In Pennsylvania, where the bank was popular, the President's course was severely condemned. At a large meeting in Philadelphia, composed of Jackson's political friends, the veto and other public acts of the President were censured, and they deplored his re-election to the presidency (for which he was then a candidate) as "a national calamity," which they pledged themselves "to use all lawful and honorable means to avert by opposing the re-election of Andrew Jackson." But Jackson gained political strength in other parts of the Union by his measures, and he was re-elected by a very large majority.

President Jackson, professing to regard the public moneys as unsafe in the hands of the National Bank, recommended Congress to authorize their removal. That body refused to do so. The President determined to take the responsibility of the removal of them without the sanction of Congress, and after ineffectual efforts to induce two successive Secretaries of the Treasury (Louis McLane and William J. Duane) to perform the act, he removed the latter gentleman from the office and appointed Roger B. Taney (afterward Chief Justice of the United States) his successor. Mr. Taney obeyed the President's order, and the funds were removed from the bank in October, 1833. The institution expired in 1836. It was rechartered in the same year by the legislature of Pennsylvania, with the same capital. It suspended specie payments in 1837 and again in 1839; and in February, 1840, it made a final suspension. On winding up its business there remained nothing for the stockholders. The entire capital had been sunk, and wide-spread distress was the consequence.
CHAPTER XXXIV.

Up to 1840 the United States Bank was a controlling money power in the land, although a large number of banking institutions were incorporated by State legislatures. They were continually increasing down to the breaking out of the late Civil War. Not long before that event these institutions numbered more than 1,400 in the Union, of which number more than one-third were in New England. Different systems have been tried to prevent excessive issues of bank notes, and to insure the safety of the public from losses occasioned by the failures of banks.

At the close of the war of 1812-15 there were sixty-three banks in the New England States, with an aggregate capital of little more than $19,000,000, and their circulation in notes of small denominations was large. The bills of each bank was the currency of its neighborhood. When they went abroad they circulated at a discount, because there was no provision made for their redemption elsewhere than at the counter of the issuer. There was consequent loss to the community; and in 1825 the Suffolk Bank of Boston attempted to remedy the evil by what is known as the "Suffolk system."

The Suffolk Bank undertook to receive all the bills of the other New England banks, and, by an agent, to present them to each issuing bank, requiring it to redeem its notes in specie. This compelled each bank to keep on hand a large amount of specie at an expense which consumed the profits of their circulation. So they entered into an agreement with the Suffolk Bank to keep on deposit in that institution a sufficient sum, say about $3,000, to redeem any balance of the notes that might be found there. Each bank was compelled to restrict its circulation to the business wants of its locality in order to keep down that balance. Each bank was also required to send promptly to the Suffolk Bank any bills of other banks that might come into its hands, as an offset to its own balance.

So it was that all the banks of New England, numbering 505 in 1860, with an aggregate capital of over $90,000,000, were continually "making a run" upon each other; and five hundred streams of currency were continually flowing into the Suffolk Bank, where the notes were assorted and sent back to the respective issuers. This system kept the paper currency of New England in a healthful state, for every bank was extremely anxious to
have its balance on the right side at the Suffolk. To be "thrown out of the Suffolk"—not to be able to meet a balance there—was fatal to the character of a bank.

In 1829 a system known as the "Safety Fund" was put into operation in New York, to secure holders of bank notes against loss. All the banks doing business in the State were required to contribute one-half of one percent of their aggregate circulation to a fund out of which the notes of a broken bank were to be paid in full. This system was unjust in its fundamental principles, since it called upon sound and honest banks to pay the debts of unsound and dishonest ones. In the great financial revulsion in 1837 the system received a severe shock. Many banks failed, and the fund was insufficient to redeem their outstanding notes.

The "Suffolk system" in New England and the "Safety Fund system" in New York, remained in operation until the exigencies of the late Civil War caused our government to provide for a national currency by a law passed in 1864, entitled "An act to provide a national currency, secured by a pledge of United States bonds, and to provide for the circulation and redemption thereof."

From 1791, until 1860, the increase of banks in the United States is shown by statements of their number, capital and operations, at remarkable periods in our history. In 1791, there were three banks, with an aggregate capital of $2,000,000. In 1811, when the first United States Bank expired, and our commerce was languishing, there were 89, with an aggregate capital of $52,700,000, and a circulation of $28,000,000. In 1820, when business revived after the war, they numbered 308, with a capital of $137,000,000, and a circulation of about $45,000,000. In 1837, immediately after the expiration of the second United States Bank, there were 634, with a capital of nearly $291,000,000, and a circulation of $149,000,000. This number was increased, in 1840, to 901, with a capital of over $358,000,000, and a circulation of $107,000,000. In 1860, the number of banks in the Union was 1,562, with an aggregate capital of almost $4,000,000,000, and a circulation of about $207,000,000. At that time, they held $83,594,537 in specie, and their aggregate deposits were nearly $254,000,000.

The act to provide for a national currency became a law on the 3d of June, 1864. It provided for a separate bureau in the Treasury Department, the chief officer of which is called Comptroller of the Currency, whose office is under the general direction of the Secretary of the Treasury.

Also that associations for carrying on the business of banking may be formed, consisting of not less than five persons; that no association shall be organized under the act with a less capital than $100,000, nor in a city whose population exceeds 50,000 with a less capital than $200,000, but that banks with a capital of not less than $50,000 may, with the approval of the
Secretary of the Treasury, be established in any place the population of which does not exceed 6,000.

That such associations shall have existence for twenty years, and may exercise the general powers of banking companies.

That the capital shall be divided into shares of $100 each.

That stockholders shall be equally liable to the extent of the stock for the debts and contracts of the bank.

That every association, preliminary to the commencement of banking business, shall transfer bonds of the United States to an amount not less than $30,000, and not less than one-third of the capital-stock paid in.

That upon the proper examination being made into the affairs of the proposed institution, it shall be entitled to receive from the Comptroller of the Currency circulating notes equal in amount to 20 per cent. of the current market value of the bonds transferred, but not exceeding 90 per cent. of the par value of such bonds.

It was also provided that notes, to an amount not exceeding in value $300,000,000 should be issued; that those notes should be received at par in all parts of the United States, in payment of taxes, excises, public lands, and all other dues to the United States, except for duties on imports, and also for all salaries and other debts and demands owing by the United States, to individuals, corporations, and associations within the United States, except interest on the public debt, and in redemption of the national currency; that the rate of interest to be charged, should be that allowed by the State or Territory where the bank should be located; and that any State bank might become a national bank under this act.

By an act passed in March, 1867, it was provided that temporary loan certificates bearing 3 per cent. interest, may be issued to an amount not exceeding $50,000,000, and used for this purpose; and that such certificates might constitute for any national bank a part of the reserve provided for by law, provided that not less than three-fifths of the reserve of such bank should consist of lawful money of the United States. An additional amount of $25,000,000 of temporary loan certificates was authorized in July, 1868; and in July, 1870, provision was made for issuing $54,000,000 additional currency to national banks. The act further provided for the re-distribution of $25,000,000 of bank circulation to banks in States not having their proper proportion, to be taken from banks in States having circulation in excess after the whole amount of 54,000,000 of new circulation had been applied for and issued. By a law which taxed all banks chartered by States, 10 per cent. per annum on all circulation paid out by them, Congress effectually drove their notes from circulation.

By an act of Congress passed in 1875, banking under the national system is made free, without any restrictions as to the amount of circulating notes
that may be issued to any part of the country; and the privileges attached
to the national banks are open to individuals everywhere. This will pro-
duce a more equal distribution of banking capital than has hitherto been
accomplished, for it will go wherever the exigencies of business may require
it. Before that law was passed, that distribution was very unequal, and was
based upon no sound equitable principles. For example: in 1872, Boston,
with a population of 250,000, and a manufacturing industry of $111,000,000
a year, had 48 banks, with a capital of $48,600,000, and a circulation of
$26,000,000; while Philadelphia, with a population of 674,000, and a manu-
facturing industry of $325,000,000 a year, had but 29 banks, with a capital
of $16,235,000, and a circulation of $11,384,000.

Early in the late Civil War, all the banks of the United States suspended
specie payments, and they have not yet resumed, though Congress has pro-
vided for an initial step toward general resumption, to be taken on the first
of January, 1879, at which time the government itself stands pledged to
resumption and to the final redemption and removal from the currency of
the country of the legal-tender notes as fast as they shall be presented for
redemption. This is in accordance with the provisions of an act passed in
January, 1875, which makes express provision for resumption at the date
above-mentioned. By an act of the present Congress, resumption by the
government was begun by calling in its fractional currency, and giving silver
coin in exchange.

The Clearing House, established for facilitating the business of banking
in large cities by saving time and trouble in the use of both coin and paper
currency, is a recent contrivance. It originated in London, and was intro-
duced into this country a little more than twenty years ago. By its system,
all the banks in a city, associated as members of a Clearing House, become
as one individual in labor. The system now exists in New York, Philadel-
phia, Boston, and other large cities in the United States. Its operations
are simple, and may be illustrated and described as follows:

Until the introduction of the clearing-house system here in 1853, each
bank in a city had heavy clerical labor to perform, which is now dispensed
with. Suppose, in a large city, there were sixty banks. Each one of these
banks receives checks on all the other banks, and has checks drawn upon it,
in favor of all others. There are also drafts and bills from abroad continually
coming to each to be paid by others. Formerly each bank employed a
man to go round and collect all these checks and drafts, each day, and each
bank kept sixty accounts open.

Now, in Philadelphia (and in a similar manner in other cities), this labor
is saved by the Clearing House, in the following manner:

At about 8 o'clock every morning a messenger and clerk from each bank
appear at the Clearing House. The clerks take their seats inside of desks
arranged in the form of a hollow ellipse. Each messenger brings with him, from his bank, a sealed package for each other bank, containing all the checks or drafts on such bank; the name of the bank sending and the name of the bank to which it is sent being printed on each package, and the amount sent is written thereon. The messengers take their places near the desks of their respective banks, and they have with them tabular statements of the amount sent to each bank and the aggregates. These are exhibited to the respective clerks, and noted by them on the blank forms.

At precisely 8:30 o'clock, the manager of the Clearing House calls to order, and gives the word for proceeding, when all the messengers move forward from left to right of the clerks, handing in to those clerks the packages addressed to their respective banks, and taking receipts for them on their statements. These clerks make a mutual exchange of all claims, and the balance, if any, is struck, and each bank pays, in cash, the amount of that balance. This operation occupies about one hour, within which time all accounts are adjusted.

The balances due by the several banks are paid into the Clearing House the same day at 11:30 A.M., and are receivable by the creditor banks at 12:30 P.M. A second clearing of drafts by the morning's mail is made at the Clearing House by the several messengers at 11:30 A.M. Each bank is obliged to furnish the Clearing House a daily statement of its condition at the end of business hours that day; and tables are daily furnished to the several banks of the condition of all the banks in the Clearing House. Of all these matters, complete records are kept on the books of the Clearing House. By the intervention of this institution, there is a saving of full 96 per cent. of expense in the business of banking, in large cities, in the cost of making these exchanges.

Savings Banks are institutions for the deposit and safe keeping of small sums of money. Benevolent persons originally put in practice the receiving of such small sums from the poor, allowing them interest, and so encouraging them to save. The earliest regular Savings Bank of which we have any record, was founded in Hamburg, in 1778. The next was in Berne, in Switzerland, in 1787. The oldest savings bank in the world, which has had a continuous existence until now, is in Zurich, Switzerland. It was established in 1805.

Several institutions similar in plan, and the same in their prime objects, have been put into operation in England within about eighty years. So early as 1771, a bill for the incorporation of the rate-payers of any parish for the purpose of receiving the savings of the people, investing the same, and granting deferred annuities to the owners thereof, passed the House of Commons, but failed in the House of Lords. Nothing more was done until 1797, when Jeremy Bentham suggested a plan for "Frugality Banks," in
connection with the management of paupers. Other efforts were made in the same direction for the benefit of the laboring class, and in 1806 the "Provident Institution" was established in London, to which a savings bank was at first attached, but it finally became merely a life insurance company.

Probably the first regular savings bank in Great Britain was one established in Edinburgh in 1813, which, within three years, received from 1,837 depositors the aggregate sum of £8,316, or about $40,500, on which an annual interest of 4 per cent. was paid. Other institutions of the same kind speedily appeared in different parts of the United Kingdom. The first one established in Ireland was opened at Stillorgan, in Dublin county, in 1815.

Parliament first legislated on the subject of savings banks in 1817, when it passed a law entitled "An act to encourage the establishment of savings banks in Ireland." Other laws respecting these institutions were enacted, and, in 1861, a law for the establishment of savings banks in connection with the post-office went into operation. By December, 1862, the balance of deposits on hand, in these institutions, was £1,694,724, or about $9,775,000. The total amount of deposits, at the end of the year 1873, was £21,745,442, or about $108,727,000. The total amount of deposits in all the savings banks of the United Kingdom, in May, 1875, was £65,673,000, or about $328,360,000.

The first savings bank in the United States was established in Philadelphia in 1816, at the suggestion of Condé Raguet. It was called "The Philadelphia Savings Fund Society," and still exists in a flourishing condition. It held deposits on the 1st of January, 1875, to the amount of $10,275,752. The second savings bank was established in Boston the same year; the third in New York in 1819.

These banks are regulated by State laws, and the average interest paid to depositors is about 5 per cent. According to the most careful estimates, the total number of depositors in these banks, in 1875, was 2,164,263, and the aggregate amount of deposits was $810,096,745. The largest number of depositors in one State was in New York, being 872,408, where, also, was the greatest aggregate of deposits in any one State, being about $304,000,000. In Boston there is a Five Cent savings bank, whose depositors, at the time of its last report, numbered 71,228, and the amount of its deposits was $13,301,893.

The public debt of the United States at the close of the old war for independence, State and National, was about $70,000,000. At the close of the second war for independence (1815), it amounted to about $127,000,000, which was all extinguished in the course of twenty years from that time. In 1835, the Republic was out of debt, and in 1836, there was a surplus of
The Civil War that broke out in 1861 burdened the nation with heavy indebtedness, under which load, lightened somewhat by partial liquidation, it still labors. But from the beginning of the nation in 1789, until the close of the fiscal year in 1861, by a judicious arrangement of customs duties, the sales of public lands, and taxes, the receipts of the government have been greater than its expenditures, ordinary and extraordinary. The total receipts during that period of seventy-two years were $1,846,275,863, and the expenditures were $1,453,790,786, making an excess of revenues of $392,485,077. To compute the increased wealth of the nation, to this excess of receipts over the expenditures should be added the enormous value of public lands still at the disposal of the government, its public property of every kind, and its untold mineral resources. The aggregate will show a vast excess of assets owned by our government over its liabilities, though these amount, at the present time, to over $2,000,000,000.

On the first of January, 1861, the total national debt was a little more than $69,000,000, consisting of loans, the Texan indemnity, Texas debt, and treasury notes. The magnitude of the Civil War that soon ensued, caused a sudden and enormous increase of that debt, and for the first loans the government was compelled to pay interest at the rate of 12 per cent. a year. But the patriotism of the supporters of the Union soon made ample provision for the immediate wants of the government, by loans at six per cent.

When Congress met on the 4th of July, 1861, the Secretary of the Treasury reported that he estimated the probable expenditures for the year, at $318,519,581, the ordinary expenses at nearly $94,000,000, and the extraordinary ones, on account of the war at nearly $224,000,000. Congress at once authorized a loan of $250,000,000. They also imposed higher duties, a direct tax, and an income tax.

By wise and extraordinary exertions, the Secretary of the Treasury (Mr. Chase,) procured loans to meet the demands made upon his department, and at the close of 1861, the whole national debt (actual and authorized) of the general government, the States, cities, towns and counties, was estimated at $1,400,000,000. The circulation of the banks of issue of the country, was about $200,000,000, and this, with the large amount of money drawn from them in the shape of loans to the government, caused their suspension of specie payments in December, 1861. From that time forward, to the close of the spring of 1865, the debt of the National Government steadily increased by loans, and the issue of bonds, treasury notes and currency.

On the 30th of June, 1865, the total national debt amounted to $2,682,593,000. On the first of January, 1866, the total amount was $2,807,310,000. The total debt on the last of June, 1875, was $2,270,932,088.
At the same time there was $142,243,361 in the Treasury, showing a decrease in the national debt since January 1, 1866—a period of nine years and one-half—of $678,621,274.

The several States in the Union, in 1870, had an aggregate debt of $864,785,000, of which amount $324,748,000 is represented by bonds. In this list, the State of New York appears the largest debtor, the sum being $159,808,000. Pennsylvania owed the next largest sum—$80,000,000. Three other States owed over $50,000,000 each, namely, Louisiana, Massachusetts and Virginia. Three other States owed over $40,000,000 each, namely, Illinois, Missouri and Tennessee. North Carolina owed over $32,000,000; and Maryland $29,000,000. Three other States (Georgia, Ohio and New Jersey), owed over $20,000,000 each; and seven States owed more than $10,000,000 each. The States least indebted were Oregon and West Virginia, the former then owing $218,486, and the latter $561,767. The Territories had an aggregate debt of $3,891,691.

The total indebtedness of the several States, and of counties, towns, cities, et cetera, in 1870, was $1,384,486,818. The whole public indebtedness of the United States, at this time, is, probably, full $3,400,000,000, or almost $500,000,000 less than the national debt of Great Britain, in 1874.
CHAPTER XXXV.

WE have observed that Insurance is an aid to Commerce. It was undoubtedly practiced, in some form, before it was regulated by law, assumed the features of an institution under the control of the State, and took its place in history. The prudence of capitalists gave it birth. Men were unwilling to risk their fortunes in hazardous enterprises, such as pertain to commerce on land or sea without some guarantee against losses. The consequence was that commerce and manufactures struggling for development, were restrained by this protection of capital which, if freely used, would have given them great vitality and stimulated their growth.

At the close of the age of chivalry and the period of the Middle Ages, in the fifteenth century, when the commercial spirit was becoming dominant in Europe, the student of social science and political economy, with the few lights at his command, discovered the great law of average, and from it drew deductions out of which was developed the invention of insurance. It was discovered that what was called chance, was governed by strict rules, notwithstanding the incidents were as variable and uncertain as possible. Winds, fires, births and deaths, seemed to obey no laws whatever, until, by a long series of observations, it was discovered that, taken in great numbers, the average that occurs within a given time, is almost certain.

"If," says a recent writer, "we look at single families, we find that some are all boys, others all girls, and many are of both sexes, without any apparent proportions. Yet the census returns of all civilized countries show that there are twenty-two males for every twenty-one females; and that, notwithstanding the uncertainty of death, this proportion will hold good through generations. The number of houses burned in a year, in any given locality, obeys the same law of average as in all the incidents of life. The number of ships engaged in any trade, that are lost, comes under the same rule."

Analogous to these facts is the operation of the periodic law in the occurrence of human events, not only in the lives of individuals, but of communities and nations; and from this law may be drawn deductions and inferences which, in expression have the features of prophecy. Herbert Spencer says:

"The rhythmical tendency is traceable in all departments of life—in the despotism after revolution, the alternation of reforming and conservative
epochs, ascetism and licentiousness, regularly recurring inflations and panics in commerce, in fashions so carried from one extreme to another, that a gentleman of the old school in wearing one style of apparel, found himself seven times fashionable during his life."

It is by the study of the principle of average, the doctrine of chances, and the periodic law in connection with extensive observations of occurrences in society and in nature, that marine and fire insurance, life insurance and the weather predictions of the Signal Office, have been brought within the range of almost scientific certainties in calculations.

It is said that the history of marine insurance runs back to the Emperor Justinian late in the fifth century; but its regulation by law seems not to have taken place before the fifteenth century. The rate of premium was determined by averages. For example: if in the course of long experience and observation, it was ascertained that of fifty ships engaged in any particular trade, one is lost every year, the chance of loss is one in fifty, and the owner of the ship insured should pay one-fiftieth part to cover his risk, exclusive of the sums required for the expense and profits of the insurers. In this way a whole mercantile community become responsible for the losses of one of its members. The adoption of this system gave a wonderful impulse to commerce, for hazardous enterprises were undertaken with more confidence and alacrity.

For a long time Marine insurance was the only kind adopted by commercial men; but toward the close of the seventeenth century the same principle was applied to fire-risks. The chances of the destruction of property by fire, were calculated from the results of long experience and observation, and premiums were arranged accordingly.

The habit of insuring property against losses at sea or by fire, has prevailed in this country, more or less, ever since the middle of the seventeenth century, especially when ship-building and commerce became quite active at an early period. The business before the Revolution, was conducted chiefly if not wholly, by individuals who were called Underwriters, (a name still used in this connection,) from the fact that they subscribed their names to the policies. Now the business is done in this country by incorporated companies of two kinds, namely, stock companies, in which the stock is owned by persons who receive the profits by way of dividends; and mutual companies, where the profits are divided among the insured. Marine and fire insurance companies of these two kinds flourish in the United States.

It has become almost a universal habit in our country to insure property against losses, especially by fire. By constant improvements toward making buildings fire-proof, the rates of insurance have been diminished, and the business is a profitable one to all concerned. For some time after the close of the war for independence, it seems to have been confined, in this country,
FIRE INSURANCE.

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to individual underwriters. At length the "Insurance Company of North America," was incorporated, with its head-quarters in Philadelphia. That was in 1792. Seven years afterwards, the "Providence Insurance Company" appeared at Providence, Rhode Island; and in 1806, the "Eagle Company," of New York, was incorporated. These were all stock companies. For many years it was the habit for each fire insurance company to put a plate on the building insured, with the name of the company, and often with the date of the insurance, upon it. This practice continued until about fifty years ago.

With the great increase in the commercial and industrial activities of the country, during the last seventy years, the business of insurance has kept pace, and an immense amount of capital is invested in it. It is more extensively carried on in Hartford, the capital of Connecticut, than in any other city in the Union, in proportion to its population. In 1870, Hartford had a little more than 109,000 souls, and then it contained eight flourishing fire insurance companies on the stock principle, with an aggregate capital of $7,100,000, besides two Mutual companies. The oldest company is the "Hartford," which was incorporated in 1810, and has a capital of $1,000,000. The "Etna," with a capital of $3,000,000, was incorporated in 1819. Within fifty-four years that company has paid losses to the amount of $39,000,000. Hartford has also eight Life Insurance companies (three of these mutual); a Life and Accident Insurance Company, and one Accident Insurance Company. The gross assets of these life and accident insurance companies is nearly $80,000,000. The Connecticut Mutual Life Insurance Company, incorporated in 1846, has about $35,000,000 assets.

The business of fire insurance has wonderfully increased in our country within the last ten years. The capital engaged in it, in 1866, was $44,410,000; now it is about $56,000,000, notwithstanding a loss of over $15,000,000 sustained by the great fires in Chicago, Boston, and elsewhere, in 1871 and 1872. This is exclusive of the great amount of foreign capital that has found its way to our shores.

In 1865, the premium receipts for fire insurance in this country were $29,529,000; in 1875, they were about $65,000,000, while the losses, which, in the same year (1865), were $17,265,000, had increased in 1875 to about $32,000,000. The amount of property covered by insurance in 1865 was $3,428,000,000; in 1875, it was $6,273,000,000.

In 1865, fire insurance companies associated for mutual and public benefit, under the name of the National Board of Underwriters. Their deliberations have led to the enactment of many salutary laws relating to the preservation of life and property from fires. They have suggested the erection of fire-proof stores, and the introduction of various methods for preventing great conflagrations.
According to a report made to that board at its annual meeting in New York, late in April, 1876, full 35 per cent. of the number of fires in the United States and Canada, in 1875, originated from the incendiary's torch, and 55 per cent. of the whole property destroyed was the result of that cause. Out of a total amount of property burned in the United States and Canada in 1875, amounting to $86,000,000, nearly $50,000,000 of it was caused by the work of incendiarism. The board has a fund created by the contributions of insurance companies, which is partly used in carrying out measures for detecting incendiaries, by rewards, et cetera.

Fire engines, such efficient co-workers with insurance companies in saving communities from the burden of losses by fire, are modern contrivances. We have no account of the existence of any machine for the purpose before the sixteenth century, and it is not certain that the one then used at Augsburg resembled the machine as we know it, in its principle of construction. One seen at Nuremberg, in 1537, did resemble the machines in present use. They were used in Paris in 1684. Leather hose for gathering and distributing the water was invented in Amsterdam, about the same time.

The dreadful losses of life and property by fires, before the fire engines came into use, form the materials of a sad chapter in social life, and yet this machine has sometimes been found to be powerless, as in the case of the Chicago fire in the fall of 1871. When the great fire desolated London in 1666, nothing but "hand-squirts" or syringes were known, and the water was carried in buckets. On that occasion, the conflagration lasted four days, and spread over 436 acres of ground, including 400 streets, and 13,200 houses, most of them small and very combustible. Two hundred thousand persons were made houseless. No less than 89 churches were burned, and $50,000,000 worth of property was destroyed.

The English were slow in copying contrivances of their continental neighbors, and it was not until about the close of the seventeenth century, when the "hand-squirt" was superseded by a pumping engine invented by Newsham. It was a clumsy affair; and down to the period of our revolution, very few engines were used in Great Britain. They were not in common use in our country until early in the present century, when great improvements were made by American mechanics.

The steam fire engine is now rapidly displacing the hand-worked engines in our larger cities. It was invented by Captain John Ericsson in 1828. He was then a resident in London, and a machine was built at the expense of J. Braithwaite. The working cylinder was twelve inches in diameter, and it threw a stream of water more than an inch in diameter, to the tops of high brewers' chimneys.

The great fire in New York in 1835, called public attention to the importance of more efficient extinguishers than the hand engine; and the
Mechanics' Institute of that city offered its great gold medal for the best model of a steam fire engine. Captain Ericsson, who had lately become a resident of New York, won the prize. That was in 1840. The following year, the associated insurance companies of that city employed Mr. Hodges to construct a steam fire engine. It was built, and on several occasions did good service, but its immense weight was a fatal objection, and it was abandoned.

In 1852, the authorities of Cincinnati employed A. B. Latta to construct a steam fire engine. It was completed in 1853, but its great weight was a serious objection. After that they were made lighter, and designed to be drawn by horses, confining the functions of the engine simply to the throwing of the water. Now they are successfully used in a large number of places, and are superseding the hand engines. No less than 275 cities and villages in the United States are supplied with one or more steam fire engines. Ninety places have efficient fire patrols; 78 have paid fire departments; 65 have public water works, and 87 have a sufficient water supply by gravitation.

Very recently a scientific invention called the "Automatic Signal Telegraph," designed, originally, for the detection of burglars at their first attempt to enter a building, has been effectively employed in the benevolent work of assisting in the protection of property from destruction by fire. This contrivance is one of the scientific wonders of our day. It is a new application of the electro-magnetic telegraph, which is yet, doubtless, in its infancy of promise and performance. This instrument for the detection of fire is now largely used in some of the great cities of our land. Its operations are as follows:

A series of main lines of insulated wire are erected throughout the different sections of a city, with which an unlimited number of buildings may be connected by various loops or branches, all of which centre at the Insurance Patrol stations which, in New York, have been established by the New York Board of Fire Underwriters. The battery power is supplied at the stations; never in the building protected.

The line enters the building, extending through every apartment at the ceiling, thus forming a continuous unbroken connection from cellar to roof. In this line, about twenty feet apart, are placed Thermostats, or heat-detectors, which consist of small brass-cased tubes, each enclosing an adjustable circuit-closing screw, which connects with one of the wires of the circuit; also a ceiled spring composed of two different metals of unequal expansion, which connects with the other wire of the circuit; these are insulated, and the ends so slightly separated that the expansion (by a fixed degree of heat) of the metallic spring will bring it in contact with the screw, thus completing the circuit and transmitting the signal.
The Thermostats can be set to operate at any predetermined degree of temperature above ordinary changes, as may be required for different exposures. At the end of each story of the building is placed a transmitting instrument, which will indicate at the station, the street, the number of the building, and the precise apartment in which a Thermostat has been closed by heat.

The transmitter consists of a revolving circuit-breaker, worked by a train of wheels automatically released and set in motion by the power of a magnet whenever the circuit is closed by the action of heat in the Thermostat. Each is arranged according to the floor on which it is placed, to transmit at intervals a series of signals, or a number, which shall indicate at the station by signals on the gong; also by printing on paper the situation of the building on fire, and additional signals, at quicker intervals, indicating the particular apartment. The transmitters are so connected with the main line that if tampered with or removed, or if the wires are cut, the signal will be given at the station.

Near the front door of each building is placed under the transmitter a switch, with the knob of which "hand signals" may be sent to the station by the watchman, or others who may discern or be informed of a fire in an adjacent building which may not be thus protected.

A public exhibition of this instrument was made in the store of H. B. Clafin & Co., New York (in whose building it was first introduced), early in December, 1873, to which the Fire Commissioners, heads of the Fire Department of the city, a committee and experts from the Board of Fire Underwriters, and merchants, were invited. A fire was built of five pounds of wood in an ash-can on the floor beneath a fifteen feet ceiling. Three and a half minutes after the match was applied the heat had closed the Thermostat and the signal gong sounded at the station, four minutes after which the patrol force arrived from the nearest station, six or seven blocks away, seventeen men appearing on the fourth floor with fire extinguishers, axes, buckets, oil-cloth covers, et cetera, only to find a crowd of gentlemen waiting at the top of the stairs to tell them that all was for experiment, which fact had, until that moment, been kept from them. Buildings so protected are insured at reduced premiums.

The "extinguishers" above mentioned are those of the Babcock Manufacturing Company, who own the American patent of an apparatus invented in Paris in 1862, patented in the United States in 1869, and reissued in 1872. Its efficacy consists in the projection of water charged with carbonic acid gas, by its own pressure, into the fire. It consists of a metallic cylinder of sufficient strength to sustain a pressure of over 250 pounds to the square inch. In it are placed about seven gallons of water, holding in solution two and a half pounds of bicarbonate of soda. In the upper part of the
cylinder is a small vessel into which is placed eight or ten ounces of sulphuric acid. When the cylinder stopper is thoroughly secured the acid is precipitated into the solution of bicarbonate of soda, causing the liberation of carbonic acid gas. This, escaping with the water through a discharge bore or pipe, upon the fire, is a powerful extinguisher of flames.

The business of Life Insurance has assumed large proportions in our country since the incorporation of the first company, organized here about fifty years ago. Like every institution of civilized society, and almost every new form of industry, its growth has been gradual, and it is far from its full perfection yet.

The germ of Life Insurance may be found in the doctrine of probabilities developed by Pascal and Huygens two hundred years ago in regard to games of chance, and which was first applied by John De Witt, of Holland, in 1671, to life contingencies, but only for the purpose of determining the rates of life annuities and reversions in view of aiding his government in obtaining loans.

It was almost ninety years after the great Dutch statesman applied the principle for the benefit of the State before it was applied to life insurance; yet in less than thirty years after De Witt's application of the principle the distinct germs of modern life insurance appeared in the London "Mercers' Widows' Fund," established in 1698. This was speedily followed, in the same city, by the "Society of Assurance of Widows and Orphans," founded in the year 1700, and the "Amicable Society for a Perpetual Assurance Office," founded in 1706, and which continued in existence until 1867. This society, until a very recent period, placed no reliance upon the science which concerns life contingencies, and was purely mutual. It was founded "rather on the principle of mutual benevolence than mutual insurance."

In 1760, Thomas Simpson, of England, with another gentleman named Dodson, applied for a charter of the "Society for Equitable Assurance," on the plan of graduating the premium to insure a prescribed amount according to the probabilities of living, after the age of entry. Mr. Simpson had written a valuable essay on life contingencies twenty years before. The crown refused a charter on the ground that it would be unjust to existing companies, which had paid large sums for their charters, and because it was an untried speculation, depending "on the truth of certain calculations taken upon tables of life and death, whereby the chance of mortality is attempted to be reduced to a fixed standard."

Mr. Simpson died in 1761, and the next year the "Equitable Life Insurance Company" was founded, without a charter, by a deed of settlement, and it has ran a long and very prosperous career. It still exists, and has a
surplus fund of about $50,000,000. At about that time the Rev. Richard Price was devising schemes for the same object; and in 1769 he published an able treatise entitled "Observations on Reversionary Payments," which resulted in the dissolution of societies founded on that principle, or the modification of their plans.

Mr. Price was called to the aid of the "Equitable," which, until that time, had accomplished very little. By his judicious advice and able labors it flourished, and it survived a host of wild schemes that were crystallized into companies, whose defects he exposed, and they were swept away before they had done much mischief. In all his writings upon plans for the relief of widows and orphans he seems to have been more concerned in the security and permanence of the society than in the contingencies of the insured. He did not seem to perceive that provision both for his heirs and for the old age of the insured himself could be secured in the same policy, or that the cessation of the necessity for either provision could be provided for in the policy by a stipulation of terms of surrender. This is a more modern discovery.

It has been remarked that Dr. Price (the honorary degree of Doctor of Laws was conferred on him by Yale College in 1783) "is justly regarded as the father of modern life insurance. What has since been done and what remains to be done are mere corollaries to his general propositions." By his work entitled "Observations on Civil Liberty and the Justice and Policy of the War with America," published in 1776, he attracted the attention and gratitude of the struggling patriots. He was a thorough republican, and was disliked by the king and his friends. Gilray caricatured him in 1790 as a discovered writer of seditious essays against Church and State, the picture being entitled "Smelling out a Rat; or, The Atheistical Revolutionist Disturbed in his Midnight Calculations." For his "Observations on Civil Liberty," et cetera, Dr. Price received the thanks of the corporation of London and the freedom of the city; and in 1778 the American Congress invited him to become a citizen of the United States, and to aid them in managing their finances, promising him a liberal remuneration if he should settle in this country.

There is, in the annals of Life Insurance, a long and melancholy list of wrecked companies in Great Britain. A greater part of the present ones are ably managed and solidly prosperous. The strength of our own institutions of that kind is well known. The average age of American life insurance companies is less than seventeen years, while that of the British companies is over thirty-five years. In this view it is instructive to look upon a comparison of the amounts insured, funds in reserve, and death-claims within one year, according to the showing of late reports, as follows:
Principal office of the New York Life Insurance Company.
Life insurance companies in America, may date their origin before the old war for independence. Dr. Franklin and Richard Price were intimate friends in England, and they arranged rules and premiums for a company chartered in Pennsylvania in 1769, for the benefit of families of Episcopal clergymen. But it was late in the present century before any regular life insurance company was chartered in this country. The "Massachusetts Hospital Life Insurance Company" was organized and commenced business in 1825. In 1829, the "New York Life and Trust Company" was chartered, and these are the pioneers in the business.

In the years 1843, 1844, 1845 and 1846, four companies were organized, one each in the States of Massachusetts, Connecticut, New York and New Jersey. These seem to have been the first to win decided success in business; and in 1870, they combined almost one-third of the insurance and considerably more than one-third of the accumulated funds. Such insurance companies increased quite rapidly after 1843, and especially after 1858. In 1870, the number of companies in the United States was 64.

The company organized in New York in 1845, and alluded to above, was the New York Life Insurance Company, the first home office of which was at 68 Wall Street. It was founded as a purely mutual company, and has neither capital stock nor stockholders; and its assets are the property of its insured members. Its first officers were J. De Peyster Ogden, President, and Pliny Freeman, Actuary. Mr. Ogden was succeeded by A. M. Merchant. The growth of the business and progress of the company for thirty-one years, may be seen by the following simple tabulation:

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<th>Period</th>
<th>No. of Policies issued</th>
<th>Amount insured.</th>
<th>Premiums received.</th>
<th>Received from Interest, et cetera.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1845 to 1849, 5 years.</td>
<td>4,767</td>
<td>$8,116,349</td>
<td>$410,378.07</td>
<td>$13,395.17</td>
</tr>
<tr>
<td>1850 to 1854, 5 years.</td>
<td>5,448</td>
<td>12,077,702</td>
<td>1,544,004.75</td>
<td>361,775.66</td>
</tr>
<tr>
<td>1855 to 1859, 5 years.</td>
<td>3,404</td>
<td>18,077,437</td>
<td>1,020,992.51</td>
<td>181,453.66</td>
</tr>
<tr>
<td>1860 to 1864, 5 years.</td>
<td>15,104</td>
<td>38,577,842</td>
<td>4,259,964.45</td>
<td>766,708.15</td>
</tr>
<tr>
<td>1865 to 1869, 5 years.</td>
<td>38,918</td>
<td>126,964,416</td>
<td>16,941,095.69</td>
<td>2,737,397.90</td>
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<tr>
<td>1870 to 1875, 6 years.</td>
<td>50,860</td>
<td>140,240,513</td>
<td>36,708,955.80</td>
<td>8,106,272.00</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>118,501</strong></td>
<td><strong>$347,594,259</strong></td>
<td><strong>$61,795,381.27</strong></td>
<td><strong>$12,157,002.84</strong></td>
</tr>
</tbody>
</table>
In 1848, Mr. Merchant was succeeded by Morris Franklin, and in 1863, Mr. Freeman was succeeded as Actuary, by William H. Beers, who was also elected Vice President in 1868.

The number of policies on the books of the New York Life Insurance Company, January 1, 1876, was 44,661, insuring more than $126,000,000. The income for 1875, amounted to $7,939,661, of which sum $1,870,658, was for interest. The expenses of the company amounted to only $729,623, while the disbursements to policy holders in that year, were $4,131,136, of which sum $1,524,814 were for Death Claims. This shows the gratifying fact that the amount of interest received, was largely in excess of the Death Claims paid that year.

The site of the new building of the company, at 346 and 348 Broadway, (formerly occupied by the New York Society Library) was secured in 1860, while the edifice that occupied it was in flames.

The structure which the company erected there and moved into in 1870, is very spacious and elegant, as the accompanying pictures of it attest. It is 60 feet front on Broadway, and 196 feet front on Leonard street. Its width, in the rear, is 71 feet, on Catharine Lane. It is four stories in height at each end, three in the middle, and has a basement, sub-basement and cellar. The ceiling of the first story is 21 feet above the floor; that of the second story is 17 feet; the the third story is 16 feet, and the fourth story 18 feet.

The exterior of the building is very imposing in appearance. Its outer walls are of pure white marble from the quarries of Masterton and Hall, at Tuckahoe, New York. The design of the building, architecturally, was taken from the temple of Erechtheus at Athens, and is of the Ionic order. The principal entrance has a portico 20 feet in width, with double columns on each side, and projects four feet from the line of the front of the building.
It supports a cornice with broken pediment, and a beautiful piece of sculpture representing the nest of an eagle with the mother bird feeding the young. This is the significant insignia of the Company, indicating the protecting and nourishing care of a sound life insurance company. The remainder of the front is composed of pilasters, columns, circular-headed windows, and an elaborately wrought cornice with a balustrade. The whole is surmounted by a superb carving of the arms of the city of New York, with the usual supporters—a Sailor and an Indian—the shield bearing a beaver.

The first story on Broadway is approached by a grand entrance 12 feet in width, with marble steps leading into a hall of the same width. On the north side of the hall is a room 20 feet wide and 80 feet deep; and on the south side is another 20 feet wide and 62 feet deep, with a grand stair-case in the rear of the latter, 18 feet wide. Through the well-hole of the stairs is a steam elevator extending from the basement to the top story. In the rear of the large hall is a vestibule 20 feet in diameter, from which are entrances to the spacious apartments of the Company. These rooms cover an area 60 feet in width by 110 feet in depth. They comprise besides the principal office, waiting-rooms, book-room, a room for the burglar fire-proof safes, two rooms for the principal offices, and a private office. A part of the rear of these apartments is made two stories in height to accommodate a directors’ room, medical examination-room and closets. These apartments are all well-lighted.

The second story, connected with the first by an iron spiral staircase, is divided into five large offices and the rooms for the agents of the Company; and the third and fourth stories are rented for offices. The entire building is heated by steam, forced into it on the fan principle; the rooms are thoroughly ventilated, and the structure is fire-proof throughout, the floors being laid upon iron beams, with brick arches between. The roof is of iron.

The hall floors are of tesselated marble, and the whole of the first story is finished with black walnut inlaid with marble: so, also, is the grand stair-case to the third story. The rear stairs are of iron. The cellar, sub-basement, and basement, are used for store purposes, and have all the necessary elevators, dumb-waiters, et cetera. The first floor on Broadway is 9 feet 6 inches above the street, and, on account of the falling of the ground, it is 26 feet above Catharine Lane. The sidewalks are covered with patent illuminated lights, giving good light to all rooms below the street.

This fine building was designed by Griffith Thomas, of New York, and was constructed by Thomas Gardiner, Jr., of the same city, at a cost of about $1,000,000.

The Company claims that its peculiar characteristics are the cause of its great success. These are: 1. Ample security guaranteed by judicious management and an immense fund securely invested and rapidly increasing;
2. Pure mutuality; 3. Economy in expenditure; the ratio of its expenses to its income being less than half the average ratio of companies doing business in the State of New York; and 4. Non-forfeiture policies—that is to say, after the payment of three full yearly premiums on an ordinary life policy, or but two full yearly premiums on a limited payment life policy, or on an endowment policy, either of these policies, being surrendered in accordance with its provisions, secures to the assured a paid-up policy, covering a certain specified proportion of the original insurance.

The New York Life Insurance Company issue Tontine Investment Policies. The tontine plan originated with Lorenzo Tontine, a Neapolitan, about the middle of the seventeenth century, and consists in the association of a number of persons who form a fund, the income of which is divided among the living at the end of stated periods. As each of the associates die, his share passes to the rest, so that the man who lives longest receives the most. The surplus accumulating on tontine investment policies is distributed by the Company on this principle.

Tontines have been resorted to by the French government (and once by the British government) as a financial measure. Louis the Fourteenth, finding his finances embarrassed in 1689, authorized a tontine fund of 1,400,000 francs, divided into fourteen classes, according to age, from children of five years to adults of seventy. On the death of a member, the dividends were increased, and after the death of the last subscriber the whole fund reverted to the State. The last survivor of Louis' tontine was the widow of a poor surgeon, who had invested her little capital of 300 francs in two tontines, and who enjoyed, at the time of her death, at the age of ninety-six years, an income of 73,500 francs.

In 1794, a building known as the Tontine Coffee House (erected on the corner of Wall and Water streets, New York, by merchants who had formed an association on the tontine plan), was completed, and opened as a sort of merchants' exchange. The shares were $200 each. Each subscriber might select a nominee for each share, during whose life he or she were to receive an equal proportion of the net profits of the invested fund, but upon whose death, his or her interest reverted to the owners of the surviving nominees. When the number of these nominees should be reduced to seven by death, the property was to be conveyed to these survivors in fee simple. That number of nominee survivors, I believe, has been reached. In 1870, there were only thirteen survivors, the eldest of whom (Horatio Gates Stevens) was then ninety-three years and six months old, and the youngest (William Bayard) was seventy-nine years of age. The longevity of these nominees has been most remarkable. Of the 203 whose names were entered on the books at the beginning, fifty-one were living sixty-two years afterwards.
CHAPTER XXXVI.

THE electro-magnetic recording telegraph, which was invented by Professor Samuel Finley Breese Morse more than forty years ago, has become one of the most important and powerful aids to commerce, as well as a promoter of civilization.

Professor Morse was not the originator of the idea of telegraphing by electro-magnetism; but by combining and applying the discoveries of others during the previous one hundred years, and especially since the splendid discovery of Oersted in 1820, of the identity of electricity and magnetism, he produced an instrument and form of telegraphing which amply secured what others were diligently seeking for. He was the fortunate winner of the prize which others had almost obtained. He fashioned an instrument and gave it language, which, by the use of electro-magnetism, became endowed with the functions of a communicator of thought between vast geographical spaces in minute measures of time.

Mr. Morse was an artist of considerable eminence. He had studied under Benjamin West in London; and in the course of time, he became the founder of the American National Academy of Design. While he was in college, Mr. Morse paid special attention to chemistry and natural philosophy, the former, by its developments, then exciting the profound attention of the scientific world. These sciences occupied much of his attention while engaged in the pursuits of a portrait and historical painter; and in 1826–27, his mind was drawn to the subject of electro-magnetism—that science which treats of the development of magnetism by means of voltaic electricity—by his association, as colleague lecturer at the New York Athenæum, with Professor J. Freeman Dana. Mr. Dana lectured on electro-magnetism, and Mr. Morse upon the fine arts.

Mr. Morse was profoundly impressed by Professor Dana’s lectures, and by private intercourse with him, for they were warm friends. An electro-magnet on Sturgeon’s principle, the first ever seen in the United States, then used by the Professor, became the property of Morse by gift from Professor Torrey.

In 1829, Mr. Morse visited Europe a second time, to complete his art studies, and during his absence he was elected Professor of the literature of
art in the University of the City of New York. Dana had suggested, by his spiral volute coil, the electro-magnet of the present day; and when Morse returned, late in 1832, he found this magnet in use here. It is now used in every Morse telegraphic instrument in America and Europe.

While abroad, Morse became acquainted with the experiments of Professor Ampere and others in electro-magnetic telegraphing, induced by the then recent discovery of Oersted. These experiments took deep hold of his thoughts, and while he was on board the packet-ship Sully, on his voyage homeward, in the autumn of 1832, after conversation with some of the passengers on that discovery, his mind conceived, in nearly all its fullness, his great invention. He planned, on shipboard, not only an electric telegraph, but an electro-magnetic and chemical recording telegraph, essentially and substantially as he unfolded it after his return, and as it now exists. His drawings on ship-board, and the testimony of his fellow passengers to whom he showed them and explained his ideas, presented in the courts with his own testimony, conclusively proved this fact. The conception of the electro-magnetic and chemical recording telegraph, now universally used, may be fairly assigned to the year 1832.

Before the close of that year, Morse had constructed a part of an electromagnetic machine, but circumstances prevented his completing it before 1835, when, in November that year, he showed the telegraph in operation, in a room in New York, in which he had coiled around its sides a half a mile of wire. Necessity compelled him to follow his profession of painter for a livelihood for himself and three motherless children, and it was the autumn of 1837 before he had so far perfected his machine, alphabet, and dictionary, that he ventured to file a caveat at the patent office. He proposed to take his model to Washington, and in January, 1838, he gave a private exhibition of it in the University of New York to intelligent and leading citizens.

Among the company present on that occasion was Morse’s warm friend and fellow-artist, Thomas S. Cummings, who had just been commissioned a brigadier general. A mutual friend gave Morse a sentence to transmit, which he did in telegraphic characters, as follows:

"Attention the universe! By kingdoms! Right wheel!"

These military phrases were in compliment to General Cummings, who now possesses that dotted and lined dispatch as it came from the machine. And that machine is in the possession of Professor Morse’s family, at his late residence near Poughkeepsie, New York. The achievement was hailed with delight by the company present; and a few days afterward the following paragraph appeared in the New York Journal of Commerce:

"The Telegraph.—We did not witness the operation of Professor Morse’s Electro-magnetic Telegraph on Wednesday last. We learn that the
numerous company of scientific persons who were present pronounced it entirely successful. Intelligence was instantaneously transmitted through a circuit of ten miles, and legibly written on a cylinder at the extremity of the circuit. The great advantages which must result to the public from this invention will warrant an outlay on the part of the government sufficient to test its practicability as a general means of transmitting intelligence."

The inventor now formally placed his discovery and mechanical contrivance before the government of the United States, and asked for pecuniary aid in constructing an experimental line of telegraph wire between the cities of Washington and Baltimore. The action of our government was tardy, and Morse went to Europe with the hope of interesting foreign governments in his invention. He was not successful. He returned home, and for four years he struggled on with scanty means before his appeal to the government was answered. A bill appropriating $30,000 for his use had passed one House at a previous session, but at evening twilight, on the last day of the session, in March, 1842, when it was pending in the other House, there were many bills before his. In despair of its passage at that session Morse returned to his hotel, paid his bills and his railroad fare to New York the next morning, when he had just seventy-five cents left; "all the money," he said to the writer, "I had, that I might call my own."

The next morning, while taking his solitary breakfast before daybreak, preparatory to his departure for the cars, a servant came to Mr. Morse and told him that a young lady in the parlor wished to see him. He obeyed the summons, when he was met by the young daughter of the Commissioner of Patents, whom he well knew. "I have come to congratulate you," said the young lady. "For what?" asked the Professor. "Because of the passage of your bill," she replied. "Impossible," said the Professor. "It is true," said the maiden. "You know my father took great interest in the matter. He remained in the House till the hour for adjournment, and five minutes before twelve o'clock your bill was passed."

"How can I recompense you for bringing me this good news," exclaimed the Professor, with emotion. "By allowing me to furnish the first message for the telegraph when it shall be completed between here and Baltimore," she said. The Professor promised to do so, and in the spring of 1844, when the communication between Washington and Baltimore was completed, Professor Morse sent for Miss Anna Ellsworth to bring her message. It was brought, and these were the words—words that fell from the lips of Balaam—
"What hath God wrought!"

This was the first and most significant message ever sent over an electromagnetic telegraph wire. The first public message was the announcement of the nomination of James K. Polk for President of the United States by the Democratic National Convention in session at Baltimore.

This triumph was succeeded by vexations and lawsuits that involved ruinous expenses. Others claimed the honor of the invention, and Professor Morse suffered persecution at their hands. His patents were infringed, and lawsuits for the maintenance of his rights seriously disturbed his just and gentle nature, until he almost despaired of justice. To the late Daniel Lord, his legal counsel, Professor Morse once unburdened his heart, saying:

"The plot thickens all around me; I think a dénouement not far off. I remember your consoling me under these attacks with bidding me think that I had invented something worth contending for. Alas! my dear sir, what encouragement is there to an inventor if, after years of toil and anxiety, he has only purchased for himself the pleasure of being a target for every vile fellow to shoot at; and in proportion as his invention is of public utility, so much the greater effort is to be made to defame, that the robbery may excite the less sympathy? I know, however, that beyond all this there is a clear sky, but the clouds may not break away till I am no longer personally interested whether it be foul or fair. I wish not to complain, but I have feelings, and cannot play the stoic if I would."

But his rights were fully and finally established by the careful sifting of testimony by the courts, and the decision has been made from which there can be no just appeal, that Professor Morse was the original and sole inventor of the Morse electro-magnetic recording telegraph system.

The value of this invention was speedily perceived and acknowledged on both sides of the Atlantic. Monarchs gave medals and Orders, to the inventor, and scientific societies hastened to do him honor for his great achievement. In 1846 Yale College conferred upon him the honorary title of LL.D. In 1856 the telegraphic companies of Great Britain gave him a public banquet in London; and in 1858, at the instance of Napoleon the Third, several European governments combined in the act of giving him a substantial token of appreciation in the form of $80,000 in gold.

Professor Morse originated sub-marine telegraphy. So early as 1842, he laid a sub-marine cable in the harbor of New York, for which achievement the American Institute awarded him a gold medal. In a letter to the Secretary of the Treasury in the summer of 1843, he suggested the possibility of telegraphic communication between Europe and America, by means of a sub-marine cable; and in 1858, he participated in the labors and honors of achieving it. In the summer of that year a cable was laid between Valentia
in Ireland and the island of Newfoundland, over the great ocean plateau discovered by Professor Maury of the Washington Observatory.

The western end of the cable was landed on the shore of Trinity Bay, Newfoundland, at the beginning of August, but no intelligible communication was made before the thirteenth, when Newfoundland asked Valentia to "send word Atlantic." Valentia immediately answered "Atlantic." This was the first intelligible word that came to America from Europe by a recording telegraph. On the 16th the following dispatch was correctly received at Newfoundland:

"Directors of Atlantic Telegraph Company, Great Britain, to Directors in America. Europe and America are united by Telegraph. Glory to God in the highest; on earth peace, good-will towards men."

Early in the morning of the 17th, during a heavy rain-storm, the following message from Queen Victoria to President Buchanan, was received at Newfoundland:

"The Queen desires to congratulate the President upon the successful completion of this great international work, in which the Queen has taken the greatest interest. The Queen is convinced the President will join her in fervently hoping that the electric cable which now connects Great Britain with the United States, will form an additional link between the two nations, whose friendship is founded upon their common interest and reciprocal esteem. The Queen has much pleasure in thus directly communicating with the President, and in renewing to him her best wishes for the prosperity of the United States."

To this dispatch the President replied, as follows:

"The President cordially reciprocates the congratulations of Her Majesty the Queen, on the success of this great international enterprise, accomplished by the science, skill and indomitable energy of the two countries. It is a triumph more glorious, because far more useful to mankind, than ever was won by conqueror on the field of battle. May the Atlantic Telegraph, under the blessings of Heaven, prove to be a bond of perpetual peace and friendship between the kindred nations, and an instrument designed by Divine Providence to diffuse religion, civilization, liberty and law, throughout the world. In this view will not all the nations of Christendom spontaneously unite in the declaration that it shall be forever neutral, and that its communications shall be held sacred in passing to the place of their destination, even in the midst of hostilities?"

Such is a brief history of the first opening of telegraphic communication between America and Europe, by a pathway under the sea, now carried on between our country and nearly the whole civilized world, daily and hourly. When the fact of the successful laying of the cable was telegraphed over the land, there were great public demonstrations of joy. Bells rang out exult-
ing peals; cannons roared; orators spoke eloquently; bonfires blazed, and cities and villages were illuminated. The newspaper press was full of the subject; and E. J. O'Reilly wrote of the cable, a stirring poem in four stanzas, of which the following is the prophetic conclusion:

"Soon, like Orion's belt of fire,
Its broad electric arm shall hold,
With all a monarch's strong desire,
The world and all its varied fold!
And from its tongue through every sphere,
'Till time and earth together cease,
Mankind the glorious tale shall hear
Of Commerce, Brotherhood and Peace."

On the first of September, 1858, the Atlantic cable ceased to work. It had been hushed by some mysterious accident at the bottom of the sea, and remained silent almost eight years. Finally, in the summer of 1866, or ten years ago, a cable that has since been permanent—ever ready to communicate—was laid between the United States and Great Britain. Since that time sub-marine cables have been stretched from continent to continent, and from island to island connecting with the main, by which from a centre like New York or London, daily and hourly intellectual intercourse may be had with nearly every civilized people on the earth.

The discovery of Dr. Wilhelm Gintel, of Vienna, Austria, in 1853, of a method of transmitting messages both ways over the same wire at the same instant of time, and subsequent improvements upon that method, occupied much of the thoughts of Professor Morse. This is known as "duplex telegraphy." There were serious difficulties in the way of making such simultaneous transmissions over great distances, and the method was very little used until Joseph B. Stearns, an American, made improvements which overcame the impediments, and that method of transmission was put into practical use here a few weeks before the death of Professor Morse, in the spring of 1872.

In the summer of 1874, T. A. Edson, of Newark, N. J., while engaged with George B. Prescott, electrician of the Western Union Telegraph Company, in experimenting upon Stearns' duplex apparatus with a view of modifying it, devised a system of simultaneous transmission, which differed, in principle, from its predecessors. The idea had been put forth, that any number of messages might be sent each way simultaneously. This device solved the problem, and now "quadruplex telegraphy" is practiced. Probably the time is not far distant when multi-telegraphy will be as common as simple telegraphy is now. This will tend to greatly decrease the expense of operating lines, and to lessen the tolls on dispatches. May we
not hope to send, before long, a telegraphic message of ten words from New York to New Orleans at the price of single letter postage?

When the experimental line of telegraph was successfully established between Washington and Baltimore, the inventor desired the government of the United States to purchase and control it; but so unsatisfactory were the results for awhile, that in 1845, the postmaster-general expressed his opinion that the receipts could not be made to equal the expenditures, under any rate of charges which might be adopted. The inventor turned to the capitalists of the country to carry forward the enterprise, but they were slow to respond, at first. Finally companies were organized in various parts of the country, and detached lines were built; and at the end of less than seven years, there were more than fifty separate telegraph organizations within the limits of the United States.

Already clashing interests, infringements of the patent, and the lawsuits alluded to, appeared, to plague the inventor. Unity and dispatch were wanting in the operations of so many separate companies, and the business was unprofitable. Finally, in the autumn of 1851, the consolidation of companies was begun. This was a movement in the right direction. Now, the Western Union Telegraph Company, with their headquarters in New York, control the business in our country, and with great advantage to commerce and society. They own (and occupy a greater portion of) one of the most imposing edifices in the United States.

The immense expansion of the business of telegraphy, chiefly in the interest of commerce, since its inception thirty years ago, may be indicated by a statement of a few facts.

Late in 1846, an obscure room, under the Express office at 46 Wall street, contained a single telegraphic instrument, and a solitary operator, who was idle most of his time for lack of business. Out of that basement room went a wire that connected with two others at Jersey City, the latter extending to the city of Washington. Three men then conducted the entire telegraph business of our country; and for that basement room, $500 a year rent was paid. Now, a thousand persons are employed in the business in New York city alone, and for the rent of almost a hundred offices in the city and suburbs, nearly $200,000 a year are paid. And a magnificent house has been erected in New York, at a cost of over $2,000,000, for the accommodation of one telegraph company, the Western Union, who, to-day, employ in that building nearly 700 persons. Look at the marvellous history of that company, and its present operations.

The Western Union Telegraph Company was organized under another name, in the year 1851. It received its present name in 1856. The Company, at the beginning of its career, began the purchasing and absorption of other telegraph lines, and has continued to do so, until now it controls the
business of telegraphy on this continent. This consolidation, as we have observed, has worked for the good of the public, and made the telegraph business a very successful one.

The growth of the business of this company since the consolidation with the other principal telegraph lines, a period of nine years to 1875, has been most remarkable. The extent of line has been increased from 46,270 miles to 72,833 miles, and the wire from 85,290 miles to 179,294 miles long, an increase of 57 per cent. of line and 110 per cent. of wire. The number of offices and stations had increased from 2,566 to 6,565, equal to 156 per cent. The number of messages transmitted had increased 192 per cent. The rate of tolls had decreased 5 per cent., and the gross receipts had increased 46 per cent.

The increase of 192 per cent. in the number of messages transmitted annually, while the mileage of wire had increased but 110 per cent., is explained by the fact that by improvements in the conductivity and insulation of the wires, and the introduction of the duplex and quadruplex apparatus, they were enabled to increase the number of messages transmitted, per mile of wire, 41 per cent. By the use of this apparatus, during 1875, the company employed more than 30,000 miles of "phantom wire," so called, which cost nothing for repairs and maintenance, excepting the cost of the instruments, which is very little more than that of the ordinary kind.

In 1875 the company employed 10,120 persons. Of these, five were general superintendents of divisions; two were assistant general superintendents; three were superintendents of construction; 6,290 were messengers of offices; 1,877 were messengers; 533 were foremen and repairmen; 130 were mechanics in factories; 78 were battery keepers; and 377 were miscellaneous employees.

There were in use on the lines of the company 8,196 sets of instruments for reading by sound; 1,829 recording instruments; 10,098 relay magnets; 10,199 transmitting keys; 219 repeaters; 18 printing instruments; 161 sets of duplex instruments; 21 sets of quadruplex instruments; 3,532 switch boards; 3,502 cut-offs; 3,312 lightning arresters; 51,956 cups of main battery, and 14,209 cups of local battery—total cups of battery, 66,165. The number of persons employed in the main office in New York was 670, a large proportion of whom are women.

The Western Union is a controlling shareholder in the International Ocean Telegraph Company, the capital of which is $1,500,000. Of this amount the Western Union owns $499,000 of preferred and $538,500 of the common stock. Their magnificent building on the corner of Broadway and Dey street, with its outer walls of brick and granite, rising 140 feet above the sidewalk, and its magnificent roof of iron, surmounted by an imposing clock tower that pierces far into the sky, is an architectural wonder, even in
New York. We may not pause to describe it and its wonderful contents, where there is continual intercourse with all the civilized world. There Man, almost every moment of time, practically answers the question of his Maker, recorded in the book of Job: “Canst thou send lightnings, that they may go, and say unto thee, Here we are?”

The superb building devoted to the business of the company has ten floors, three of them under the pitch of the roof. These floors are reached by elevators and broad iron staircases. The whole building is completely fire-proof. The battery-room occupies the whole of the sixth floor, and the operating room is on the next floor above.

The battery room has a capacity for 16,800 glass cells for acids, arranged on frames. The operating room occupies the whole of the seventh floor, and is 145 feet in length and 70 feet in width. Light streams into it from all sides through forty-two windows, from which may be obtained a view of the whole city, the harbor, and the adjacent islands and the main. In that room are about ninety operating tables; and in 1875, when I visited it, the average number of messages sent out from them daily was about 12,000. The average number of messages daily received was about 13,000; and the average number of words of news reports, daily recorded, was about 90,000. The operations were equivalent to about 30,000 messages a day.

The machinery of the operating room then represented a capacity of about 200,000 messages a day. It consisted of 150 Morse instruments; six Phelps’s printing instruments; sixteen sets of duplex machinery, and eight or ten sets of quadruplex machinery; four or five sets of Milliken’s automatic repeaters, and half a dozen sets of Button repeaters. What a contrast is this establishment, with the little dingy office with a single instrument and a solitary operator, in a Wall street basement, thirty years ago!

The later years of the great inventor of the electro-magnetic telegraph were spent in serenity, in the enjoyment of an ample fortune, and the veneration of the civilized world. In winter he lived in the city of New York; in summer he reposed at his beautiful country seat of “Locust Grove,” near the city of Poughkeepsie, on the Hudson. In 1871 the telegraph employees caused a bronze statue of him to be erected in the Central Park, New York. It was unveiled in June by the venerable poet, William Cullen Bryant. His invention will be a more glorious and lasting monument than any made of brass or marble.

Many amusing anecdotes are told of the mistakes made concerning the nature of the operations of the telegraph. The following bit of romance is given by Dr. Prime, in his Life of S. F. B. Morse, on the authority of the Professor himself:

“A pretty little girl tripped into the Washington City termination, and, after a great deal of hesitation, and blushing, asked how long it would “take
to send to Baltimore?" The interesting appearance of the little questioner attracted Mr. Morse's attention, and he very blandly replied, "one second."

"Oh, delightful! how delightful!" ejaculated the little beauty, her eyes glistening with delight, 'one second only, here, send this even quicker if you can.' And Mr. Morse found in his hand a neatly-folded, gilt-edged note, the very perfume and shape of which told a volume of love.

"I cannot send this note," said Mr. Morse with some feeling; 'it is impossible.'

"Oh, do;" implored the distracted girl, 'William and I have had a quarrel, and I shall die if he don't know that I forgive him in a second—I know I shall.'

"Mr. Morse still objected to sending the note, when the fair one, brightening up, asked, 'you will then send me on, won't you?'

"Perhaps," said one of the clerks, 'it would take your breath away to travel forty miles in a second!'

"Oh no, it won't—no, it won't, if it carries me to William. The cars in the morning go so slow I can't wait for them.'

"Mr. Morse now comprehended the mistake which the petitioner was laboring under, and attempted to explain the process of conveying important information along the wires. The letter-writer listened a few moments impatiently, and then rolled her burning epistle into a ball, in the excitement under which she labored, and thrust it into her bosom.

"It's too slow?" she finally exclaimed, 'it's too slow, and my heart will break before William knows I forgive him; and you are a cruel man, Mr. Morse,' said the fair creature, the tears coming into her eyes, 'that you won't let me travel by telegraph to see William.' And full of emotion she left the office, illustrating the truth of the poet's wish—

"'Annihilate but space and time,
And make two lovers happy.'"
CHAPTER XXXVII.

The electro-magnetic telegraph has become a powerful aid to Agriculture and Commerce through the operations of the Signal Bureau at the seat of the National Government. By careful observations at various points along our ocean and lake coasts and in the interior of the continent, of meteorological changes, which are simultaneously reported to the signal office by telegraph, forecasts concerning the condition of the weather in various regions of the republic during the space of twenty-four hours after such observations are recorded, are made with such accuracy, as to temperature, the state of the barometer, fair or foul skies, winds and rains to be expected, that full eighty per cent. of these prophecies uttered at that office, are fulfilled.

This Signal Service, in its organization for the display of cautionary signals at posts in advance of dangerous storms and its pre-announcement of weather changes, for the benefit of agriculture and commercial interests and notification of floods in the Western rivers, was set on foot at the suggestion and under the direction of General Albert J. Myer, who was chief signal officer during the late Civil War. He is the originator of the system here, as he was of the signal system used during that war; and he assisted in drafting the bill for establishing such service under the charge of the War Department, which passed Congress in 1870. General Myer has been indefatigable in procuring other legislation in favor of the service; and he has stood at the head of that service from its inception until now.

The duty of weather reporting is made a part of the signal service of the army, which is to rapidly collect information and give notice by signal or telegraph of any approaching danger. In times of war the watch is for danger to be caused by an enemy; in times of peace for danger to arise from storms or other atmospheric disturbances, or any causes a notification of which will be of public benefit.

Systems of weather reports had been used elsewhere, but were exceedingly defective. Lavoisier the French philosopher, who was guillotined during the French Revolution, suggested such a system. That was fifty years before the electro-magnetic telegraph was established.

Admiral Robert Fitzroy, who was at the head of the meteorological
department of the English Board of Trade, established a system of storm-
warnings in 1862, by the use of the telegraph, sending accounts of storms to
points they were approaching, and causing signals to be displayed. Lever-
rier, the eminent French astronomer, attempted the same thing, but as they
were largely dependent upon voluntary reports, their system (if it may be
called a system,) did not even approximate in extent, thoroughness, accuracy
or important results, that originated by General Myer. Giving to the ser-
vice in the United States the aid of military organization, has secured to
that service the promptness and obedience to the demands of duty, of
military discipline, which is essential for such labor.

In this country were first set on foot, by General Myer and his assistants,
absolutely simultaneous weather reports from observations taken at different
places, at the same moment of time, allowance being made for differences in
local time at the different stations, so that all the instruments at all the
stations are observed at actually the same instant. There are three simul-
taneous reports made in each twenty-four hours, these reports being given
at nearly equal intervals of eight hours; and warnings are given by signals,
maps, bulletins and official dispatches furnished three times each day, under
regular rules, to nearly all the newspapers in the land. So thoroughly is the
work done by means of the telegraph, and the perfect organization of the
system and the discipline and skill of all the operators, that it is estimated,
one-third of all the families in our country, know each day the information
at the Signal Office in Washington. Nothing similar, in extent, complete-
ness and efficiency, has been known or attempted in any other country,
until very recently.

The limits of one continent are too small to allow the proper study of
the atmosphere which, surrounding the earth, revolves in its whole extent
with it once in twenty-four hours. In 1873, General Myer succeeded in
inducing some foreign governments to establish, with the United States, an
exchange of international simultaneous weather reports from observations
taken everywhere at the same instant of time at which those in the United
States are taken, that is at 7.35 in the morning, Washington time. Most
civilized nations have assented to this arrangement, and now storms may be
distinctly traced from wherever they may arise, through their course, until
they disappear. When the observers at New York or San Francisco are
reading their instruments daily, it may be safely assumed that those in
Siberia, or on the islands of the Pacific, the West Indies or in Northern
Canada, are at that moment also reading theirs. These readings, reported
simultaneously, are valuable, and they are published in a bulletin in Wash-
ington city every day. These reports give us the daily meteorological
reports over a great portion of the northern hemisphere, from Siberia to
California. The project is vast; the results to be obtained, are highly
important. The brotherhood of science knows nothing of nationalities. Universal good is the noble and unselfish object sought for.

In our country the eastern line of observation in which signal stations are planted, reaches from points far southward and eastward, at Barbadoes and the Windward islands, through the West India islands, and along the Atlantic coasts to the north-east at Father Point and Halifax.

The southern line, joining that of the east at Key West, extends along the Southern coasts of the United States bordering the Gulf of Mexico to the Rio Grande and the Mexican frontier. Between this point and the southern port of San Diego upon the Pacific ocean, the intervals not covered by telegraph lines each year diminish. The time is probably not far distant, when the line can be extended across the continent.

The western line reaches, on the Pacific, with far too few stations, from San Diego to Portland, Oregon. The northern line connects with this station, and passing over the plains and by the Great Upper Lakes, through the Dominion of Canada and down the St. Lawrence valley, joins with the eastern line at Halifax.

Within these boundary lines the territory is furnished with such stations of observation as the skill and the facilities of the office have permitted. West of the Mississippi, the lines of stations are carried steadily westward, wherever improving facilities of communication and the means at the control of the service have made the measure possible.

Near the southern extremity of the eastern line, scientists have located the birth-place of those cyclones which sometimes, in a single course, sweep over the whole eastern portion of the United States, in the vicinity of the sea. Beyond the western extremity of the southern line, and upon the Gulf of Mexico, there is a region peculiarly exposed to destructive storms, such as occurred in the summer of 1875, when whole towns on the Gulf coasts were devastated. There numerous stations are needed. North and west of the Great Lakes are some of the richest territories of the United States yet unprovided with signal stations; and over the whole interior west of the Mississippi Valley, the rapidly increasing populations are impatient for the premonitions from the Signal Office.

The total of daily reports filed at the central signal office in Washington, in the autumn of 1875, numbered as follows: daily service simultaneous telegraphic reports, 109; international daily simultaneous reports, 268; reports of voluntary observers, 393; reports of the medical corps of the army, 102; and reports of the medical corps of the navy, 5, making a grand total of 877 daily reports received regularly for discussion.

The international reports are received from Algiers, Austria, Belgium, Great Britain, Denmark, Dutch Guiana, France, Germany, Italy, Japan, The Netherlands, Sweden, Norway, Portugal, Russia, Spain, Switzerland, Turkey,
and British North America. The daily issue of the bulletin of international simultaneous reports, already mentioned, was commenced on July 1, 1875. The concurrence of so many nations seems to put beyond question the practicability of securing a daily and simultaneous report of the meteoric changes over the greater portion of the earth's surface. The average number of daily simultaneous observations made abroad at near the close of 1875, was 268.

Cautionary signals are displayed, under the directions of the Signal Office, day and night, if necessary, at the principal ports and harbors of the United States, located upon the lakes, the Atlantic and the Gulf coasts. During the year ending with June, 1875, there were 1,023 cautionary signals ordered, giving warning of the approach of sixty-seven dangerous storms. Of that number, 76 per cent. were afterward reported as verified, by the occurrence of dangerous winds at the points where the signals were displayed, or within the radius of 100 miles from these points, as set forth in the rules of the Office.

Efforts have been made to distribute as widely as possible, in the more densely populated agricultural districts, the premonitions from the Signal Offices, in the form of printed forecasts, for the benefit of farmers. By an arrangement with the Post-office Department, 6,364 printed farmers' bulletins, on which have appeared the daily reports of the Office, were distributed, and displayed in frames daily, in 1875, at as many different post-offices in cities, villages, and hamlets in different States. At midnight of each day, the midnight report of the ensuing day is telegraphed to twenty centres of distribution, carefully selected as located in the midst of the denser agricultural populations of the United States, and at points whose facilities enabled the surrounding districts to be most rapidly supplied.

The telegraphic midnight report received at a centre of distribution, is at once printed by enlisted men of the Signal Service, at such station, on bulletin forms provided for that service, enveloped as rapidly as printed, and addressed to each designated post-office within the district to be supplied, and which can be reached by the swiftest conveyance by the hour of two o'clock on the afternoon of the date, where, by order of the postmaster-general, it is instantly displayed. The average hour at which the bulletins have reached the different offices, has been eleven o'clock in the morning, or ten hours after the information left the central office.

There were, in 1875, forty-six Chambers of Commerce and Boards of Trade, which had appointed permanent committees to confer with the chief Signal officer; and there were, also, about four hundred volunteer observers reporting under the direction of that officer. There were seventy-two military posts from which meteorological registers were received by arrange-
ments made with the surgeon-general of the army; and logs were received, during the year, from twelve naval vessels.

Chambers of Commerce and Boards of Trade, or associations of merchants and others engaged in traffic, exist at most of the ports of entry of the United States, and exercise a vast and beneficial influence over the commercial interests of the Republic. Institutions of this kind were established in England more than two hundred years ago, for a similar purpose, but were under the control of the government. Cromwell, during the Protectorate, established a Board of Trade, with his son, Richard, at the head of the commission; and such associations have now become common at all the commercial centres of Europe.

In the United States, these are voluntary associations, and their membership comprises a numerous body of the most eminent men engaged in mercantile pursuits. The New York Chamber of Commerce is the oldest of these institutions now existing in our country. It was organized in 1768, when the commerce of the colonies was greatly deranged by political troubles; and it was incorporated by a royal charter in 1770. That association is now composed of a large and very influential body of merchants, whose collective opinions, expressed by their official acts, have great weight in the commercial and financial affairs of our country.

The New York Chamber of Commerce materially aided our government soon after the breaking out of the civil war, when the Secretary of the Treasury was anxiously seeking loans from the people. A committee of that body, in connection with committees of the New York and Boston banks, who visited Washington city, recommended the capitalists of the country to subscribe to a loan of $14,000,000 as a good investment. This recommendation secured the money for the government when it was specially needed.

The Express business, an organized system of transportation of lighter merchandise and parcels, has performed, and is performing, an important part in the internal commerce of our country. It originated in the United States, and appeared within the decade after the explosion of the perilous credit system in 1837, to which allusion has been made. It came into being and development almost simultaneously with three other important elements which have had great influence in the expansion of our commerce, namely, ocean steam-navigation, the extended construction of railways, and the electro-magnetic telegraph. All of these four elements were in active operation when, at the close of that decade, gold was discovered in California, and gave to commerce and to these interests a great impetus.

The history of the Express business illustrates American enterprise. Forty years ago James W. Hale (yet living), one of the most active men of his day, conducted an admirable news-room—a sort of Lloyds for the shipping interests of New York—in the old Tontine Coffee-house at the corner
of Wall and Water streets. Mr. Hale was a man of a very genial disposition and of varied experience. He was popular among business men, and attracted a large number to his office for news. It was before the days of the telegraph, and before railways were very extensively used.

Among persons who called one day in 1837 was William F. Harnden, a young man twenty-five years of age, a native of Massachusetts, who, being out of employment at that season of great depression in business throughout the country, went from Boston to New York to seek for it. He called on Mr. Hale for advice how to obtain work. The latter became interested in young Harnden, and in the course of a few days Hale suggested a new business for him. Every day Mr. Hale was asked if he knew of any person going to Boston from New York. There was a continual and growing want of some one to carry small packages, especially money-brokers' parcels, for postage on letters was then very heavy—twenty-five cents between New York and Boston. "I think," said Hale to Harnden, "that if you will travel between the two cities on the steamboat, and do errands for business men in both places, charging a fair remuneration for your services, it will pay you well." Harnden resolved to do so, and at Mr. Hale's suggestion he called the new enterprise "The Express," which gave the idea of fidelity, promptitude, and speed.

A small slate for orders was hung in Hale's news-room, and in the course of a week Harnden entered upon the new business with a carpet-bag. The older merchants and brokers were slow to perceive the advantage of being able to send parcels every evening to Boston, and discouragement at the outset was the result. At the end of two months young Harnden's money was all gone, for his expenses had been greater than his receipts. He was about to abandon the enterprise when some friends procured free passage for him on an opposition steamboat. This "subsidy" enabled Harnden to carry on the business prosperously. The single carpet-bag became too small. Two or three were added; and at length a large trunk was bought.

Harnden disposed of a part of his interest to an assistant in Boston, and an office was opened in both cities; and very soon they were enabled to employ a man on each steamer, with a hand-crate, or car, to take care of the articles sent by them. Bright visions of a large fortune in the near future gladdened poor overworked Harnden when twenty dollars was earned in a single day. Then he began to consider land routes, and he established a line between Boston and Albany. Then he conceived a scheme for colonizing the West, and so creating custom for his express away toward the setting sun.

The Cunard steamers had given Harnden much business between Boston and New York, and through that line he sought to establish a system of emigration. At that time there was no organized plan whereby the emi
grants settled here could remit money to their friends "at home," or prepay the passages of those who wished to come to America. Harnden attempted to supply this want, and he established the "English and Continental Express" in 1841, with offices in Liverpool, London, and Paris, and branch offices in other parts of the continent and Great Britain. He made arrangements for the cheap conveyance of emigrants from Liverpool in sailing vessels, and chartered a considerable fleet of Erie canal boats to carry them and their effects to "the West," then in Ohio, Indiana, Illinois, Michigan, and Wisconsin.

In the course of three years from the establishment of this emigration system, Mr. Harnden, small, fragile, and dying with consumption, had been instrumental in bringing to the United States more than 100,000 laborers, and so adding to our national wealth at least $80,000,000. At the same time he impoverished himself, and destroyed his own life by overwork of body and mind. William F. Harnden, the founder of the Express system, died in 1845, a poor man, at the age of thirty-three years. His successors have accumulated enormous wealth by the business.

Soon after Harnden's enterprise promised to be successful, Alvin Adams, of Vermont, went into the business. That was in 1840. For a long time he struggled against the greatest discouragements. His pockets would almost hold the packages that were daily intrusted to his care, and a dollar carpet-bag was his chief conveyance for a long time. The emigration scheme of Harnden and Company so engrossed their attention that they neglected the home business, and that Adams, in a great degree, finally secured, and prosperity followed. He associated with himself, first, E. Farnsworth, and then W. B. Dinsmore; and in 1850 their business was so extensive that they paid $1,700 a month for a small space in a car of a fast train between New York and New Haven for the conveyance of money and small packages. Meanwhile Livingston, Wells & Co.'s Express had been established, and they carried letters in opposition to the government. It is estimated that in 1850 the express traveled 20,000 miles a day in discharge of orders.

Henry Wells, who was Harnden's agent at Albany, first extended the business to Buffalo, and then westward from that point. The first line beyond Buffalo was established in 1845 by Wells, Fargo & Dunning, and the same year Mr. Fargo became a partner in the express business with Livingston, Wells & Co.

In 1848 John Butterfield established an express, and was joined by Mr. Wasson. William G. Fargo and William A. Livingston then had the chief control of Wells, Fargo & Dunning's Express, and in 1850 it was consolidated with that of Butterfield, Wasson & Co. By the union of these three companies the American Express Company was formed, and soon became a powerful rival of the Adams company.
Pullen, Virgil, and Stone, early associates with Harnden, started an express between New York and Montreal, and so laid the foundation of the National Express Company. Other companies have since been competitors; and at this time the principal companies in the United States are the Adams, the American, the United States, the Wells, Fargo & Co., the Southern, the National, the New Jersey, the Eastern, the United States and Canada, and the Texas.

The discovery of gold in California gave a wonderful impetus to the express business. In 1851, the celebrated California express of Wells, Fargo and Company, was established by gentlemen connected with the American Express Company. Its growth in business was sudden and prodigious. In the year 1857, that company transported over their lines in California alone, about $60,000,000 in gold.

In 1859, a company was formed in California, under the name of the Central Overland California and Pike’s Peak Express, its eastern terminus being St. Joseph, in Missouri, and its western, Sacramento, in California. Then there was no link of telegraph or railway between the Atlantic and Pacific oceans; and when the announcement was made that a journey overland to California would be made in thirteen days, the greatest interest was excited.

This was a pony express, with stations sixty miles apart, across the continent. The express was dispatched weekly from each side, with not more than ten pounds of matter, the charge being $5 in gold for every quarter ounce in weight. The riders were chosen from men of the mid-continent regions who were familiar with the Indians; and they were paid, in consideration of their perils, $1200 a month. Their animals were a cross-breed between the American horse and the Indian pony, and were strong and fleet. Each messenger and steed went sixty miles, and then awaited the arrival of the messenger from the opposite direction.

The first messenger of this express started from St. Joseph on the 3d of April, 1860. From Sacramento to San Francisco, he went by steamboat, and from St. Joseph to New York, he travelled by railway. The distance from ocean to ocean was traversed in fourteen days! This express continued to run for two years, when it was superseded by the telegraph which was carried across the continent in 1862. These express riders carried a revolver and bowie knife, and had many desperate encounters with the savages in the mountains or on the plains, in which some of the riders were killed. The company which was originated and presided over by William H. Russell, lost $200,000 by the daring enterprise.

At this time express messengers travel more than 300,000 miles daily on our railroads; and the companies employ, in the aggregate, about 19,000 men, and 3,600 horses. The amount of capital employed in the business is
estimated at full $25,000,000, a greater part of which is held in reserve, to meet any losses that may accrue, and so gives stability and credit to the business. These companies enjoy the public confidence in a remarkable degree.

The Express system has given a new feature to our internal commerce called the “Collect On Delivery” business, represented by the initials of the title, C. O. D. Merchants receive orders for goods from strangers at a distance. These are sent by express, with a bill in an envelope marked “C. O. D.,” with the amount to be collected written on the outside. The express company tenders the goods and the bill to the consignee, and when the latter is paid, the goods are delivered, and the money is taken back to the merchant by the express messenger. The consignee pays the freight on the package, and the consignor the fee for collecting. This kind of business is rapidly increasing, and is a great convenience.

One of the most singular features of American commercial enterprise, is that of trade in Ice, introduced in the present century. The storing of snow, and sometimes of ice, in caves in the Appenines, by the Italian peasants, has been practiced from time immemorial, for the supply of neighboring cities; and such hoarding was done to supply Roman citizens with this refreshing cooler, in the time of the Caesars. It was practiced in France in the seventeenth century; but the making of Ice a regular article of commerce is a purely American enterprise.

Even before the Revolution, ice was gathered in our middle and northern colonies, and stored in deep cellars, for use in summer, by some of the more opulent families, but the economy of the modern ice-house was unknown.

Ice first became an article of commerce in 1805, when Frederick Tudor, of Boston, sent 130 tons in his own brig, to the Island of Martinique. He persevered in the business, without profit, for ten years, but in 1815, having made an arrangement for the monopoly of the trade in Havana, Cuba, he sent it there, and received good remunerative returns.

In 1817, Mr. Tudor introduced the trade into Charleston, South Carolina, and in 1818, into Savannah. In 1820, he extended the trade to New Orleans. A ship load arriving during the height of the yellow fever season in that city, so alarmed the native population, who knew not the precise purpose of its introduction, or the character of the cargo, that a riot ensued, and the whole of it was destroyed. The value of ice afterward became known; but so late as 1832, when Mr. Tudor had been engaged in the business twenty-seven years, his entire annual shipments did not exceed 4,400 tons. This was all gathered from a fresh-water pond in Cambridge.

In 1833, Mr. Tudor sent a cargo of ice to Calcutta, Hindostan; and the next year he exported a ship-load to Brazil. He was so successful, notwithstanding one-third of his cargo was wasted by melting in the voyage to
Calcutta, that others soon afterward went into the business, and ship-loads of ice went out of several New England ports, after 1836. But the largest amounts continue to be sent from the port of Boston. The greatest quantity shipped from that port in one year was in 1856, when it was 146,000 tons. In 1866, it was nearly 125,000 tons, and in 1871, it was a little more than 109,000 tons.

The total exports of ice from the United States during the year ending with June, 1875, were only 53,000 tons, valued at $208,249, the price being higher than in 1873, when 53,553 tons were exported, which were valued at $188,095. Of that amount, about 49,000 tons were shipped from Boston. These shipments were made to Cuba, the East Indies, the British West Indies and Honduras, British Guiana, and to other portions of the West Indies and South America. Formerly, ice was shipped from America to England, but Norway now supplies the British market, as it is cheaper than American ice.

Our domestic commerce in ice is very extensive. New York and Brooklyn consume immense quantities, which are gathered from the ponds and lakes near the Hudson river, and from the river itself above the Highlands. Last year, these two cities consumed over 8,000,000 tons of ice. The demand increases at the rate of about 70,000 tons a year.

In all the large towns of the interior of the Northern and Eastern States, the business of gathering ice for commercial purposes has become a large and increasing one. The Great Lakes afford a large crop each year, which is gathered with care, and sent to the Southern States by railroads; also through the Illinois river to the Mississippi, and by the latter to Southern cities.

It is said that the ice of deep ponds frozen by the extreme cold weather in Eastern New England, is preferred to all other products of the kind for shipment to ports in warm countries, because of its hardness and compactness. The most celebrated is that obtained from the Kennebec river. The ice found on the shallower ponds of Great Britain is so porous that the percentage of waste is very large. The most desirable ice for exportation is that which is twenty inches in thickness. From nine inches to a foot in thickness answers very well for domestic use.
CHAPTER XXXVIII.

In taking a general survey of the history of our foreign commerce during the past century, the wise political economist is compelled to suspect that there have been grave mistakes made in our legislation on the subject. Our countrymen, in the colonial period, were establishing a very prosperous traffic when, as we have observed, the jealousy of the merchants and manufacturers of Great Britain caused commercial restrictions to be imposed by the imperial government, of which the English-American colonists bitterly and justly complained. By legislation that seems unwise, we have, ourselves, within sixty years, imposed upon our foreign commerce restrictions which appear to be equally mischievous. By navigation acts similar to those which marked the folly of British legislation, and because of which our fathers petitioned for a redress of the “grievance,” and protested, remonstrated, threatened, and finally went to war, we seem to have obtained a most unfortunate result.

In the course of this century, we have declined from the proud position of a dreaded maritime power to almost insignificance upon the sea. We have, by seemingly unwise legislation, given our carrying trade, that might now be immense, to foreign bottoms, and reduced our merchant marine to the dimensions of that of a provincial dependent. As we have observed, there is now only a single line of ocean steamers, with an American flag at the mast-head of the vessels, which bears the United States mail to and from foreign countries; a humiliating fact, to which the postmaster-general has emphatically called public attention.

There is another fact, conspicuous in these days of great business depression in our land, which it might be well for our statesmen and political economists to seriously ponder. It is the spectacle of those interests for the protection of which navigation laws have been specially framed during the last fifty or sixty years, suffering far more acutely than any other. Great distress and disorders have appeared within three years among the mines; and iron-works and woolen manufactories have felt the general stagnation in business far more seriously than other industries which have no special protection, so-called.

Why is this? I simply state the fact for consideration, and leave it for
the astute political economist to answer whether the charge be true, that
the fact is the result of restrictions upon our foreign commerce—a tariff for
protection. We know that one by one England has repealed her navigation
laws, and that with such repeal she has gained an important step toward
absolute supremacy of the seas.

It has been well for our country, during these long years of commercial
restrictions, that our inter-State commerce has been absolutely free. This
freedom made our 70,000 miles of railways a necessity, for over them have
passed, in a single year, by the simple process of exchange of commodities
in obedience to the law of supply and demand, values estimated at $10,000,-
000,000, and weighing 200,000,000 tons.

This freedom has caused a vast diversity of employments among our
people. It has stimulated invention, and caused the products of our manu-
factories, to-day, to exceed in money value the products of our soil.
Machinery has allowed a great number of men to leave the fields for the
workshops, and hence the great increase in the value of the factory products
over the farm products.

More and more, as our people become enlightened by education and
experience, will they perceive and appreciate the wisdom of the fathers who
framed our national constitution, in guaranteeing that freedom of inter-
State commercial trade by clauses in the fundamental law of the land.
What we most need now, on entering upon a new century of national exist-
ence, is a greater commercial freedom and a broader education.

The last report of the National Census Bureau may be studied with
profit by every thinking man in the land, and especially by statesmen and
political economists. Analyzed and digested, it gives revelations bearing
directly upon the science of political economy, and illustrates both the
excellencies and the defects of our commercial system in a manner that may
not be gainsaid. The census deals in facts, not theories; and facts are such
"stubborn things" that they cannot well be overthrown.

That census, properly studied and understood, might serve as a beacon
light, in a great degree, for the safety of our ship of state in the future, if its
navigators shall heed its friendly warnings. Our government has established
in the waters of the United States, about 3,000 light-houses, fog signals,
light-vessels, buoys, and beacons, the maintenance of which costs almost
$2,000,000 a year, for the benefit of commerce and navigation. Let us see
to it that so important a beacon for the guidance of our people and legislators,
in their care for our national prosperity, be not neglected. Wisdom in
legislation will make the nation richer by many millions.

Allusion has been made to the need of a broader education. We seem
to have made marvellous progress in education in our country within the
past one hundred years. "Book learning," as it is called, is doubtless far
more prevalent now than it was fifty or even twenty-five years ago; but whether there is a greater degree of solid education in its proper sense—thorough intellectual culture—in proportion to the population, than there was a hundred years ago, is fairly an open question.

When the Declaration of Independence was adopted, the condition of our arts and social life were such that necessity compelled men and women to perform more brain-work than now, when, in a large degree, machinery takes its place. Then the wife and mother was the spinner and the weaver of much of the apparel for her household, and she was as frequently the tailor and dressmaker also. In those labors she was compelled to use her brain continually; and so it was disciplined—educated.

In the few useful arts then carried on in our country, every man engaged in them almost as constantly exercised his brain as his muscles. By this mental exercise the artisan became the peer of the "gentleman" (as men who were not compelled to labor were then called) in solid intellectual cultivation. The shoe-maker was made a magistrate because of his intellectual fitness for the place; the blacksmith was a leading local politician—perhaps a "local preacher" or a deacon in the church, conspicuous for his wisdom and good deeds; and the builder of houses was both architect and artisan, and "thought out" his plans for the conveniences and ornaments of the edifice he was erecting. He wrought often with the rude tools made by the blacksmith, and without machinery. So the brain and muscle of the man was built up with the house.

This is now changed. Commerce, division of labor, and machinery have revolutionized society. The workman now, in many branches of industry, has no occasion for mental labor in his business, and he is deprived of one of the principal charms of human existence. The man who tends a machine day after day, without bestowing a thought upon the exquisite product of that machine, becomes a sort of machine himself by the monotony.

Undoubtedly much of the uneasiness among the laboring classes, and the attitude of antagonism between capital and labor, assumed within the last twenty-five years, may be traced directly to this monotony of the laborer's life—this lack of mental activity, for it has been justly remarked that "an idle brain is the devil's workshop."

The idea that machinery gives the masses of men better opportunities for intellectual cultivation seems to be a fallacy. That the new appliances of art and science to production, and the greater variety of employments, has elevated communities to a higher plane of physical comfort is true. Men are not now compelled to work unceasingly, from "sun to sun," as they did a hundred years ago, to acquire a coarse subsistence. The common laborer of to-day has a better furnished table, and dresses better, than did the man of wealth a century ago, especially in our country. There is abund-
ance everywhere, even to plethora, and industry, thrift, and virtue will secure to every man, woman, and child a comfortable living here.

Laboring men and women have more leisure given them by the less number of hours they have to work, but, in consequence of the use of the machinery that abridges the time of labor, there is no education of the brain during the monotonous ten hours while they are watching wheels and pulleys, and automatic shuttles, hammers, planes and chisels, almost listlessly. And among the wealthier classes there is now much idleness and mental dissipation. These conspicuous facts make one doubt whether our people, as a whole, are really better educated—better disciplined in thought—by our vast educational machinery to-day than they were a hundred years ago by the plain country schoolmaster. Undoubtedly there is much more general information among the people now than then; but information is not knowledge; it becomes knowledge only when it is retained in the memory.

Our common school system provides well for the general education of the young, and is the only force by which the discordant elements in our country, caused chiefly by immigration, can be reconciled. In sound popular education lies, in a large degree, the power that will save and perpetuate our free institutions. The common school—the free school system that prevails in nearly all the States of our Union—must be the strong right arm of our government in preserving order and righteously and peacefully administering the laws. Edmund Burke said, long ago, that "Education is the cheap defense of nations."

Plutarch, writing of Numa, a Roman king seven hundred years before Christ (in whose wise reign of thirty nine years Livy says there were no wars, famines, or plagues), asserts that "the fair fabric of justice," raised by that monarch, passed away rapidly because it was not founded on education. In his Republic Plato enforces this idea; so also does Aristotle in his Politics.

The wise founders of ancient states cherished the same idea, but the education which they contemplated was not like the education of our day and in our country. This was confined to the patrician classes, and was not extended to the plebeians. We propose to educate all, of whatever hue, nationality, or social circumstance. In the older forms of society there were really only two classes, masters and slaves; in our society all are free and sovereign in political power. In educating the whole people we educate the future sovereigns of the Republic. The opportunity for advancement is open to all. The servant to-day may become a master to-morrow. The cottage of the poorest laborer, is his castle, whose portal may not be opened by the highest authority, if he be virtuous, without his consent. That is the sentiment of Magna Charta signed at Runnymede more than six hundred years ago. That is the sentiment of our Magna Charta. The theory of our government is embodied in the idea of liberty, equality and fraternity.
From the time of the earliest settlements of English families in America, the education of their children was a dominant idea. The first effort to establish a school was made in Virginia, when the Company to whom the colony was granted, set aside 15,000 acres of land to endow a University for the colonists and Indians, at Henrico, a spot near Varina, on the James river, not many miles below Richmond. At about the same time (1619), the sum of £1500 was subscribed by the dignitaries and others of the Church of England, to endow a college in Virginia for the Indians.

Through the exertions of the Rev. Patrick Copeland, chaplain of the Royal James, of the British navy, £150 were subscribed, mostly by that ship's company on its return from the East Indies, to endow a school at Charles City; and for its support 1,000 acres of land were appropriated by the Company. That was in 1621, when families had just been established in Virginia, by the exportation from England, a year or two before, of ninety comely young women, as wives for the colonists there. This was called the East India School, and was designed to be a preparatory to the University. On the 22d of March, 1622, the Superintendent of the University, and over 300 of the colonists were killed by the Indians, who had secretly leagued for the extermination of the white people. So ended the first efforts to establish an university in Virginia.

The Dutch West India Company in conjunction with the Church of Holland, established schools in New Netherland (now New York); and when they granted special privileges to patroons to settle lands with emigrants, the patroons were required to make prompt provision for the maintenance of a minister and a school-master, "that thus the service of God and zeal for religion might not grow cold, and be neglected among them." A school which was in existence in New Amsterdam (New York) in 1633, still survives in connection with the Reformed (Dutch) Church in that city. Wherever the Dutch planted settlements, the school-master appeared.

In New England, education received the earliest and most earnest attention, not only of the settlers themselves, but of the magistrates whom they chose to conduct public affairs. These settlers were mostly from the best middle classes in England, and the leaders among them were mostly educated men, who had been thoroughly instructed in the grammar schools and academies of their native land, and some of them had graduated from the English universities.

All, leaders and people, came hither with a resolution to make America their permanent home. They brought with them the most earnest religious convictions, for their faith had been tried by sharp persecution. They came in families, and not as individual adventurers, with the noble purpose of building up a free commonwealth whose statute-book was the Bible, and where they might worship God in full liberty; and they felt the necessity
of establishing schools for the education of their children, that they might “wisely read the Holy Scriptures” and be intelligent men and women, and useful members of the State.

While men of wealth among them, might have sent their children “home” as England was fondly called, to be educated in the grammar-schools and colleges there, it is the crowning glory of these leaders, that they not only refrained from doing so, but they also refrained from setting up “family schools” or “select schools” for the children of ministers and magistrates, but gave of their own substance freely, and consented to take funds out of the public treasury as freely, for the establishment of common schools where all the children might be educated together. They entreated all the parents, the rich and the poor, to send their children to the same school where those of the dignitaries in Church and State, were educated.

When towns were organized in the New England colonies, they almost universally made provision for the elementary education of the children. This was not a new thing, for they had been accustomed to such care of children in England; but it was much for them to do with the scanty means at their command. So early as 1634, the town of Boston, according to its records, entreated “brother Philemon Purmont to become a school-master for the teaching and nurturing of the children.” The “richer inhabitants” of the time, also established a free school, with the Rev. Daniel Maude as teacher. It was an endowed grammar-school; and several persons bequeathed property to it. Similar instances occurred in other towns in the colony of Massachusetts Bay.

Soon after the planting of the seed of the Connecticut colony at Hartford, a public school was established by the inhabitants; and there was also a “Dame School” for girls kept by “Goody Betts.” With the founding of the New Haven colony, a school was set up; and three years after the first log-house was built on the site of the city of New Haven, and public worship was held under a spreading oak tree there, a free school was established, and the magistrates urged masters to send their apprentices to it, and parents their children. The famous Ezekiel Cheever was the master of that school; and when Harvard College was founded, and opened, at Cambridge, donations of wheat and other things were made in the townships to assist worthy young men to the enjoyment of a course of study in that institution.

Among the earlier promoters of the common and free schools of New England, the name of the Rev. John Davenport, one of the founders of the New Haven colony, ought to be spoken with reverence, for he was ever zealous and active in the work of establishing schools for all the children. Chiefly through his influence, Governor Edward Hopkins bequeathed much of his estate in the colony, to trustees residing in New Haven, “to give some encouragement in these foreign plantations for the breeding up of
hopeful youths both at the grammar school and college, for the public service of the country in future times." With funds derived from that estate, three grammar schools were established; one at New Haven, another at Hartford, and a third at Hadley, all of which, I believe, are yet in existence. They justly rank among the oldest literary institutions in America.

In Rhode Island and New Hampshire, special attention was paid by the public authorities to the education of the young. There was a public school in Newport, in 1640; and for the encouragement of the first school-master (Robert Lenthal), the authorities of the town granted him and his heirs, one hundred acres of land, and four acres for a house lot. They also granted one hundred acres for the use of the school-master, that he might give gratuitous instruction to the children of the poor. All over New England, as the population spread, the towns provided for common and free schools.

Higher seminaries of learning were also established in the English-American colonies, within a century after they were planted. The earlier of these was Harvard College, at Cambridge, in Massachusetts; William and Mary College, at Williamsburg, in Virginia, and Yale College, at New Haven, Connecticut.

The oldest and the best equipped of these institutions, is Harvard University, at Cambridge. Only six years after the first settlement of that region of New England by an excellent company from old England, measures were taken for the founding of a college. The following entry may be read on the records of the colony, under date of October 28, 1636: "The court agreed to give 400l. toward a school or college, whereas 200l. to be paid the next year, and 200l. when the work is finished, and the next court to appoint where and what building."

Two years afterward, the Rev. John Harvard left, by his will, one-half his estate, amounting to £779, as an endowment of the college. The General Court had already ordered the college to be built at Newtown, under the supervision of the governor and the lieutenant-governor, with ten others, among whom was John Cotton and John Winthrop. In honor of the University of Cambridge, in England, where several of the colonists had been educated, the name of Newton was changed to Cambridge, and in the spring of 1639, the General Court ordered the institution to be called "Harvard College," in compliment to its munificent patron. In addition to the liberal sum of money, Mr. Harvard bequeathed to the institution a library and three hundred books.

Harvard College was not chartered until 1650, and it struggled for existence through long years of poverty. The £400 granted for its establishment, by the General Court, was not paid, as stipulated by the act, but an annuity of £100 was allowed from the public treasury, for the space of seventy years, when it was increased to £150. The efforts of the legislature
to grant it lands, failed; and the salary of the President and two or three tutors was supplied by private donations. "During that whole period," says President Quincy, in his history of the College, "its officers were dependent for their daily bread upon the bounty of the General Court. They always stood before the Court, in the attitude of humble suppliants, destitute of the power even to enforce their rights; and found, by bitter experience, how miserable is he who hangs on a sovereign's favor, be that sovereign one or many, prince or people."

In early times, the Colony, the Province, and the State of Massachusetts, helped materially to sustain the College, while lotteries were chartered to obtain money to build some of the older college halls. One of these, Harvard Hall, built in 1682, was destroyed by fire in 1764. The last grant to the college from the public treasury of the State of Massachusetts, was in 1814, since which its scholarships and endowments have sustained it.

Until 1865, the privileges, and the method of organization under its first charter, had remained, with very little modification; the Council and Senate of the State having been made successors of the magistrates, in the Board of Overseers, as constituted in 1642. Now the Board is chosen annually by the alumni of the College, the first election having taken place in 1866. Only inhabitants of Massachusetts are eligible as members of the board.

Increase Mather, who was the sixth president of Harvard College, received, in 1692, the first honorary degree of LL.D. conferred by that institution. Munificent gifts have been bestowed upon the College, the earliest of which, after Mr. Harvard's, was by the Hollis family early in the last century, with a part of which a "Hollis Professorship of Divinity" was established.

The University lands in Cambridge comprise about 60 acres, of which amount 15 acres are in the College-yard, and 32 acres are laid out with taste, and shaded by elms old and stately. Around these grounds, and forming a quadrangular inclosure, are fifteen extensive buildings of brick or stone, from two to five stories in height. Seven of the chief of these, namely, Hollis, Stoughton, Holworthy, Grays, Thayer, Weld, and Mathews halls are exclusively dormitories, and these with two other buildings, afford accommodations for 700 students. The other principal buildings are Massachusetts, University and Boylston halls, devoted to recitations, lectures, examination-rooms, and laboratories; Gore Hall containing the library; Dawes Hall for the law school, and Holden and Appleton chapels.

Connected with the College are a gymnasium; scientific, mining, and divinity schools; a museum of comparative zoology; and a botanical garden. Near the College-yard stands Memorial Hall, built by the alumni and friends of the College in commemoration of the students and graduates of the institution who perished in the public service during the Civil War.
Means are provided for giving such pecuniary aid to students, that none need leave before graduation on account of indigence. Ninety-two scholarships, varying in their annual income from $40 to $350, have been established, and the number is rapidly increasing. More than $20,000, from this source, are distributed annually among the undergraduates. Other provisions are made for aiding young men with small means to be educated at the University. No distinction is made as to color or age in the admission to Harvard, but women are excluded. There are evidences, however, that common sense and simple justice will soon prevail in this regard, for a system of examination for women has been adopted, the first of which was held in June, 1874.

The various libraries of the University contain about 200,000 volumes; and the total investments of the college are valued at $2,770,000, of which amount, over $1,854,000 are productive. The total number of officers of instruction is 110; and the average of students is over 1,000. The first of the twenty-two presidents of the college was Henry Dunster, who served from 1640 to 1654; the present incumbent of that office is Charles William Eliot, chosen in 1868. Harvard University, the oldest existing seminary of learning in the United States, having lived 236 years, is now the most munificently endowed institution of the kind in our Republic.

The second of the three older colleges in the United States, is at Williamsburg, in Virginia. Nothing more seems to have been done toward the establishment of a seminary of learning in that colony, after the sad ending of the Henrico enterprise, until the spring of 1661, when the General Assembly passed an act making provision for a college "for the advancement of learning, promoting piety, and provision of an able and successive ministry in this countrey;" and the commissioners of the several county courts were ordered to subscribe such sums of money or tobacco for the purpose as they should think fit, and also solicit subscriptions from others. The Governor, Council, and Burgesses had already subscribed a considerable sum. Liberal subscriptions were made, and lands were appropriated as an endowment; and so was founded The College of William and Mary, which, for nearly thirty years, had no other name but "The College."

We have only here and there glimpses of the history of the College, endowed in 1661, until the fourth year of the reign of William and Mary, or 1693, when it was chartered, with its present title, by those joint monarchs. It probably lay in a nearly dormant state all that time, for Sir William Berkeley, the royal governor, was a foe to popular education. When, in 1671, he was officially asked by officers of the crown, "What course is taken about instructing the people within your government in the Christian religion? and what provision is there made for the paying of your ministry?" Berkeley replied:
"The same course that is taken in England out of towns; every man, according to his ability, instructing his children. We have forty-eight parishes, and our ministry are well paid, and, by my consent, should be better, if they should pray oftener and preach less. But of all other commodities, so of this; the worst are sent us, and we had few that we could boast of since the persecution in Cromwell's tyranny drove divers worthy men hither. But, I thank God, there are no free schools nor printing, and I hope we shall not have these hundred years; for learning has brought disobedience, and heresy, and sects into the world, and printing has divulged them, and libels against the best government. God keep us from both!"

Was ever a higher compliment paid to the character of popular education, and its marvellous coadjutor, the printing press, as champions of free thought, free speech, freedom of conscience, and the rights of man, than this?

When Rev. James Blair went to England, immediately after the accession of William and Mary, to obtain a charter, he was graciously received by the monarchs, and they gave, out of the quit-rents, £2,000 toward the building. Mr. Blair conveyed to Attorney-General Seymour the royal command to issue a charter. Seymour was opposed to this liberality because the nation was engaged in a costly war. The money was needed, he said, for better purposes, and he could not see the slightest occasion for a college in Virginia.

Mr. Blair replied to Seymour's vehement remonstrances, that it was intended to educate and qualify young men to be ministers of the Gospel, and begged the Attorney-General to consider that the people of Virginia had souls to be saved as well as the people of England. The imperious Seymour exclaimed, "Damn your souls! make tobacco!" The charter was prepared and signed in due time, bearing the date of February 19, 1693. It provided that the College should be denominated forever, "The College of William and Mary, in Virginia," and made the president and professors of it a body politic "in deed and in name." The quit-rents, then in the hands of William Byrd, of Westover, were handed over to the trustees, together with the title to 20,000 acres of land. This venerable institution thus began its useful career.

The College building was planned by Sir Christopher Wren, to be an entire square when completed. The first commencement exercises were held in it in 1700. Planters came in coaches to attend it, and others came in sloops from New York, Pennsylvania, and Maryland, to witness the performances. Some Indian chiefs also visited Williamsburg for the same purpose; and there was a great concourse. The College building, with the library and the philosophical apparatus, were destroyed by fire in 1705, and was not rebuilt complete until 1723. The College front was 136 feet in length. The walls were left standing, and were used in the rebuilding.
The history of the College of William and Mary, from its foundation, is an interesting one, but we may not here, in the brief space allotted, do more than touch some of its more prominent points. Its usefulness has been very great, and it has before it a great and good work to perform. Bishop Meade, in his volume on the old churches and families of Virginia, says that the "hopes and designs of its early benefactors, in relation to its being a nursery of pious ministers, were not entirely disappointed. It is positively affirmed, by those most competent to speak, that the best ministers in Virginia were those educated at the College, and sent over to England for ordination. The foreigners were the great scandal of the Church."

Lord Botetourt, who was appointed governor of Virginia in 1768, was a benefactor of the College, and gave a sum of money, the interest of which would purchase annually two gold medals, one to be given to the best classical scholar, and the other to the best scholar in philosophy. The governor's statue, wrought in marble, which was erected in the old capital in 1774 at the expense of the colony, was removed to the front of the College building in 1797. It had been somewhat mutilated during the Revolution. There it remained until the late Civil War, when it was removed to the grounds of the Asylum for the Insane, in Williamsburg, for safety, and in 1871, it was taken back to its old place in the College grounds. It is as perfect as when it was first erected there, excepting a few bullet marks which it received during the Civil War.

From 1693 until 1777, there were six presidents of the College of William and Mary, when Bishop Madison was elected, and held the position until 1812. For seventy years before Bishop Madison's accession, the average number of students was about sixty-five, ten or fifteen of whom were received on scholarships or foundations. At the beginning of the Revolution, the number was seventy. Then its annual income was nearly $20,000. In 1776, it was the richest college in North America, for it had been the constant recipient of royal, colonial, and private benefactions; and its chartered endowments were of great and increasing value. The Revolution and the formation of our national government took from the College all of its endowments and prosperity, save the buildings, about $2,500 in money, and the then unproductive lands granted by the crown. Some of the leading men of the Revolution were graduates of the College of William and Mary.

When the allied armies approached Williamsburg, in 1781, to dislodge Cornwallis at Yorktown, the exercises of the College were suspended. The troops injured the College buildings, and the president's house was burnt. The organization of the institution was changed in 1779; and in 1788, Washington was made its Chancellor. Its course of usefulness continued until early in 1859, when the College, with most of its precious contents
were consumed. That year ex-President John Tyler, was appointed Chancellor, the first since the death of Washington.

In the spring of 1861, when the Civil War had begun, the College was closed. The military took possession of the buildings, and those which survived were held by National troops from 1862 till the close of the war. On the 9th of September, 1862, after a fight with the Confederates, some National soldiers out of the control of officers, fired and destroyed the principal building. The damage done to the premises by fire, and other injuries, plunder, et cetera, during the war, was equivalent, in value, to $80,000.

The main college building was restored, and the faculty was re-organized in 1869. Because of its past usefulness, and its capacity for excellent work hereafter; because of its venerable age, its distinguished alumni, and its stirring history connected with the founding of our Republic, the College of William and Mary deserves and should receive the hearty sympathy and aid of the friends of learning in our country.

The College has recently voluntarily put itself in accord with the public school system of Virginia, and gives a free scholarship to each free school district in the State, besides having fifteen other scholarships. Many young men go there to be educated, without money, and none who are deserving are turned away because they can not pay. There is connected with the College, a grammar school, the building standing on the site of the colonial governor's palace.

The President of the College is B. S. Ewell, LL. D., who is assisted by Rev. George T. Wilmer, D.D., Rev. L. B. Wharton, A.M., C. S. Dodd, A.M., Dr. R. A. Wise, A.M., and J. Cannon Hobson, who compose the faculty. In 1876, there were 71 students in the College proper, and 15 in the preparatory department.
CHAPTER XXXIX.

In the year 1700, ten of the principal ministers of the colony of Connecticut, met at New Haven, and associated themselves as trustees to erect and govern a college. They brought together a number of books, each of them saying, as he laid his own upon a table: “I give these books for founding a college in Connecticut.” The Colonial Assembly granted a charter, and toward the close of 1701, the trustees met at Saybrook, near the mouth of the Connecticut river, and chose the Rev. Abraham Pierson, rector or president of the institution, which had received the name of the “Collegiate School of the Colony of Connecticut.”

From March to September, 1702, only a single student—Jacob Hemingway—was under the charge of the rector. In the latter month the number was increased to eight, and a tutor was chosen to assist in the instruction of them. In 1716, the institution was removed to New Haven, and had begun to receive donations from Elisha Yale, a native of that town, who had resided in England ever since he was ten years of age. Mr. Yale had become a distinguished man in that country. At the age of thirty years he went to the East Indies, and became governor of Fort St. George, Madras. Returning to England in 1692, he was soon afterward chosen Governor of the East India Company, and little later, Fellow of the Royal Society.

Governor Yale sent gifts to the “Collegiate School,” amounting, in the aggregate, to £500, and in recognition of his generosity, the trustees, in 1718, named the collegiate house at New Haven, Yale College. When, in 1745, a new charter was granted, the name at first given to the building was applied to the whole institution. Until 1755, the only instructors were the rector or President, and tutors, when a professorship of divinity was established.

The general government of Yale College is vested in the corporation, which consists of a president and ten ministers—the successors of the original founders having power to choose their own successors—the governor and lieutenant-governor of the State, and six State senators, annually appointed. The number of the rectors or presidents, since its foundation in 1701, or 175 years ago, is only nine, namely: Abraham Pierson, A.M.; Timothy Cutler, S.T.D.; Elisha Williams, A.M.; Thomas Clap, A.M.; Naphtali Daggett,

Next to Harvard University, Yale College is the most munificently endowed institution of learning in this country, yet not more so than its actual wants as an expanding seminary needs in carrying on its increasing work. Some of the gifts made to it, from time to time have been directed to specific objects, and others have been left wholly at the control of the corporation. Governor Yale, Bishop Berkeley, and James Fitch were among the earlier donors. In 1832, a subscription among the alumni added $100,000 to its funds, and a somewhat larger sum was raised, in a similar way, in 1853. The State of Connecticut has also made large gifts to the institution, and special funds have been from time to time bestowed on the medical, theological, and scientific schools. The most important gift of this kind, was made several years ago, by Joseph E. Sheffield, of New Haven, who gave to the Scientific School, a building well furnished with laboratories, lecture-room, et cetera, costing over $50,000, and an equal sum for the maintenance of the school.

The College possesses a considerable sum for the assistance of indigent students, and giving rewards to the meritorious. There is a separate fund for the maintenance of the library, for which a fire-proof building was erected in 1845. Its geological and mineralogical cabinets are extensive and valuable; and the college possesses many paintings by Colonel John Trumbull. The college grounds and buildings occupy a large space in the city of New Haven, and add much to the attractiveness of the place. In the number of its professors, tutors, and students, Yale ranks next to Harvard. It is the younger of the three earlier colleges in the English-American colonies.

There were four other exalted institutes of learning established during the colonial era, namely, the College of New Jersey, at Princeton, N. J.; Queen's College (now Rutgers), at New Brunswick, N. J.; King's College at New York, (now Columbia College), and the College of Rhode Island, now Brown University. The name of King's College was changed to Columbia at the close of the Revolution, and that of the College of Rhode Island to Brown University, in 1804, in honor of Nicholas Brown, its most distinguished benefactor.

The College of New Jersey was chartered in 1746, and was opened in May, 1747. It was established under the auspices of the Presbyterian Synod of New York, (which then included New Jersey), first at Elizabethtown. It was removed to Newark, and afterward to Princeton, where a substantial stone building was erected, and at the suggestion of Governor Belcher, it was called Nassau Hall, "to the immortal memory of the glorious King
William the Third, of the illustrious house of Nassau." The president of Princeton College (the eleventh) is Rev. James McCosh, D.D., LL.D. Since his accession in 1868, more than $1,000,000 have been given to the college.

Rutgers College was established by royal charter, in 1770, with the title of Queen's College, under the auspices of the General Synod, and theological seminary of the Protestant Reformed (Dutch) Church. It was connected with that Synod until 1865, when it became a partially independent literary college on the condition that its president and three-fourths of its trustees should be members in full communion with that church. It received its present name in 1825, in honor of Colonel Rutgers, who contributed $5,000 to its funds. Since the accession of Rev. W. H. Campbell as President of the College, in 1863, several hundred thousand dollars have been given to the institution, and six new professorships have been created.

The College of Rhode Island was founded at about the middle of the last century, by the Philadelphia Association of Baptist churches. Money for the purpose was raised chiefly among the Baptists of Rhode Island, and a charter was obtained in 1764. In its charter it was provided "that into this liberal and catholic institution shall never be admitted any religious tests; but on the contrary, all the members thereof shall forever enjoy full, free, absolute, and uninterrupted liberty of conscience; and that the public teaching shall, in general, respect the sciences, and that the sectarian differences of opinions shall not make any part of the public and classical instruction."

The Board of Trustees consist of thirty-six members, of whom twenty-two must be Baptists, five Friends or Quakers, four Congregationalists, and five Episcopalians. This proportion represented the different denominations then existing in the colony. Nicholas Brown, in whose honor the college was erected in 1804, was a graduate of that institution. He inherited an ample fortune at the age of twenty-two years, and founded a successful mercantile house. He was secretary of the college from 1796 until 1825. His gifts to the university amounted, in all, to $100,000.

The university has established an agricultural college in connection with it, according to the provisions of the act of Congress. It has five college buildings, a museum, and a library containing over 40,000 volumes. The president at this time is Rev. E. G. Robinson, D.D., LL.D.

King's College, in the city of New York, was chartered by the king in 1754. Funds for its establishment were first raised by a lottery, authorized in 1746 and 1751, when the amount collected was over $17,000. Preparatory to its organization, the control was vested in ten trustees, one of whom was a Presbyterian, two were of the Reformed Dutch communion, and seven were Episcopalians, some of the latter being vestrymen of Trinity church. This school went into operation in 1754, under the presidency of Rev. Dr.
Samuel Johnson, in a vestry room belonging to Trinity church, but the college buildings were not completed until 1757. The name was changed to Columbia College in 1784. Rev. Frederick A. P. Barnard, LL.D., is the president.

Besides these more important colleges established in colonial times, and which still exist, there were two others that are now flourishing institutions, namely, the University of Pennsylvania, organized in 1749, and Dartmouth College, founded in 1770. Hampden-Sidney College, at Hampden-Sidney, in Virginia, was established in 1775, just at the breaking out of the war for independence.

It will be perceived that the colonies were well supplied with higher seminaries of learning at the time when the independence of the colonies was declared. Like the schools preparatory to them, they were essentially church institutions, and were controlled by various Christian denominations (as are a larger proportion of the 349 colleges which are now in existence in the United States), and from each went out many of the leading clergymen of that period.

It was not until about the close of the colonial era, and the struggle for independence, that any special or professional schools were established. There were two American Medical Colleges, one in Philadelphia and one in New York, the former established in 1765, and the latter in 1768. The Presbyterians founded a theological seminary (Dickinson College) at Carlisle, in Pennsylvania, in 1783, which is now a Methodist institution. The first law school in the United States was founded by Hon. Tapping Reeve, at Litchfield, Connecticut, in 1784.

From the peace in 1783, until the close of the eighteenth century, ten colleges were established in the United States, which still exist, namely: Washington College, at Chestertown, Maryland, founded in 1783; St. John's College, at Annapolis, and Georgetown College, at Georgetown, D. C., founded in 1789; Williams College, at Williamstown, Massachusetts, in 1793; Union College, Schenectady, New York, in 1795; Middlebury College, Middlebury, Vermont, and Frederick College, Frederick, Maryland, in 1797; Bowdoin College, Brunswick, Maine, in 1798; and the University of North Carolina, at Chapel Hill, North Carolina, 1799. The Georgetown College is a Roman Catholic institution, the first of its kind established in the United States by that denomination.

In 1873, there were 349 colleges in the United States, of various grades, some of them organized on the university plan. In this country, the terms "college" and "university" are convertible, and are used in speaking of the same class of institutions. Of the whole number of colleges in 1873, only six of them were organized previous to the year 1820; and forty of them were established between 1820 and 1840. The remainder, excepting the
Of the whole number of Colleges, only fifty-seven are non-sectarian, the remainder being denominational institutions. The aggregate number of volumes in the libraries of all these colleges is nearly 1,900,000. The library of Harvard College contains the largest number—136,000 volumes. Yale has the next larger number, it being 83,000. Of the more modern colleges, the University of Virginia, at Charlottesville, chartered in 1819, and organized in 1824, has the largest library, the number of volumes being 40,000. Many others have 10,000 volumes.

Among our modern colleges, the University of Michigan may be considered a model institution. In 1805, Congress made a grant of land for the support of a university in that Territory. A charter was given in 1816. Another appropriation was made in 1826, but it was not organized until 1837. The University was first opened for students in 1842. It now consists of three departments, each having its own faculty of instruction, while the senate of the University is composed of all the faculties. The departments are: Literature, Science and the Arts, comprising a school of mines; Medicine and Surgery, organized in 1850, and Law established in 1859. There is also a Homeopathic Medical College, and a Dental College. In all but the first named department, the instruction is given largely by lectures.

The University grounds contain forty-four and a half acres. The buildings consist of a central one called University Hall, for the department of literature, science, and the arts; buildings for the departments of law and medicine; a chemical laboratory, and residences for the President and professors, and an astronomical observatory. The latter was presented to the University by the citizens of Detroit. In University Hall there is an auditorium, with sittings for 3,000 persons.

The libraries of the University contain an aggregate of nearly 23,000 volumes and 7,000 pamphlets. Almost 100 American and European periodicals are provided for the use of the students, and over 50 newspapers. About 31,000 volumes of the libraries are accessible to the students.

The museum contains a valuable and rare collection of objects, illustrating History, Art, Natural Science, Ethnology, Agriculture, Astronomy, and Materia Medica. It has a cabinet of over 6,000 minerals; and its geological collection is very large and rare, containing about 41,000 specimens. Its zoological cabinet is also a rich one, and contains over 110,000 specimens. The botanical cabinet contains about 70,000. A collection illustrative of the Fine Arts and its history was begun in 1855, and it is already large and valuable. All objects in the museum are arranged in galleries, and are accessible alike to the student and the visitor.

The University of Michigan is open for the admission of both sexes, and
both are placed on an equality of privileges in all the departments. The course of lectures for women in the medical department are distinct from those for men. In 1875-76 there were ninety-five feminine students in the University, of whom forty-nine were in the literary department, two in the advanced zoology and botany department, one in analytical chemistry, and three in pharmacy; thirty-five were in the regular medical department; two in the law department; two in the homeopathic college, and one a resident graduate. In 1875 two feminine students received the degree of bachelor of science, three that of bachelor of philosophy, two master of arts, twelve doctor of medicine, and two bachelor of laws.

The means for popular education were steadily increasing in the English-American colonies when the revolution broke out. The war that ensued (like all wars) was adverse to the interests of learning, and while many elementary schools existed, much of the common education of the young devolved upon parents. The calls of patriotism took young men from the colleges, and the study of what are called the liberal professions. But the activities of that war stimulated a greatly increased mental force, and when peace and independence came to bless the land, the people felt more keenly than ever the importance of a broad system of education, that should embrace both sexes, for in the colonial period the provisions for schools were made chiefly for boys, and the girls were neglected.

Among the earliest and most efficient champions of a broader education to be fostered by the National and State governments, immediately after the close of the revolution, was Noah Webster, who wrote many powerful essays on the subject, and of whom it has been justly said, "He taught millions to read but not one to sin." He agreed with Washington that it was the duty of the State to promote, as an object of primary importance, institutions for the general diffusion of knowledge." Thomas Jefferson said, "A system of general instruction, which shall reach every description of our citizens, from the richest to the poorest, as it was the earliest, so shall it be the latest, of all the public concerns in which I shall permit myself to take an interest. Give it to us in any shape, and receive the inestimable boon the thanks of the young and the blessings of the old, who are past all other services but prayers for the prosperity of their country and blessings to those who promote it." It was and is the sentiment of all thinking men, so well expressed by Chancellor Kent when he said: "The parent who sends his son into the world uneducated defrauds the community of a lawful citizen, and bequeaths to it a nuisance."

Popular education before and just after the revolution was quite a different thing from what it is now. The difference consisted chiefly in the books that were used. Then Dilworth's Spelling Books, the Psalter, the New Testament, and the Bible, were the only reading books in the schools. No
geography was studied until Dr. Morse (father of the inventor of the electro-magnetic telegraph) made some elementary books on the subject in 1786. English grammar was not usually studied: and no slates were used in working out the problems of the simple arithmetic then taught. The writing employed in this study was done on paper. History, as a study, was unknown in the schools, and the young had no outline of the story of their country from which to draw instruction.

In 1783 Noah Webster gave a great impetus to the art of spelling—the most essential art in popular education—by the publication of his Spelling Book, which he had prepared while teaching school in Goshen, Orange County, New York. It was the basis of all his works on that subject, and its use produced a vast improvement in the art of spelling, for he gave with it a system of pronunciation. Before the appearance of his spelling book pronunciation was left entirely to the teacher, who himself had no sure guide. No elementary book has ever been so extensively studied as that. It is widely used now, in a modified and improved form, and it is estimated that more than 50,000,000 copies of Webster's Spelling Book have been printed and sold in the United States.

In 1785 Mr. Webster published a Reader and Speller, which contained brief sketches of the geography and history of the United States. This soon took the place of Dilworth and the other books mentioned, in the schools, and planted the seeds of a public taste for the study of our geography and history.

The district school-house in those days, was generally a wretched affair, as it too often is now. It was square, rough clap-boarded; with a narrow entry for hats, bonnets, and dinner baskets, and was heated by a wood fire in a large open fire-place. Long boards called desks, extended around the room for writing upon. The seats were always loose, generally made of a single board, and sometimes of a slab, with two legs at each end; and little boys and girls often had to sit with their feet dangling two or three inches from the floor, enduring the torture of this "juvenile penitentiary" six hours each day. In winter these rooms were crowded to excess; and in summer there was no play-ground, no inclosure, and no shade for the children at "recess." We have not made much improvement in these respects in many of the rural districts of our country.

The Rev. Heman Humphrey, D.D., in a letter to Henry Barnard, L.L.D., in 1860, gave the following picture of very common occurrences at district school-houses at the beginning of the present century:

"For the most part, the winter schools were miserably supplied with wood. I kept school myself in three towns, and in but one of the schools was there any wood-shed whatever; and no wood was got up and seasoned in summer against winter. Most of what we used was standing in the forests when the school began, and was cut and brought sled length by the
farmers in proportion to the number of scholars which they sent. Not exactly that, either; for sometimes when we went to the school-house on a cold morning, there was no wood there. Somebody had neglected to bring his load, and we were obliged to adjourn over to the next day. In many cases the understanding was, that the larger boys must cut the wood as it was wanted. It always lay in the snow, and sometimes the boys were sent to dig it out in school-time, and bring it in, all wet and green as it was, to keep us from freezing. That was the fuel to make fires with in the morning, when the thermometer was below zero, and how the little children cried with the cold, when they came almost frozen, and found no fire burning; nothing but one or two boys blowing and keeping themselves warm as well as they could, by exercise in trying to kindle it. Such were our school-houses and their disaccommodations.

The teachers were often selected more for their willingness to work hard for small pay, than for their ability to impart knowledge. Men were generally engaged for the winter months when big boys were in school; young women taught the district schools in the summer, at wages about the same as they would earn by spinning. The teacher "boarded round" among the families of the district, and was generally regarded with much consideration as a very learned person. The people in the rural districts looked up to him as a model of wisdom:

"And still the wonder grew,
How one small head could carry all he knew."

Self-instruction largely prevailed in the schools of that time, and the studies seemed to be "elective." The chief business of some of the teachers evidently was to start the machinery in motion in the morning, keep it moving by the power of a switch and ferule, and criticise its products. The late Joseph T. Buckingham, of Cambridge, Massachusetts, in some reminiscences of his early school-days, beginning with 1783, wrote to Dr. Barnard, as follows, concerning his first essays in arithmetic:

"The farmer with whom I lived thought I could read well enough, and as the district school-house was a mile or more distant, he considered it unnecessary to send me that distance in the winter, merely to read; and consequently for two or three winters I went to school not more than eight or ten days in each. At length I was thought old enough to learn to cipher [when he was eleven or twelve years of age], and accordingly was permitted to go to school more constantly. I told the master I wanted to learn to cipher. He set me a sum in simple addition—five columns of figures, and six figures in each column. All the instructions he gave me was—'Add the figures in the first column, carry one for every ten, and set the overplus down under the column.'"
"I supposed he meant by the first column the left hand; but what he meant by carrying one for every ten was as much a mystery as Samson's riddle was to the Philistines. I worried my brains an hour or two, and showed the master the figures I had made. You may judge what the amount was when the columns were added from left to right. The master frowned and repeated his former instruction—'Add up the column on the right, carry one for every ten, and set down the remainder.' Two or three afternoons (I did not go to school in the morning) were spent in this way, when I begged to be excused from learning to cipher, and the old gentleman with whom I lived thought it was time wasted; and if I attended the school any further at that time [1793], reading and spelling, and a little writing, were all that was taught."

"When I was a boy, seventy-five or eighty years ago," wrote the venerable Dr. Nott, President of Union College, to the same gentleman, in 1861, "in good old Puritan Connecticut, it was felt to be a practical maxim 'that to spare the rod was to spoil the child;' and on this maxim the pedagogues acted in the school room, and applied it for any offence, real or imaginary; and for having been whipped at school by the relentless master, the unfortunate tyro was often whipped by his no less relentless father; so that between the two relentless executors of justice among the Puritan fathers, few children, I believe, were spoiled by the withholding of this orthodox discipline."

The system of flogging in schools, in those days, was universally practiced. Watson, in his "Annals of Philadelphia," gives us some graphic pictures of this kind of discipline. He tells of a Friend, who taught school in Philadelphia, and whose "strap"—a bridle-rein—was the ruling sceptre in his kingdom. He seemed to delight in torturing his scholars; and he would inquire, after giving a blow, "Does it not hurt?" On their replying in the affirmative, he would say, "Then I'll make it hurt thee more! Thou shalt not want a warming pan to-night. Intolerable being! Nothing in nature is able to prevail upon thee but my strap!"

Todd (the name of the schoolmaster) had a boy who wore leather breeches. One day he strapped him soundly across the seat of his breeches, as he was bent over the master's knee to draw his nether garment tight. Todd asked the boy, "Does it not hurt?" when to the amazement of the school, the youngster cried out, "No! Hurray for leather crackers." Todd threw him from his knee, sprawling on the floor, and dismissed him with these indignant words: "Intolerable being! Get out of my school. Nothing in nature is able to prevail upon thee—not even my strap!"

This corporeal punishment was not confined to the boys by schoolmasters in those days. They were made to strip off their jackets and loose their trousers-bands, preparatory to hoisting them upon a boy's back to
receive their flogging, with only the linen between the flesh and the strap. Watson says: "The girls, too—we pity them—were obliged to take off their stays to receive their floggings with equal sensibility." Nearly all the teachers then were from England or Ireland. Their calling was looked upon with a degree of contempt; and they were often low-bred, intemperate adventurers from Europe, and thereby degraded their profession. The extent of their teaching was generally limited to what a London alderman designated as the three R's, namely: "Reading, Riting, and Rithmetic." To cipher beyond the rule of three was a high achievement for the average scholar in those days. Happily common sense and common humanity have dismissed the fourth R—the Rod—as a relic of barbarism, and now brutality of this kind is very rare in the school-rooms anywhere in our country.

Such is a brief outline picture of the system of education in this country during the earlier portion of the concluding quarter of the last century. Before the century closed, and especially after our real national life began, when the Constitution was ratified, and the new government under it was organized and put in motion, there was speedy and marked improvement, for the education of the people, in its broadest sense, became the care of States and statesmen.
CHAPTER XL.

THE Art of Printing is the sovereign dispenser of learning. It is the grand school-master, speaking all languages, and scattering the blessings of knowledge broadcast with impartiality and amazing plenitude. It liberated learning from the cloisters, and introduced it to the people as an abiding friend.

The art of printing marches in the van of modern civilization as the powerful co-worker of blessed Christianity, instructing the head while its matchless coadjutor cultivates the heart. It is a mighty democrat, continually laboring, by its teachings, for the social elevation of the lowly. It presents the trinity of Liberty, Equality and Fraternity, as worthy of adoration next to the Creator.

Tyrants and oppressors fear the art of printing more than armed legions. A single printing-press may be more fatal to the ambition of an unrighteous prince, or corrupt demagogue, than a hundred thousand bayonets. In a society like ours it is more powerful in restraining crime, and immorality and wrong-doing, than the most puissant police force on the earth; and it may be a preacher of righteousness more persuasive than scores of silver-tongued and earnest evangelists. It was well characterized by Isaiah Thomas as "The art that preserves all art," for with its aid a knowledge of everything may be perpetuated.

The Printing Machine with which the art of printing performs its wonderful mission, as we see it in its perfection now, may justly rank among the marvellous achievements of the century just closed. Its greatest advance toward its present perfection has been made within the last fifty years; and the speed of its performance which is now so marvellous, has been obtained within the last twenty years.

The art of printing was known and practiced in China, more than a thousand years ago, and their methods of producing books now are very slight improvements upon those used in printing their literature of former ages, before the thirteenth century. Their method involved the art of wood-engraving, for each page of a book was engraved on a solid block (and still is), for movable types were unknown. The art, as we know it, performed by movable types was introduced into Europe at about the middle of the fif-
teenth century, though block-printing, in the ornamentation of fabrics and the making of playing-cards had been practiced in Italy as early as the close of the twelfth century. The full practical development of the art depended upon the manufacture of paper, a commodity which, according to Hallam, was not a staple of commerce before the close of the fourteenth century.

A printing-press was first set up in our country, at Cambridge, Massachusetts, in 1638, and the first printing done within the bounds of our republic was performed there in January, 1639. It was for the use of Harvard College, which, with type and a printer, was furnished by Rev. Jesse Glover, a wealthy dissenting clergyman, who accompanied them on their voyage across the Atlantic, but who died before the ship arrived at Boston. His widow became the wife of Henry Dunster, the first president of Harvard College. The printer's name was Stephen Day; and he has the honor of having been the first printer in America north of the city of Mexico. His first production was *The Freeman's Oath*, and the next was an *Almanac*. This was the beginning of book-publishing in America. Day began printing at Cambridge forty years before another printing-press was set up in then British America. Because he was the first printer in the colony, the General Court gave him 300 acres of land, one lot of which he mortgaged as security for the "payment of a cow, calf and heifer."

The printing-press then used was doubtless the rude kind (a late improvement of a ruder kind by a citizen of Amsterdam), on which Franklin worked in London, in 1725, and which were in common use until about the period of our Revolution. Franklin's press is preserved in the Patent-office at Washington, and exhibits the kind of machine on which all printing was done here before our old war for independence. It performed its work after the ink was put on the type by "dabbers," (balls with handles, made of wool or cotton covered with soft leather), by a pressure given with a simple screw moved by a lever. In this way an expert workman could produce about one hundred and twenty impressions in an hour. Most of the presses used in our country at the time of the Revolution, were imported from England, but a few were made here.

Franklin's press (made chiefly of wood) was known as the "Ramage," and these were in common use in the United States until 1820. At about the beginning of this century the Earl of Stanhope invented a press made entirely of iron. He discarded the screw and substituted the toggle joint, by which the machine was worked more rapidly and effectively.

The "Columbian" press, invented by George Clymer, of Philadelphia, in 1817, was the first important American improvement of a printing machine. The power was applied by a compound lever, consisting of three simple levers of the second order. This was superseded by a press invented by Peter Smith; and the "Washington" press of Samuel Rust, invented in
1829, superseded all others for awhile. The dabbing balls were succeeded by a roller, which a boy might work; and later a self-inking apparatus was invented which was made to work by a weight and pulley set in motion every time the pressman pulled his lever. With that machine a good workman could produce 2,000 impressions a day.

Many attempts were made to contrive a power-press, capable of doing work as well and more speedily than the hand-press. Daniel Treadwell, of Boston, produced the first one in this country. In 1830 Samuel Adams, of Boston, invented the celebrated "Adams" press, which was improved by his son, Isaac Adams, and has superseded all other platen presses. Its principle is essentially the same as the "Washington" press, only its bed rises with the type to meet a stationary platen, instead of a movable platen descending upon the type. It is a most ingenious construction in all its parts, and is moved by steam-power. It will now make about one thousand impressions an hour. Every operation, excepting the feeding of the sheets (and sometimes even that) is performed automatically.

Still greater rapidity, especially for newspaper work, was required, and inventors turned their attention to the employment of a rotary motion. This was first successfully done by a German machinist in London, and the rotary press was first used in printing the Times in 1814. It could give about 1,800 impressions an hour. Many years afterward more simple machines were made by Cowper and Applegath. An improved machine of these kinds was made for the Times in 1848, which produced about 10,000 impressions an hour. Meanwhile R. Hoe & Co., of New York, had produced printing machines superior to any in the world.

The house of R. Hoe & Co. has been in existence nearly three-fourths of a century, having been established by Robert Hoe in 1803. He was a native of England, and a man of high integrity, firm will, and indomitable energy. His pecuniary means were small, and like his education, were self-acquired. Mr. Hoe was the first man who set up a steam-engine in New York to drive his machinery, and he used the first, and for years the only, large machine in our country for cutting, to correct theoretic shape, the teeth of gearing, which to this day are too often merely smoothed with a file, or even left as they come from the foundry sand.

Hoe’s machine lathes and planes were the first seen in New York, and were the best that Europe could then produce, for he frequently sent skilled workmen to the great manufacturing centres there to bring away the most approved tools as well as a knowledge of the most approved processes of his business. The novelty of iron machinry, the scrupulous neatness of his workshop on what is now Cedar street, and the sleek-coated horses which kept his machinery a-going before he introduced steam, attracted many visitors.
So early as 1805 R. Hoe & Co. began the manufacture of printing machinery, first after the old Ramage pattern; but in their hands the machine assumed a more perfect appearance. In 1827 the house began the manufacture of cylinder presses, which gave the firm a wide reputation (which it has ever since sustained), for their presses, improved and remodelled, are much superior, in design and workmanship, to any other now made in Great Britain or in Continental Europe.

The flat-bed cylinder press, first manufactured by R. Hoe & Co., mainly modified to meet the wants of newspaper publishers, continued to supply these wants for many years. At length the increasing circulation of daily newspapers called for something more speedy, and the firm made a double cylinder press on the same general plan. That was believed to be the limit of invention in that direction. It was one of the wonders of machinery at that time. But in 1846 Richard M. Hoe (who, with his brothers Robert and Peter, then composed the firm, the father having died in the fifty-third year of his age) produced the "Rotary Press," so well known to the newspaper world. This preceded the improved Applegath press by several years, and was working successfully in the office of the Philadelphia Ledger, New York Sun, and New York Herald, before the completion for the London Times of the Applegath cumbersome systems of vertical cylinders, or more properly speaking, polygonal prisms.

On Hoe's rotary press the form of type is secured upon the surface of a large horizontal cylinder, and prints at every revolution as many papers as it has impression cylinders. These cylinders were at first four in number, afterwards six, eight, and ten, giving a maximum production of 20,000 impressions an hour. In this invention the most serious difficulty, that of holding the type in place, was overcome by an ingenious and simple arrangement which made the machine, from the outset, a brilliant success, and it obtained the name of "lightning press."

Between 1850 and 1860 R. Hoe & Co. made successful attempts at printing from a roll of paper, on both sides of the sheet, but practical difficulties of the time, such as slow-drying ink, unequal paper, and the then unsolved problem of disposing of the sheets as they rushed from the machine, rendered the process too slow to be profitable. But the wonderful development within a few years past in the art of electrotyping, and stereotyping from paper moulds (to which the firm has contributed much patient labor and many machines both new and useful) allowed them to accomplish their object in making the "Web Perfecting Press," on which from 15,000 to 20,000 perfect newspapers may be printed in an hour.

A newspaper form may now be duplicated in ten or twelve minutes by the process of stereotyping alluded to, and this has, in turn, originated a new era in press-making as well as in the art of printing, for it enables
any number of machines to be employed simultaneously upon one newspaper. Economy and dispatch are the important consequences.

The art of stereotyping, or the production of solid pages of type from moulds made in plaster of Paris, has greatly facilitated and cheapened the processes of book making, and contributed largely to the spreading of knowledge. It is an old art revived within the present century. John Müller, of Leyden, produced a sort of stereotype plate in 1690; but to William Ged, a young goldsmith of Edinburgh, seems to belong the honor of the invention of stereotyping as we know it. An edition of Sallust was printed from stereotype plates made by his process, in 1736, the first product of the art. This art encountered the violent opposition of the craft, and after the death of Ged, the art was lost sight of until it was revived in Paris in 1795. It was introduced into the United States in 1813.

Electrotyping is an improved method of stereotyping, which, within a few years, has superseded, to a great extent, the old process. It consists in making a cast of metal upon a mould, by galvanic action. A "form" of type, or a wood-cut, is moulded in pure wax by a heavy pressure. This mould is dusted with plumbago or black lead to give it a conducting surface for a galvanic current. It is then washed with a weak solution of sulphate of copper, after which it is dusted with fine iron filings, by which means a film of metallic copper is deposited upon the plumbago surface, which increases its conducting power. The mould is then suspended in a bath composed of sulphate of copper and sulphuric acid, with water, and opposite the face of each mould is suspended a plate of copper. By galvanic action, metallic copper is deposited on the prepared face of the mould to any required thickness. This shell is afterward backed with melted type-metal of the thickness of an ordinary stereotype plate, and a perfect fac simile of the type or wood-cut in copper is the result. This makes a much more durable stereotype than that made of type-metal.

Numerous inventions have been made in the direction of a rotary perfecting printing press, the most successful of which, for a time, was that of the late William Bullock, of Philadelphia; but the "Web" press of R. Hoe & Co. appears to be free of the defects in plan or construction which mark all others. It stands, in all respects, on higher grounds of excellence than any other yet produced. It is yet unapproachable in the speed with which it runs, and the quality of its work. The machine is low and compact. Every part is within reach of a man, and has three places on each side at which it can be started and stopped. It is composed of two sets of printing and impression cylinders (one for each side of the sheet), and a third pair for cutting off the separate newspaper lengths; and there is an "accumulating cylinder," on which six papers are wound, one exactly above the other, for
delivery together to the fly. The perfection of this final delivery is the triumph of this machine, the whole operation of which is as follows:

The paper from the roll, in passing between the first cylinder of stereotype plates and its corresponding impression or blanket cylinder (the circumference of each of which is just equal to the future length of the newspaper sheet), gets printed on one side, and, continuing afterwards to the second printing cylinder, is printed on the reverse side; but as the blanket cylinder geared to the latter is three times its size, with consequently three times the extent of blanket to take the set-off, the printing is proportionably excellent and free from smear. The paper next passing onwards to the cutting cylinder, is divided into sheets which are carried by tapes and wound six deep upon the accumulating delivery drum, to be at last laid down by the fly upon the table so quietly and regularly as to require no straightening, making it possible for one man to take away leisurely the production of two machines. Both the "Web" presses and the Rotary presses are now constructed by R. Hoe & Co., when desired, with folding machines attached in place of sheet flyers. They have constructed and sold more than two hundred of the Rotary presses.

R. Hoe & Co. also manufacture a great variety of flat-bed cylinder presses, for job work of every kind, from the coarse hand-bill to the most delicate wood-cut. Of these they make over sixty kinds, the most costly of which are those for lithographic printing. These are regarded as superior to any others in use. In proof of this estimation by the trade, is the fact that not long ago, one which originally cost $5,500 was sold at sheriff's sale for $5,000 cash, after a year's use, while the best English, French, and German lithographic presses may be bought for two-thirds that sum. They also manufacture bed and platen presses for book work, invented by Mr. Adams, whose patents and business the firm purchased in 1857. They also make a very ingenious press for printing railroad tickets.

R. Hoe & Co. manufacture hydraulic and screw presses of all sizes for pressing books, paper, etcetera; also stereotyping and electrotyping machinery of every description. They make embossing presses, cutting machines, copying machines, etcetera, for book-binders; and a prominent part of their business, as we have observed on page 257, is the manufacture of cast steel saws, which were first made in this country by that firm fifty years ago.

The buildings of the Hoe manufacturing establishment make a very extensive and imposing pile. The small premises on Cedar street were, in course of time, exchanged for more extensive ones in Gold street (which they still own and occupy), having a front of about 100 feet and a depth of 60 feet. Their main factory is on a lot bounded by Grand, Broome, Sheriff and Columbia streets, and covers considerably more than one entire block. The first of the group of buildings which now compose the establishment
was erected more than forty years ago. The more recent structures are lofty and capacious and are built in the most substantial manner. The total surface of floor room amounts to over 200,000 square feet or over four acres and a half; and the assortment of tools and machinery of all kinds, taking into account both size and quality, ranks among the first in the world.

The business purchased of Isaac Adams, in 1858, was carried on in his former shop in Boston until 1869, when street improvements swept away the whole suite of buildings, and it was removed to New York. They opened a small repair shop in London, in 1861, for the care of the large and expensive presses which the firm had put up in England. Since then they have placed the business there in more commodious quarters, and it is very flourishing. In 1875 seven "Web" presses for the London Standard and five others for offices in England, Scotland and Australia, were constructed there. The London papers pronounce the "Web" perfecting press to be superior to any in the world.

The total number of hands employed by R. Hoe & Co. is between 800 and 900, of whom about 600 are engaged in the Grand street establishment, an equal number in the shop in Dorset street, London, and a few in their ware-rooms recently opened in Chicago. The number of apprentices is more than 100. For these, drawing classes are provided in the evenings of all the cooler months, each youth having two lessons a week, of two hours each. These youths, who serve from the age of sixteen to twenty-one years, inclusive, are also divided into day classes for instruction in mathematics, each apprentice having one recitation a week of one hour and a half, for which he is expected to prepare in his evenings at home. Attendance on all these classes is compulsory, though for the day recitations they are paid as if working in the shop. This instruction has resulted in such good that applications for the positions of apprentices have been made more frequently and by a better class of boys.

There are other cylinder press manufactories in this country, the most conspicuous of which are those of A. B. Taylor, Cottrell & Babcock, Potter, and Campbell. These various machines have their distinctive merits, but Hoe's perfecting press has been adopted by most of the leading daily newspaper establishments in America, England, Scotland and Australia. Bullock's perfecting press, by entirely automatic action, will deliver cut sheets, piled, at the rate of 8,000 to 11,000 an hour, and has a folding machine attachment. In the Hoe perfecting machine the rolled up sheet is between four and five miles long or equal to about 10,000 newspapers. A counter is attached which shows the number of sheets printed. The Walter machine, with which the London Times and the New York Times are now printed, give about 11,000 perfected sheets in an hour.

With the aid of the powerful printing press (which has been amazingly
strengthened by inventions within the last fifty years), education, in our country, has made wonderful progress during the present century. The best printing press, as we have seen, fifty years ago, would make only 250 impressions in an hour, on one side of a sheet of paper; now a single press of Hoe's manufacture can make from 15,000 to 20,000 impressions on both sides of the paper, in the same length of time. Even so early as the beginning of this century the newspaper press of our country began to exert much influence in favor of popular education, by a general diffusion of information which created a thirst for more learning. This led to schemes for popular education, the results of which were salutary.

Most of the earlier organized States of our Union made provision, either in their respective constitutions or in statute laws, for common schools; and those which have since entered the Union have all made such provision. The absolute necessity for popular education has been felt from the beginning, when it was perceived that every voter was to be a sovereign of the new nation; but until a comparatively recent period, teaching was not regarded as an art or a science. Even yet it is held in too light esteem.

Training schools for teachers were unknown in our country before the close of the last century, and very few minds seem to have contemplated the importance of such institutions. The earliest suggestion of making more provision for the specific professional training of teachers, seems to have been that of Elisha Ticknor, in the pages of the Massachusetts Magazine for June, 1789. The suggestion involved the idea of the Teachers' Institutes and Normal Schools of our day, which were not then dreamed of. It was ten or eleven years later when a society, having in its general aims a relation to these modern institutions, was organized, with the title of the "Middlesex County Association for the Improvement of Common Schools," which was formed at Middletown, Connecticut, in 1799. It was composed largely of teachers, who compared notes, discussed methods, dwelt upon the dignity of their calling (for they felt it), and adopted measures for asserting that dignity by elevating the character of the schools of which they were teachers.

In 1811, Albert and John W. Picket, brothers, who were earnest in promoting the growth and efficiency of common schools, were active in forming the "Incorporated Society of Teachers," in the city of New York. Albert was president of the Society, and John was secretary. In 1816, Denniston Olmstead, in an oration at receiving his Master's degree at Yale College, proposed a State institution for the training of teachers for the State public schools—the ideal of the Normal School.

In the spring of 1823, Rev. S. R. Hill opened at Concord, Vermont, the first teachers' seminary in the United States. It was very unpretending, and only aimed at the improvement of the teachers in and near his own
A year or two later, various pamphlets were issued, urging the necessity and the advantages of the establishment of institutions for the training of teachers. This was followed, early in 1826, by the appointment of a committee by the legislature of Massachusetts to report a plan for a State institution for the instruction of young men in practical arts and sciences. The committee reported favorably, and in their plan was a department for the professional training of teachers. Nothing more was done.

The following year (1827), Governor Clinton, of New York, recommended to the legislature the establishment of a normal school, and an act was passed for that object, but never went into operation. In August, 1830, the "Essex County (Massachusetts) Teachers' Association" was established, and, I believe, is still in existence; and the next year, the brothers Pickett, with Samuel Lewis, were very active in forming the "Western College of Teachers," in Ohio.

These efforts were cotemporaneous with the founding of the "American Institute of Instruction," by teachers and friends of education, who met in Boston in the spring of 1830. The object was to form a "permanent association of persons engaged and interested in the business of instruction." It was incorporated by the legislature of Massachusetts in 1831. It gave a powerful impetus in the direction of improvements in the common school system of our country; and conventions for the same purpose were held in various places. Already other conventions had consulted upon means of improvement of schools and teachers. The "Pennsylvania Society for the Promotion of Common Schools" was founded in 1828; and there was a convention of the teachers of New York, at Utica, in 1832.

These movements led to the formation of societies known as State Teachers' Associations. The Massachusetts "State Teachers' Association," and the "Rhode Island Institute of Instruction" were organized in 1845. These were followed in 1847, by the establishment of the "Ohio State Teachers' Association." These were the seeds of a bountiful crop of similar institutions; and now, in some of the States, many of the counties have each a Teachers' Institute.

Normal schools for the training of teachers now exist in nearly if not quite all of the States in our Union. In 1873, there were 119 of these institutions, having an aggregate of over 16,000 pupils, who were preparing for service in the great and increasing army of teachers of elementary education to the young. The usefulness of these institutions, in this regard, may not be estimated.

Munificent provisions have also been made in the several States and Territories, by public authorities or by individuals, for the education of the young in schools of a lower grade than colleges and universities. We are largely provided with implements for secondary instruction, in the form of
academies, seminaries, high schools and grammar schools. There were in
the United States, in 1873, no less than 1,057 of these institutions. Of this
number, 187 were exclusively for boys; 234 were exclusively for girls; and
636 were mixed. There were also 93 preparatory schools, including schools
for secondary instruction having preparatory departments.

More important than all the Colleges and academic schools in our coun-
try, are the Common Schools, for the maintenance of which every State and
Territory of the Union has made provision. They are the nurseries of the
national strength, next to the virtuous family circle. They form the stomach
in which the foreign elements of society so largely imbibed through the
medium of immigration are digested, and become a healthful part of the
body politic—American citizens. To the public schools of our land we are
indebted for a large portion of the healthy social and political life of the
nation; and if we shall cherish them, and stimulate their growth, posterity
will be blessed by them more than we.

According to the reports made from the several States, to the United
States Commissioner of Education, in 1873, the aggregate school population
of the States and Territories was about 13,350,000. It is probably a little
more, for the reports were often defective. Of the school population, about
6,000,000 were enrolled on the records of the public schools; and there was
an average attendance of about sixty per cent. of that number, some more
and some less in the different States and Territories. It is safe to assume
that the average attendance at the public schools in the Republic now, is
3,500,000. The number of schools upon Indian reservations, in 1873, was
285, with a little more than 9,000 pupils, about one-half of whom were girls.
These employed 357 teachers, and occupied 167 school-houses. The number
of Indian children who had learned to read and write during that year, was a
little more than 1,000. The whole number of Indians in the United States,
is estimated at 295,000. As civilization shall spread among the tribes, there
will be needed a much larger number of teachers.

There are schools for special instruction, in our country, such as Sunday
schools, generally carried on by the various religious denominations; also
schools for the instruction of deaf mutes and the blind; schools of science,
of theology, of medicine, of pharmacy, and of dentistry; industrial schools
and commercial and business schools.

Sabbath schools are found in every part of our country wherever a church
is organized, and in many instances where no church exists; and the amount
of good which they have performed and are performing is incalculable. As
a rule, the teaching in Sunday schools, among Protestants, is entirely unsec-
tarian—the exposition and elucidation of the Scriptures being the chief aim.

Martin Luther established Sabbath schools in Wittenburg as early as
1527, for the instruction of children who could not attend day schools.
John Knox introduced them into Scotland in 1560; and in 1580 Archbishop Borromeo, of Milan, established a system of Sunday schools throughout his diocese. Some of the clergy in England, in the 17th century, statedly catechised the children on Sunday; and at the same time a similar system was carried on in the Netherlands. Joseph Alleine opened a Sunday school in England in 1668.

A Sunday school was established at Roxbury, Massachusetts, as early as 1674, and another was opened at Plymouth six years afterward. Ludwig Hacker opened a Sunday school at Ephrata, in Pennsylvania, about the year 1740; but Sunday schools upon the general plan now pursued, first appeared in our country since the Revolution. They were unknown here and in Europe a hundred years ago. The first one of the kind in England seems to have been established by Robert Raikes, at Gloucester, in 1781, and he gave feminine teachers an English shilling a day for their instruction a few hours on a Sunday. The system rapidly spread throughout the United Kingdom.

Bishop Asbury of the Methodist church, was the first who established a Sunday school in the United States. He opened one in Hanover County, Virginia, in 1786. The same denomination, at a conference held in Charleston, South Carolina, in 1790, resolved to establish Sunday schools for white and colored people.

Bishop White introduced the institution into Pennsylvania in 1791; and the first Sunday school in New York was begun by a pious colored woman, named Katy Ferguson, in 1793. In 1797 Samuel Slater opened a Sunday school in Pawtucket, Rhode Island; and the benevolent Isabella Graham established one in a private house in New York in 1801. After that the system rapidly spread among Protestant churches. Finally the Roman Catholics adopted it; and within a few years past the Friends or Quakers have opened "First Day" schools in their meeting houses.

The number of Sunday schools in the United States, at the beginning of 1876 was about 70,000, with nearly 753,500 teachers, and about 6,000,000 scholars. The other special schools, excepting commercial or business institutions, will be considered elsewhere.

Commercial or business colleges, as they are generally called, are now very numerous in the United States and are rapidly increasing. They are of very recent origin, as independent seminaries of instruction, the first one established being that of Comer's Commercial College, in Boston, founded in 1840. Their more rapid increase has been since 1870. In that year there were twenty-six of these institutions in the United States, with 5,824 students; in 1874 they numbered 126, with 577 tutors and 25,892 scholars. Of this number, 2,867 were of the gentler sex.

The Eastman National Business College, at Poughkeepsie, New York, is
not only the pioneer among these institutions, in teaching actual business, but is a model. Dr. Eastman first opened a commercial school at Oswego, New York, in 1855. Previous to that time only Penmanship, Arithmetic and the theory of Book-keeping were taught in commercial schools. He introduced with theory, actual business operations, teaching the students practical knowledge in buying and selling according to the fundamental principles of trade.

In the College at Poughkeepsie, which was founded in 1858, the student not only learns the theory of business of every kind, but is actually engaged in the practical operations of a merchant, a banker, a trader, an accountant, and a book-keeper, using real merchandise, and specie, bank-notes and fractional currency, in as legitimate a way, as if he were a member of a mercantile or business house. Each day’s business is based upon quotations in the New York market, whether it be stocks, merchandise or produce.

Dr. Eastman opened his College in Poughkeepsie, in a small room, with only three students. They numbered sixteen the second week. At the end of three years they had expanded to 500; and in 1863, to 1,200. The next year the College register, at one time, showed a regular daily attendance of over 1,700 students. Then it had more than 60 teachers, and occupied five distinct buildings, two of them abandoned church edifices. The city swarmed with young men. They filled the churches and Sabbath schools, and crowded the boarding-houses. The College reaped a harvest, but the people of the city a greater one.

The rules and regulations of the Eastman Business College are calculated to insure order, and a high moral tone. The students are generally earnest young men seeking practical business knowledge. Its graduates, now numbering about 23,000, fill many places of trust in our land, and many others have become leaders in commercial circles. These commercial and business colleges are real blessings, and may lend powerful aid in building up the commercial prosperity of our country.
CHAPTER XLI.

We have remarked that the education of girls was neglected in our country a hundred years ago. Indeed, until a comparatively recent period, only trifling provision was made for their instruction. They were permitted to attend the common schools, but the prevailing opinion was that girls did not need much "book-learning," skill in needle-work and house-keeping being more important.

The Moravians had a more exalted idea of the importance of education for women, and they established the first eminent school in this country, for girls, at Bethlehem, Pennsylvania. The Moravian Seminary, at that place, was organized in 1749, but it was not opened as a boarding school before 1785. Its high character attracted pupils from various parts of our Union, and from many families outside of that denomination; and its excellence and popularity are still maintained.

In his famous school at Greenfield, Connecticut, Rev. Timothy Dwight was the first, it is claimed, who admitted girls to an entire equality with boys in intellectual training. In 1792, a school for the academic education of girls was opened at Litchfield, Connecticut, by Miss Prime; and Rev. William Woodbridge taught a school for young women at Norwich, Connecticut, as early as 1797.

In 1816, Mrs. Emma Willard began her famous Troy Female Seminary, which exerted a powerful influence in favor of the higher education of girls; and it was chiefly through her exertions that the Legislature of the State of New York was brought to acknowledge the importance of such education for the gentler sex, by providing aid for such seminaries from the literature fund of the State, on equal terms with academies. Other seminaries of the kind gradually appeared, and now they are abundant.

In 1873, there were, in the United States, 223 institutions for the superior instruction of women, a large proportion of them being, like the colleges, denominational schools. Many of them possess libraries containing 1,000 volumes and upwards. The Oakland Female Institute, at Norristown, Pennsylvania, has a library of 11,000 volumes; that of the Brooklyn Heights Seminary for Young Ladies, has 10,000 volumes; Mount Holyoke Female Seminary has 8,700 volumes in its library; those of College Temple, at Newnan, Georgia, and the Cincinnati Young Ladies' Seminary have 5,000
volumes each. The Moravian Young Ladies' Seminary, at Bethlehem, Pennsylvania, contains a library of 4,700 volumes.

It was not until the year 1861, that a College for Women, equal in its organization, equipment and privileges to any for men, appeared on the face of the earth. In that year, Matthew Vassar, a resident of Poughkeepsie, on the Hudson river, gave of his fortune, the sum of $408,000, for the founding of such a college. The idea had been suggested to Mr. Vassar, several years before, by his niece, Miss Lydia Booth, who was the accomplished principal of a young ladies' seminary.

Mr. Vassar was a native of England, and was brought to this country when he was a little child. His parents settled in Poughkeepsie, at the beginning of the present century, where, about the year 1812, Matthew began the business of an ale-brewer. He became a successful master of the business, and by it he accumulated a large fortune. Being childless and of a benevolent disposition, he began to consider, as old age approached, how he might dispose of the bulk of that fortune for the good of his fellow-creatures. The suggestion of his niece took deep root in his mind. It grew, and finally resulted, by the aid of others, in the adoption of a plan for the founding of a College for Women on a magnificent scale.

By an act of the Legislature of New York, passed January 16, 1861, the following persons were constituted a body corporate, by the title of "Vassar Female College: ". Matthew Vassar, Ira Harris, William Kelly, James Harper, Martin B. Anderson, John Thompson, Edward Lathrop, Charles W. Swift, Elias L. Magoon, Stephen M. Buckingham, Milo P. Jewett, Nathan Bishop, Matthew Vassar, jr., Benson J. Lossing, Ezekiel G. Robinson, Samuel F. B. Morse, Samuel S. Constant, John Guy Vassar, William Hague, Rufus Babcock, Cornelius Du Bois, John H. Raymond, Morgan L. Smith, Cyrus Swan, George W. Sterling, George T. Pierce, Smith Sheldon, Joseph C. Doughty and Augustus L. Allen. By a subsequent legislative act, the word " Female" was dropped from the title, and the corporation became known as " Vassar College." The twenty-nine corporators were all personal friends of Mr. Vassar, and as his life-long religious associations had been with the Baptists, a majority of these friends, some of them clergymen, and others eminent educators, were of that denomination. But there has never appeared a shade of sectarianism in the management of the institution.

The Board of Trustees were organized on the 26th of February, 1861, at which time Mr. Vassar surrendered into their hands, absolutely, $408,000. During the whole of the Civil War which had then just broken out, the work of erecting and furnishing the college buildings went steadily on. A few weeks after the close of that war, in 1865, the Faculty were chosen; and in September following, the institution was opened for the reception of pupils, when nearly 350 entered.
The faculty was composed of John H. Raymond, LL.D., President, and Professor of Mental and Moral Philosophy; Hannah W. Lyman, Lady Principal; William I. Knapp, A.M., Professor of Languages; Charles S. Farrar, A.M., Professor of Mathematics, Natural Philosophy and Chemistry; Sanborn Tenney, A.M., Professor of Natural History, including Geology and Mineralogy, Botany, Zoology, and Physical Geography; Maria Mitchell, Professor of Astronomy, and Director of the Observatory; Alida C. Avery, M.D., Professor of Physiology and Hygiene, and Resident Physician; Henry B. Buckham, A.M., Professor of Rhetoric, Belles-Lettres and the English Language; Edward Weibé, Professor of Vocal and Instrumental Music, and Henry Van Ingen, Professor of Drawing and Painting.

Mr. Vassar purchased and presented to the college, in 1864, at a cost of $20,000, a collection of paintings in oil and water-colors, with an Art Library of rare excellence, containing about 800 volumes. The College was also furnished with cabinets and apparatus of the best kind known, for the use of the various departments, and a library of several hundred volumes. So manned and equipped, Vassar College, the pioneer of such institutions for the education of women, started on its bounding career. It has been successful from the beginning; and the Founder lived to enjoy the knowledge, that his dream of being a real benefactor, was already fulfilled. He died in June, 1868, leaving by a provision in his will, a large amount as an endowment for the college.

Mr. Vassar appropriated for the latter purpose $50,000 as a "Lecture Fund" for employing, with the income, distinguished persons, not officers of the College, to deliver lectures before the students. Also $50,000 as an "Auxiliary Fund" for aiding students who are of superior promise, but unable to defray the full expense of their education, to an extent not exceeding in any case, one half the regular charge for board and tuition. Also $50,000 as a "Library, Art, and Cabinet Fund" for the enlargement of the Library, Art Gallery and Cabinets; and $125,000 as a "Repair Fund," to meet the expenses of necessary repairs and additions to the buildings and other college property. The gifts of the founder to the college amount, in the aggregate to about $778,000.

The only other important donations to the college have been a valuable collection of North American birds, by the late J. P. Giraud, a friend and companion of Audubon; and a permanent scholarship secured by an investment of $6,000 by Alanson J. Fox.

The college buildings are six in number. The main edifice is about 500 feet in length, with a breadth through the centre of about 200 feet, and at the transverse wings of 164 feet. The centre of the building and the wings are four stories in height. Within this building are five dwellings for resident
officers; also class-rooms, dining-rooms, chapel, library, reading-room, infirmary, dormitories and kitchen.

The Observatory stands some distance from the main building and is well equipped with excellent astronomical instruments. So, also, are the laboratories well supplied with philosophical instruments. A Museum and Gymnasium edifice, a Laundry, a building wherein gas and heat are generated for the lighting and warming of nearly all the apartments in the various structures, and a stately gate-house and porter's lodge complete the group.

In the Museum building where the works of art and the geological and mineralogical cabinets are kept, instruction is given in drawing and painting, natural history and music. Many additions have been made to the art gallery, such as statuary, autotypes, photographs, et cetera. The Library now contains 9,622 volumes, and is continually increasing.

In the various buildings of the College are daily employed an average of 550 persons. These are students, officers of instruction, business officers and servants. The buildings are upon the "College Farm" of 200 acres. Around them the grounds are tastefully laid out and planted with evergreen and deciduous trees and shrubbery. There is also a very extensive flower-garden cultivated by the pupils, and a large vegetable garden. On the premises is a beautiful little lake of pure spring water, with which the college is bountifully supplied, and which furnishes a place for boating in summer and skating in winter.

The supreme legislative authority is vested in the Board of Trustees, who fill vacancies in that body. The executive head is the President, and the lady principal is the chief executive aid of the President, and immediate head of the college family. While speculative theology and sectarianism are discomfited in this institution, the principles of vital religion and the highest morality are continually inculcated by precept and example. The curriculum of studies in this institution is equal in breadth to any college in our land; and honorary degrees are conferred.

Besides the Gymnasium, ample provision is made for out-of-door bodily exercise on the College grounds; and the resident physician and the steward labor in accord for the preservation of the health of the students. The vital statistics of Vassar College show that it is one of the healthiest, if not absolutely the healthiest institution of learning in the world. Careful physical training and strict attention to diet are among the leading duties performed in the institution.

Educators from abroad have pronounced Vassar College a model institution in all its departments; and the editors of foreign journals of education call the attention of their readers to it. Other colleges for women have since been established in our country by the generosity of wealthy men, and others will speedily follow, so that the young women of the land—the future
mothers of the sovereigns of the United States,—may be as well instructed as the young men. The mother, especially, moulds the general character of the man.

For the purpose of gathering information from every part of our country and from foreign lands respecting the condition of seminaries of learning—their plans of government and their methods of instruction—so as to diffuse among the people correct ideas concerning the value of education as "a quickener of intellectual activities; as a moral renovator; as a multiplier of industry, and a consequent producer of wealth; and, finally as a strength and shield of civil liberty," our government established a Bureau of Education, in 1867, as a part of the machinery of the Department of the Interior. Henry Barnard, LL.D., was made the first incumbent of the office of Commissioner of Education, but, finding less Congressional aid than he expected, withdrew, and was succeeded by the present Commissioner, John Eaton. The prodigious amount of valuable labor which Colonel Eaton has performed, may be seen in his annual reports, rich with school statistics, which cover about 900 pages each; also the occasional issue of a pamphlet containing special information. These special reports are now between thirty and forty in number, upon interesting topics, such as historical summaries and reports on the subject of systems of public instruction in foreign countries; the relations of education to labor; vital statistics of colleges, et cetera, and other information important to be known concerning the dissemination of learning and its intrinsic value.

The Newspaper is a most useful educator of the people. The illustrated newspaper is especially so, for pictures are the literature of the unlearned.

News were first printed in England in the form of doggerel ballads, in the reign of Queen Mary. Then occasional broadsides appeared, containing intelligence of some special events; and in 1622, appeared the Weekly Newes from Italy, Germanie, et cetera. Soon after that similar publications appeared in great numbers between the accession of Charles the First and his son Charles the Second, some of them published semi-weekly and tri-weekly. As early as 1642, or early in the civil war, the people were so eager to hear the news, that a daily newspaper called Diurnal Occurrences, appeared in London, in which the proceedings in parliament were regularly reported. The contending armies each carried a printer with it to publish exaggerated reports of their respective doings.

The genesis of the newspaper has been concisely given by a late writer as follows: "First we have the written news-letter furnished for the wealthy aristocracy; then as the craving for information spread, the ballad of news sung or recited; then the news pamphlet, more prosaically arranged; then the periodical sheet of news, and lastly the newspaper."

A hundred years ago the newspaper was a luxury in this country; now
it is a necessity. Then it was seen by only a few persons, outside of cities and large towns; now it is seen and perused everywhere. A hundred years ago there were only thirty-seven newspapers in the whole English-American colonies. Each of them was published weekly or semi-weekly. The aggregate circulation of all did not exceed, probably, 4,000 a week. In 1870 there were published in the United States 5,871 newspapers with a circulation of 20,842,475 daily or weekly, and a yearly issue of 1,508,548,250 copies.

Of the whole number of newspapers printed in the colonies, in 1776, one was issued in New Hampshire, seven in Massachusetts, two in Rhode Island, four in Connecticut, four in New York, nine in Pennsylvania, one in Delaware (issued in 1761, and lived only six months), two in Maryland, two in Virginia, two in North Carolina, three in South Carolina and one in Georgia.

There are four newspapers yet alive whose existence began before the Revolution. These are the Newport Mercury, Maryland Gazette, Massachusetts Spy (now Worcester Spy) and Courant, published in Hartford, Connecticut.

The first newspaper published in America was issued at Boston in September, 1690, and called Publick Occurrences. It lived but a day. The sheet was so radically democratic and outspoken that the government smothered it on the day of its birth. The first permanent newspaper established here was the Boston News Letter, issued in April, 1704.

The first newspaper issued in Pennsylvania was The American Weekly Mercury, published in Philadelphia in 1719; the first in New York was The New York Gazette, in 1725; and the first in Maryland was The Maryland Gazette, issued at Annapolis in 1728. The South Carolina Gazette, printed at Charleston in 1732, was the first newspaper issued south of the Potomac. The first one printed in Rhode Island was The Rhode Island Gazette, printed at Newport, in 1732, and The Virginia Gazette, the first in that province, was printed at Williamsburg in 1736. The first in Connecticut was The Connecticut Gazette, printed at New Haven in 1735; and The North Carolina Gazette, printed at New Berne in the same year, was the first one issued in North Carolina. The New Hampshire Gazette, published at Portsmouth in the summer of 1756, was the first newspaper printed in that province. In 1761 the Wilmington Courant was printed at Wilmington, Delaware. These were all weeklies. The first daily newspaper in the United States was The Pennsylvania Packet or the General Advertiser, published at Philadelphia. It was established before the Revolution, by John Dunlap, but was not issued daily until 1784, when its name was changed to Daily Advertiser.

In the year 1800, the number of newspapers in the United States had increased to 200, of which several were dailies. From that date to 1810, the number and circulation of newspapers very largely increased. At that time they numbered 359, of which 27 were dailies, and their total annual issue was over 22,000,000 copies. In 1824, there were 11 daily newspapers in Philadel-
Philadelphia, and 12 in New York, with a circulation of 1,000 to 4,000 each. Now, a single newspaper in Philadelphia (The Public Ledger), has a daily circulation of about 93,000.

During the last quarter of a century, the number and circulation of newspapers have very greatly increased. In 1850, their number was 2,526, and their annual issue was 426,410,000 copies; in 1875, their number was 6,793, and their annual issues were about 2,000,000,000 copies. Of these newspapers 724 were dailies, and 5,869 were weeklies. About one-seventh of the daily papers issue tri-weekly or semi-weekly editions.

In 1833, the first of the cheap newspapers which became the great daily vehicles of news and general information to the masses of the people in cities, was issued in New York, by Benjamin H. Day, and was called The Sun. It immediately acquired an enormous circulation, its price being only one cent. It was less than a foot square. In 1837, it was enlarged, and the price raised to two cents a copy.

This enterprise radically changed the character of the newspaper press. It stimulated publishers to the adoption of great improvements. The New York Herald, established in 1835, at one cent, showed such vigor in its management, and especially in its gathering of shipping and other intelligence, that a new era in journalism then dawned. At length, when the telegraph became a reliable and important vehicle of news, arrangements were made for its use as such, in the most economical way, and in 1849, several of the New York city newspapers combined in forming the “New York Associated Press,” by which all would be furnished with the same news, simultaneously. Other like associations have since been organized; and the rural newspapers as well as some city papers, buy their news of the “Associated Press.”

For about twenty-five or thirty years, illustrated weekly newspapers have been published in our country. Some were short-lived, and others continue. Among the latter, the leading ones are Harper’s Weekly and Frank Leslie’s Illustrated Newspaper, each of which has an enormous circulation, and employ scores of artists in their production.

There are many flourishing newspapers published under the auspices of the various religious denominations. The first of this class was The Boston Recorder, founded in 1815. There are also many newspapers published in our country in foreign languages. Of these, 110 are in German; 16 in Spanish; 6 in Dutch; 2 in Italian; 4 in Welsh; 5 in Bohemian; 2 in Polish; and one each in the Swedish, Portuguese, Chinese and Cherokee languages.

The colonial newspapers, particularly the earlier ones, were very insignificant affairs, in size and contents. The Boston News-Letter was sometimes printed on a single sheet foolscap size (and more often on a half-sheet) with two columns on each side. It contained foreign news, which occupied about three-fourths of the paper, and the domestic news, which would fill not more
than half a column of a New York or Philadelphia newspaper now, occupied
the remainder. There were no advertisements; no notices of marriages were
given, and only one or two deaths were recorded at a time.

The first effort at newspaper-reporting in this country, seems to have been
made by the News-Letter. That was in 1704. Six pirates were executed
near Boston, and the "exhortations to the malefactors," and the prayer by
the officiating clergyman after the pirates were on the scaffold, were given
"as near as could be taken in writing, in the great crowd." Stenography
was then unknown. This report filled nearly one-half of the paper.

When newspapers began to comment on local public affairs, they excited
the fears and the jealousy of the crown officers, for their utterances were
generally in a democratic tone. The little American Weekly Mercury, estab-
lished by Andrew Bradford, in Philadelphia, had trouble with the authorities
there, for the crown officers were prone to construe the most harmless
expressions as seditious. On one occasion in 1721, the Mercury published the
following paragraph:

"Our General Assembly are now sitting, and we have great expectations
from them, at this juncture, that they will find some effectual remedy to
revive the dying credit of this Province, and restore us to our former happy
circumstances."

This gentle insinuation that the authorities had been remiss in duty,
caused the editor and publisher to be arraigned before the Provincial Counci-
Bradford got off with a reprimand, after declaring that the paragraph
was written and inserted by a journeyman, without his knowledge, and that
he regretted it. He was warned never to publish anything more in relation
to the affairs of any of the colonies. There was then no freedom of the
press there.

That freedom was nobly vindicated when, in 1734, John Peter Zenger,
the publisher of a newspaper in New York, warmly commented upon the
conduct of the avaricious royal governor. Zenger was arrested and thrown
into prison, on a charge of libeling the government. His papers, containing
the offensive articles, were publicly burned by the common hangman, and
the poor printer was in a very strait place. So early as at that period, there
was an association of democrats in New York, known as the "Sons of
Liberty." They espoused Zenger's cause, and the great mass of the people
sympathized with the victim.

The case excited much interest throughout the colonies, for the liberty
of the press and the freedom of speech were on trial as well as Zenger.
When he was arraigned before the chief-justice of the Province, the venera-
ble Andrew Hamilton, of Philadelphia, a leading jurist of the day, appeared
as Zenger's counsel. So earnest was his plea in favor of liberty of speech,
and so logical withal, that the jury, after brief consultation, acquitted Zen-
The verdict was a popular triumph. The people shouted, in token of their joy and gratitude, and they carried Hamilton out of the court-room on their shoulders.

The Corporation of the City of New York presented the able advocate of right and justice the freedom of the city in a gold box; and this brave man who generously performed the duty "without fee or reward," was hailed as a public benefactor. The dignity and freedom of the press were vindicated; and from that time until the kindling of the old war for independence the newspapers of the colonies were far more outspoken than before. They became, in a degree, the tribunes of the people, and the organs of public sentiment.

The newspaper has become a vast power in this country and disputes for the prize of usefulness and influence with practitioners in all the learned professions. Being perfectly unshackled while it keeps within the pale of the law, it speaks out its praises and its censures boldly; and it stands at the portals of our free institutions, as the guardian of the precious treasures within. It is the watchman that warns the people against corruption in high places, and it is a terror to evil doers. It creates and governs public opinion in a large degree; and it diffuses information of every kind, from the news of a slight accident or a petty theft in a neighborhood, to a report of the most eloquent oration, persuasive sermon or erudite lecture, or the doings of armies, of senates and cabinets in every part of the globe. It puts on record what the telegraph tells us of events here and there and everywhere; and it discusses the most subtle problems of science, metaphysics, ethics and theology. In a word it is a teacher whose school is boundless; a preacher whose parish is limitless. How wonderfully the newspaper of to-day shows progress in our country in the space of one hundred years!

We have observed the pettiness of the newspapers of colonial times; let us bring in contrast the greatness of one of the leading newspapers of our day, the Public Ledger of Philadelphia. The first number of this newspaper appeared on Friday, the 25th of March, 1836—forty years ago. The chief editor was Russell Jarvis, a short, dark complexioned and pugnacious man, who lived in New York and edited the daily Public Ledger for fifteen years at a distance of ninety miles from the place of its publication.

The editor foreshadowed its policy and course in that first number. He declared that "the common good" was its object, and in seeking that it would have special regard to "the moral and intellectual improvement of the laboring classes." It declared that it would not give place to religious discussions nor to political ones of a partisan character. "The Ledger will worship no men and be devoted to no parties," said the salutatory. "While this paper shall worship no men," it continued, "it shall vituperate none. It will be fearless and independent, applauding virtue and reproving vice.
wherever found, unawed by station, uninfluenced by wealth." That was an exalted view of the true mission of a newspaper; and in general accordance with it has been the career of the Ledger during the forty years of its existence.

The sharpness with which the Ledger attacked public abuses and exposed shams and wickedness excited the fears and anger of wrong-doers, who tried to crush it; and it was called, even by some of the respectable daily papers, a "virulent little sheet." But it went steadily forward in the prescribed path of duty. The public sustained it; and so large was its circulation at the end of six months that a power-press was needed to print it. The Daily Transcript, another "penny paper," was combined with it, and Mr. Drane, its publisher, has been connected with the Ledger ever since. In the spring of 1837, a weekly edition was published. More spacious apartments were occupied and a double-cylinder "pony" press was purchased. Ten years from that time (April, 1847) the first rotary press built by R. Hoe & Company was first set up in the office of the Public Ledger.

From the beginning the course of the Ledger was approved. It survived many "penny papers" which its known success had tempted other men to establish, and it has become an "institution" in Philadelphia and a power in the land. Because of the increase in the cost of white paper during the Civil War, it was published at a loss, and the proprietors not being able to agree upon advancing the price above one cent, and also the charges for advertisements, resolved to sell the entire establishment. This they did, on the 3d of December, 1864, to George W. Childs, a popular book publisher of Philadelphia, and under his management it has become more prosperous than ever.

Mr. Childs possesses a rare combination of qualities for the general supervision of a high-toned public journal, and these qualities are manifested in the Ledger itself. He is thoroughly honest and sincere in all his acts and aims; fearless in doing right; unswerving in fidelity to his moral convictions; impartial in his dealings with men, institutions and principles; with forecast that savors of inspiration and which makes him bold in business operations; with good judgment and calmness of temper; generous in the management of his affairs and in society, and is fully alive to the importance of his position as the publisher of a newspaper that daily makes deep impressions upon the minds and hearts of tens of thousands of his fellow-citizens who have learned to trust its utterances as the teachings of a wise oracle. Mr. Childs has been ably assisted in his labors by the judicious counsels of William V. McKean, a thoroughly cultivated gentleman of sound judgment and keen sagacity, and a racy, vigorous and judicious writer who, as chief editor, has stood at the head of the literary management of the Ledger from the time it became the property of the present owner.
Pluck and perseverance are conspicuous traits in the character of Mr. Childs. It is related that when he was eighteen or twenty years of age he hired a store in the old Ledger building for the sale of periodical literature. One day he said to Mr. Swain, the rich proprietor, "I have made up my mind to own the Ledger one of these days." "Have you?" said Mr. Swain. "Well, well, my young friend you will be an old man before you accomplish that, I guess." Many years afterward, when it was known that the Ledger was for sale, Mr. Childs, then a successful bookseller and publisher, called on Mr. Swain and said, "Do you recollect the threat I made, and which you laughed at sixteen years ago, that I intended, some day, to be proprietor of the Ledger?" "Why yes," answered Mr. Swain. "I recollect a chubby little fellow hiring an office of me, and boasting that he would own the Ledger, and me too, I suppose he would have added, if I hadn't pooh-pohed the conceit out of him." "Then you thought you did that? but you are mistaken. It has remained in my head ever since, and I have made it my special business to call upon you to-day to carry out my purpose if I can. If I cannot now I'll wait, I am yet young. But I want the Ledger and I will give—" "Stop, stop," interrupted Swain; "you are too fast, what am I to do? It takes two, at least, to make a bargain. Let us see—"

The result was, Mr. Childs bought the Ledger; boldly tried the experiment which Mr. Swain had not the courage to do, in advancing the subscription price of the paper from one cent to two cents, and advertisements in proportion, and triumphed. He infused new energy into the old establishment. He discarded all advertisements (worth from $12,000 to $15,000 a year) such as too frequently taint the columns of public journals; and nothing ever appears in the Ledger that the most careful father would hesitate to read aloud to his daughter. The consequence is the Public Ledger is, to-day, the acknowledged model newspaper of our country.

The newspaper establishment a hundred years ago usually occupied some dingy basement room or small garret, dimly lighted by little windows in the daytime and a tallow candle at night. It was furnished with a single "stand" containing a few small fonts of type; a Ramage press with two inking balls; two or three "sticks" for setting up the type; two or three "galleys" on which to make up the columns; a smoothed plank for an "imposing stone;" two or three "chases" in which to lock up "forms;" a few rules, ornaments, quoins and a mallet. In one corner of the room might be seen a deal table and a splint-bottomed chair for the use of the editor, who was generally the proprietor, and in his person composed the entire "staff," editorial, reportorial and mechanical, of the establishment. He was his own compositor, printer, distributor of the paper and book-keeper, and carried on the whole business with the aid, sometimes, of a boy.

The Public Ledger establishment to-day, presents a contrast to this
picture. It occupies a greater portion of a building made of iron and brown freestone, on the corner of Chestnut and Sixth streets, Philadelphia, which was completed for Mr. Childs in 1867, at a cost of about half a million dollars. It has a front on Chestnut street of 84 feet, and on Sixth street of 165 feet. It is five stories in height with a Mansard roof surmounted by a magnificent central dome, from which rises a flag-staff sixty feet in height above the roof, where it terminates in a lightning rod, the points of which are 150 feet above the side-walk. The vane represents a pen six feet in length. Mr. Childs’s ensign armorial is a broken sword crossed by a quill pen, and bearing the words of Richelieu: *The Pen is mightier than the Sword.*

The first story of this great structure is composed of forty-two beautiful wrought iron columns, weighing in the aggregate, 167 tons. In this story are numerous large stores and offices; the remainder is occupied (on the corner) by the publication office of the *Ledger*, which is 23 feet on Chestnut street and 60 feet on Sixth street. On the corner of the exterior, standing upon a stone column, is a statue of Franklin, ten feet six inches in height, wrought from Brunswick stone by Bailey, from a portrait by Duplessis. Carved out of the same light stone, by the same artist, are the Arms of Pennsylvania, seen over the main door-way of the Sixth street front; and at the base of the column that supports the statue of Franklin are two ornate white marble drinking fountains for the public use. Sixty feet above the pavement is an elaborate cornice from which rises the Mansard roof.

The publication office is probably the most superb business apartment in the world. Its joinery is of black walnut and butternut wood; and with these costly materials the sides and ceilings are wainscoted in delicately wrought panels. From the latter are suspended three large chandeliers with numerous gas-burners. The private office of the publisher is in two rooms, divided by plate-glass. They are supplied with carved furniture in the Italian style, and the floors are covered with Wilton carpets of a beautiful blue and gold pattern.

The editorial rooms, occupying 23 feet on Chestnut street, and 65 feet on Sixth street, form a suite of beautifully frescoed apartments, fitted up in drawing-room style. There are four of them, for the accommodation of editors and reporters. The corner room known as The Library, is principally occupied by the managing editor. The walls and ceiling are beautifully frescoed, with light green as a prevailing color; the floor is covered with a rich crimson and gold Wilton carpet, and the chandeliers and other gas-fixtures are bronze. This room connects with the three adjoining editorial rooms, all of which are elegantly furnished with book-cases, newspaper files, tables, secretaries, desks, wardrobes, lounges and chairs. These rooms also, are handsomely frescoed and carpeted.

The composing-room is in the fifth story, under the Mansard roof, which
gives a height of ceiling 21 feet above the floor. That room is 23 by 127 feet in floor dimensions, and is light and very cheerful in aspect. It contains thirty-six double stands of type. At one end of it, railed off, is a place for the accommodation of proof-readers, night editors and reporters. On the third floor is a job-office, with an immense sheet room on the fifth floor. The job-office contains presses and every sort of implement for the business; and it occupies a space, in the form of a letter F, of 5,772 square feet. The various floors are reached by spacious stairways of easy ascent; and there are offices in the building rented for business, other than the three spacious stores.

Adjoining the composing-room is a stereotype foundry, 18 by 35 feet in floor extent, which was constructed with special reference to danger from fire. It is furnished with every improved implement used in the trade; and is connected with the press-room in the basement, by a hoisting apparatus in a well-hole.

The press-room of the Public Ledger is in the basement, and extends under the granite pavement of the street. It is a room 46 feet wide and 126 feet in length, and contains 9,183 square feet of space for the presses, folding machines, boilers, steam-pumps, et cetera. The height of the basement from floor to ceiling, is a little more than 23 feet. The ceiling is supported by 15 immense iron columns weighing 4,289 pounds each. This room is also furnished with a long covered gallery for the accommodation of the carriers. In it, also, is a living spring of pure water in quantity sufficient to supply the daily wants of an edifice double the size of the Ledger building. This water is lifted to the tank on the roof by a Woodward steam-pump capable of sending up 7,000 gallons of water in an hour.

The press-room contains four of Hoe's "Last Fast" rotary presses, equal to 36 cylinders with a capacity of 69,000 impressions an hour. These, and the other machinery of the establishment, are propelled by a sixty-six horse-power Corliss engine, a duplicate of the one sent by the Corliss Company to the Paris Exposition. To relieve carriers of a vast amount of labor, the Ledger printing machines fold the papers. The shafting of the establishment was furnished by William Sellers & Co. (see page 206); and Horstmann and Brother (see page 303) presented to Mr. Childs, when the building was completed, a large and handsome set of colors, consisting of the National, State and City flags. One hundred and ninety flags now decorate the building.

This building contains 64,812 square feet of space, and is lighted by 334 windows, with a total of 2,824 panes of glass. In its construction, about 500,000 pounds of iron were consumed; and about 20,000 square feet of tin (exclusive of slating) were used to cover the flat portion of the roofs alone. Morris, Tasker & Co. (see page 210) furnished 6,500 feet of gas-pipe, and 15,339 feet of tubing for distributing the heat of steam for warming the
building. Some idea of the size of this structure which is mostly used for the publication of a single newspaper in 1876, may be obtained from the fact, that more than 40,000 days’ work were performed in erecting it, and that it takes a journey of more than a mile to pass around the several apartments above the sidewalks.

Many of the newspapers printed in this country one hundred years ago did not contain a dozen advertisements each, from which they may have derived an annual income of $200; the annual income of the Ledger from this source alone, amounts to a very large figure. It has a daily circulation of nearly or quite 93,000 copies. When the great building was completed, representatives of the press throughout the country, and distinguished men in all professions were invited to see it. To them, the proprietor gave a sumptuous banquet at the Continental Hotel, at which sat about 500 guests, Hon. Morton McMichael, of Philadelphia, presiding. Many ladies were entertained at dinner in an adjoining parlor, and after the repast, they entered the great dining-hall, and listened to the speeches in the evening.

It only remains to be said (and it should be said) that Mr. Childs continually evinces a deep concern for the welfare and happiness of those whom he employs. He not only provides for their physical health while in his service, by well-ventilated and lighted apartments, and bath-rooms, but he secures an insurance on their lives for the benefit of their families and has provided a burial-place for them in a delightful rural cemetery, near Philadelphia, when they die. Because of his true manliness in all that pertains to social goodness, the proprietor of the Public Ledger is honored by all men. On the evening of the day when the Centennial Exhibition was opened, Mr. Childs entertained at his house, as his guests, the President of the United States and his wife, and his cabinet ministers and their wives; also the Emperor and Empress of Brazil; foreign ministers, governors, generals, admirals, and a host of representatives of the literature, science, art, the church, and good citizenship of the United States. It was probably, the most brilliant assemblage of dignitaries that ever met in a private house.
CHAPTER XLII.

"Of the making of many books there is no end," said Solomon a thousand years before Christ. The remark will properly apply to our country and to our time, for book-making is a very extensive industry here. It is an old trade—as old as the recorded history of man; but it is only since the discovery of the art of printing that it has assumed its present features. It was doubtless practiced, in a rude way, in pre-historic ages, for books are mentioned among the earlier annals of our race.

Books were originally written upon tablets of stone, lead, and wood, with sharp iron pens. The ten commandments, brought down from Sinai by Moses, were written upon stone. The inner barks of trees, and of reeds like the papyrus (from which comes the name of paper), were used for writing upon; also the leaves of the palm. There is a Bible in the library at Göttingen, containing 5,373 pages written upon palm-leaves, with a sharp iron pen, and a black pigment rubbed into the lines.

The Chinese seem to have been the first who made paper, in modern form, from vegetable fibre. From China the art was introduced, in the seventh century, into Samarcand, once the seat of Asiatic learning and of extensive commerce—the capital of the great empire of Timour, the ambitious conqueror. From that point of contact with the West, the art spread over Europe; and so early as the eleventh century, mills were in operation in Toledo, Spain, for making paper from cotton rags. In France and Germany soon afterward, it was made from the fibre of flax; and France has ever maintained a superiority in the manufacture of the finest paper.

The art of paper-making was practiced in England at the close of the fifteenth century, but not extensively; and for two hundred years afterward, the English people were supplied with paper made in Holland. To the skill and enterprise of a Dutchman from Arnhem, in the Batavian province of Guelderland, famous for its paper manufactures, we are indebted for the introduction of the art within the borders of the Republic. That Dutchman was William Rittinghuysen (Rittenhouse), who, in 1690, in company with William Bradford, the printer in Pennsylvania, and Thomas Tresse, set up a paper-mill on a small tributary of the Wissahickon, in Roxborough, near

Another mill was erected twenty years later on a tributary of the Wissahickon, in Germantown, by a relative, by marriage, of the Rittenhouses. Then one appeared on Chester creek, and another at Elizabethtown, New Jersey, which was owned by Bradford, in 1728. At about that time, the General Court of Massachusetts, for the encouragement of paper-making, granted a patent for ten years, to parties named, for making paper, on the condition that in the first fifteen months they were to make 140 reams of brown paper, and 60 reams of printing-paper; the second year to make 50 reams of printing-paper in addition to the before-mentioned quantity, and the third year were to make 25 reams of superior quality of writing-paper in addition to the quantities before-mentioned. The whole annual product was to be not less than 500 reams. That quantity of printing-paper would now supply one of the rotary perfecting presses for only six or eight hours.

Now a single paper-mill in Massachusetts—that of the Montague Paper Company—manufacture about two tons of printing-paper every twenty-four hours.

A hundred years ago the paper-mills of our country were so few and feeble, that they could not supply the demands of the 37 newspaper presses, and those engaged in making the few books and pamphlets then published. And this dearth continued until some years after the Revolution. One of the largest of these establishments was set up in Troy, New York, in 1793, and produced only from five to ten reams of printing-paper in a day. With the beginning of this century paper-mills more rapidly increased in number and capacity; and in 1810, there were 185 in the United States, which manufactured annually in the aggregate, 50,000 reams of newspaper; 70,000 reams of book paper; 111,000 reams of writing-paper, and 100,000 reams of wrapping-paper. In 1870, there were 663 establishments, employing 17,913 persons (of whom 10,921 were women and girls), to whom $7,250,000 were paid in wages. These establishments employed a capital of $34,265,000, and their total annual products were valued at nearly $49,000,000. The paper-mills of the United States now furnish paper equal in quality to any made in Europe, and they supply the home demand. During the year ending with June, 1875, we imported paper of the value of only a little more than $239,000, and at the same time we exported paper and stationery, valued at $440,233.

A leading establishment for the manufacture of paper in this country is that of the Montague Paper Company, situated at Turner's Falls on the Connecticut river, in Turner's Falls Village, in Montague county, Massachusetts, where the water power is very great and the water pure. There the river is about 1,000 feet wide, and is spanned by a dam with natural rock abutments,
a rock island in the centre, and a rock bottom. The water falls perpendicularly twenty-eight feet; and during the greatest drought known since the dam was built by the Turner's Falls Water Company, there was 30,000 horse-power available for manufacturing purposes.

The Montague Paper Company was projected by Hon. Alvin Crocker, of Fitchburg, Massachusetts, and Edwin Bulkley, of New York city. It was organized in May, 1871, by the election of Mr. Crocker, President, Mr. Bulkley, Treasurer, W. F. Davis, Clerk, and a board of seven directors, of which Messrs. Crocker and Bulkley were members. The capital stock was originally $125,000. The site of the mill was fixed at the head of the canal near the dam of the Turner's Falls Water Company, and their erection was begun in 1871. In May, 1872, they were so far advanced that a seventy-two inch Fourdrinier paper machine was put in operation.

The main building of the works, at first, was 128 feet in length, 55 feet in width, and three stories in height, with a basement. In this building were placed the rag or stock boilers, with the necessary rag-cutting machinery and chemical works, and twelve washing and heating engines with a capacity for producing six tons of rag pulp a day. The wing contains two paper machines, super calenders, and finishing rooms. These buildings were substantially made of stone foundations and brick superstructure.

Previous to the autumn of 1872 news printing paper was made exclusively at this establishment. In September that year the Company began the manufacture of super calendered book paper, and that business was continued with such success that in the spring of 1874, they determined to enlarge their works. They extended the wing of the main building 100 feet in length, 55 feet in width, and three stories in height. In 1875 they purchased the adjoining and extensive works of the Turner's Falls Wood Pulp Company, whose building was 200 feet long, 55 feet wide, and two stories high. It was one of the largest establishments of the kind in this country. In it were thirty-two of the best wood pulp machines, capable of producing six tons of refined wood pulp a day.

After purchasing the wood pulp works, the Company determined to make a further enlargement of their mills. They enlarged the pulp mill by lateral extensions, and adding a story to its height. Now the entire works extend in an unbroken line along the Connecticut river 560 feet, and contain twenty large rag engines, three large Fourdrinier paper machines, twenty wood pulp grinding machines and three other pulp machines; three rotary and three upright stock boilers; six steam-generating boilers of 400 horse-power, and eleven turbine water wheels of 1,995 horse-power.

The Montague Paper Company are now manufacturing about ten tons of printing paper and six tons of refined wood pulp every twenty-four hours. The paper varies in size and quality from that used by the largest daily news-
papers to the finest white and tinted papers for the best periodical and book publications of the country. Their establishment has connection, by a side track running the whole length of these buildings, with the Fitchburg railroad, and so with all the markets of the country. These mills are supplied with abundance of the purest water brought from a spring on the opposite side of the Connecticut river, in a twelve inch pipe, through which flows 3,000 gallons of water a minute. This is believed to be a larger supply of spring water than is obtained by any other mill in the country.

The cost of the Company's works is over $500,000, and their nominal capital now is $290,000. The total value of their annual product is, on an average, about $800,000. Most of the paper manufactured by the Company is sold by Messrs. Rice, Kendall & Company, in Boston. Some of the best paper manufacturers of England have acknowledged that the products of the Montague Paper Company's works are equal to any manufactured in Great Britain or on the Continent. The present officers of the Company are B. H. Farren, President; George E. Marshall, Treasurer, and W. F. Davis, Clerk, with a board of seven directors.

A large amount of paper is now used in our country in the manufacture of paper-hangings for the walls of rooms. These hangings are generally adorned with devices printed in colors, and some of them are very elegant. The introduction of the Fourdrinier paper machine and cylinder printing have so reduced the cost in the manufacture of paper-hangings, that they are now in common use in Europe and the United States. There were fifteen establishments in this country, in 1870, for making paper-hangings, employing nearly 900 persons and a capital of $1,415,000. They gave a product that year valued at $2,166,000. We import paper-hangings to the value of nearly $200,000 a year.

Book-making and book-selling was not an extensive industry in our country a hundred years ago. The demand was limited in proportion to the population. Physical labor was the universal practice among all classes, and the demand for such labor, caused by the necessities of the times, made bodily toil almost incessant. The pecuniary means of the people would not allow them to indulge much in luxuries; and books, excepting the Bible, the New Testament, the Psalter and the Psalm book were regarded as such. There was no public library then, in this country, outside of the colleges, excepting the New York Society Library; and very few persons, even among the wealthiest, had private libraries containing more than two or three hundred volumes.

The books that were generally read here a hundred years ago were mostly written and published in England. Only a small edition of the Bible in the English language, was printed here before the Revolution, and that was disguised by a London imprint. The books consisted mostly of theological
works. A few persons of taste existed in every community, and some of them possessed the works of British authors from the time of Milton down to that of Goldsmith. Bailey's Dictionary might have been seen here and there, and Shakespeare's works were known and appreciated among the cultivated few. Thomson's "Seasons" delighted some families, and Hervey's "Meditations" were very popular. Mrs. Bradstreet had furnished a volume of poems; John Newman had put forth a Scripture Concordance, and the Mathers had published remarkable writings which were read with avidity by educated persons. But down to the decade before the Revolution, when the writings of Jonathan Edwards and Benjamin Franklin had begun to make deep impressions upon cultivated minds, the colonists could not be considered as a "reading community." The pamphleteers of that period, on both sides of the Atlantic, found ready and numerous readers of their essays, for the public were eager for political information.

Stephen Day, as we have seen, was the first printer of a book in the colonies. He was succeeded by Samuel Green and Marmaduke Johnson. Green and his partners printed 93 works between the years 1649 and 1692, inclusive. Of these were the Bible in the Indian language and other books translated into that tongue by John Eliot and others. The other books were mostly theological and controversial, and formed the staple of the reading of the colonists.

Many of the books bearing Green's imprint, were printed for Hezekiah Usher, of Boston, who seems to have been the first regular bookseller in the English-American colonies. He began the business in 1652. Usher was succeeded by his son John, who became rich. Of him, an English bookseller and author, who lived awhile in Boston, wrote: "This Trader makes the best Figure in Boston; he's very Rich, adventures much to Sea; but has got his estate by Book-selling." Mr. Thomas prints a list of 165 booksellers in the English-American colonies between 1640 and the breaking out of our old war for independence. But very few of these would be recognized as booksellers now. The occupation of printer, binder and bookseller, were usually combined. The booksellers then were generally persons engaged in other trades, and very frequently were the sellers of only a single work of their own printing; and a very large proportion of the "books" sold, were pamphlets.

The first Booksellers' Association formed in America, was organized in Boston, in 1724, for the purpose of augmenting the prices of books, but like other associations of the kind, the terms agreed upon were not adhered to by all, and the effort was fruitless.

After the Revolution there was greater mental activity in the United States, and a greater desire for knowledge prevailed. Society had been stirred to its foundations, and activity followed stagnation. Many books
were soon published, some of them reprinted from English editions, and at the close of the last century book-selling as a separate business, began to assume a prominent place among commercial pursuits. School-books, then as now, formed a prominent item in the aggregate sales. Webster's Spelling books and Morse's Geographies started that branch of the business, and it has gone on increasing year by year ever since. In 1820, book-making and book-selling in our country had become a large and profitable industry; and from that time until now, it has kept pace with the progress of population and wealth. The number of publications steadily increased from year to year, until the breaking out of the Civil War in 1861, which gave a temporary check to the trade.

In 1860, '61, the number of new books issued in the United States, was about 1,500; in 1871, they amounted to about 3,000. It is a pleasing and suggestive fact, that about one-sixth of all the books published that year, were upon the arts and sciences. The value of the books published in the United States in 1820, is estimated at $2,500,000; in 1840, at $5,500,000; in 1860, at about $24,000,000, and at this time the amount can not be less than $46,000,000. Only a brief life is vouchsafed to a majority of books published. It is believed that not more than one-fifth of them survive twenty years.

Among the great printing, publishing and book-selling houses now in operation in the United States, and which illustrate the progress of the business during the century which has just closed, that of Harper & Brothers, of New York, stands most conspicuously. James Rivington was considered the most extensive printer, publisher and bookseller in this country, in 1776. His store was at the foot of Wall street, New York, and over it was his printing-office, which Captain Sears and his Connecticut light-horsemen sacked at noon-day, in November, 1775. It was a small room, and seldom contained more than 400 volumes on its shelves, with a good assortment of stationery. The printing, publishing and book-selling business of Harper & Brothers, in 1876, occupy an immense building of iron, on Franklin square, five stories in height, with a cellar and sub-cellar, and another on Cliff street, in the rear of it, built of brick, six stories in height, with a basement. These buildings are connected by iron bridges at each story.

The house of Harper & Brothers was founded in 1817, by James and John Harper, sons of a Long Island farmer. They had both been apprenticed to different houses in New York, to learn the art of printing. Thoroughly grounded in the principles of morality and religion, they both illustrated the character of "The Industrious Apprentice"; and when they had reached manhood, they began business for themselves by setting up a small job and book printing-office on Dover street, New York, not far from the present establishment of the firm.
At that time there was peace in Europe. Napoleon, the Disturber of the Nations, was chained to a rock in the South Atlantic Ocean. With peace came a great revival of letters. Numerous books appeared. There was a rapidly increasing taste for reading in America, and reprint after reprint of English books were called for. It was an auspicious time for the Harper Brothers to set up a printing establishment.

Evert Duyckinck (father of the eminent author of that name) was then a leading bookseller in New York, and he employed the young Harper brothers to print the first book that ever was issued from their press. In August, 1817, they delivered to him 2,000 copies of a translation of "Seneca's Morals," which they had "composed" and printed with their own hands. In the winter of 1818 they resolved to print a book on their own account. With the prudence and sagacity which ever marked their business career, they first ascertained, from leading booksellers, how many copies each one would purchase from them in sheets. In April they issued 500 copies of a reprint of Locke's "Essay on the Human Understanding," with the imprint of "J. & J. Harper." So was planted the seed of the great American publishing house.

Joseph Wesley and Fletcher, two younger brothers of J. & J. Harper, who had learned the trade in the Dover street office, became partners with the elder ones, the former in 1823 and the latter in 1826. Then was organized the firm of "Harper & Brothers," which continued forty-three years without interruption, when the senior partner of the house was suddenly separated from it by death. The brothers had established themselves in Cliff street in 1825, and when the youngest entered the firm, they were employing fifty persons and ten hand presses. This was then the largest printing establishment in New York. They had, at the end of nine years, from the time when J. & J. Harper began business, purchased the buildings in Cliff street in which they were established.

In 1830 Harper & Brothers began to stereotype their works, and led the way to the production of cheap books and the creation of a new army of readers. They published a series of volumes uniform in size, under the general name of Library, such as Harper's Family Library, Boys' and Girls' Library, Harper's Classical Library et cetera; and in 1850 they began the publication of Harper's New Monthly Magazine, which soon revolutionized the periodical literature of our country and gave it a healthier tone. It is a great and beneficent educator, and is a salutary power in the land. From that time to this, when fifty-two volumes of that publication have been published, Harper's Magazine has been the acknowledged leader in that field of usefulness. It is filled entirely with original matter, for which the authors and artists are most generously paid.

Harper & Brothers had erected a fine structure on Franklin Square, in
connection with the buildings in Cliff street, (altogether nine in number) when at mid-day, on the 9th of December, 1853, the whole establishment was laid in ashes; the fire occurring in consequence of the excessive caution of a plumber at work in the building. The loss was very heavy; but soon afterward the present magnificent structures arose out of the ruins. Since then they have gone on with uninterrupted success, as one of the leading publishing houses of the world. Two others of the four brothers have been called away by death, and only one of the original four of Harper & Brothers (Fletcher Harper) remains. With him are associated, in the firm, five of the sons of the four brothers.

Harper's Weekly, an illustrated newspaper, was begun in January, 1857, when it became very popular, not only because of its high moral and intellectual character and the general excellence of its matter, but because its illustrations were numerous, well executed and well printed. In November the same year, they began the publication of Harper's Bazar, a beautifully illustrated repository of fashion. It, too, almost immediately attained a very large circulation because of its excellence in every particular. The Magazine is edited by Henry M. Alden, and has a monthly circulation of about 140,000. The Weekly is edited by George W. Curtis, assisted by S. G. Cotant, and has a weekly circulation of about 90,000. The Bazar is edited by Miss Mary L. Booth, and has a circulation nearly equal to that of the Weekly. The publication of these illustrated periodicals caused the introduction of an Art department in the business, which is under the general supervision of Charles Parsons.

The establishment of Harper & Brothers is supplied with every implement necessary for the production of a book after the manuscript leaves the author's hands until it is packed, in perfection, for transportation to the purchaser. Every department is thoroughly equipped and manned, and all move together in harmony like one great machine. Men have died in their employ who had been with them half a century, as boys and men; and many are there now who remained after their apprenticeship and have grown grey on the premises. The mutual attachment of masters and men in that establishment is most remarkable and significant.

The average number of persons now employed in the establishment of Harper & Brothers is about 600, of whom 170 are girls and women. There are 76 clerks. In the art department there are about 30 regular art contributors of original matter, and 50 engravers are regularly employed. Besides these there are several others engaged in drawing and engraving maps, plans, diagrams and scientific illustrations used largely in their educational works. By special arrangements with foreign publishers, they select and publish duplicate electrotype plates of the best and most valuable engravings, and reproduce them in the Weekly and Bazar in advance of the
arrival of the foreign journals. Photography is largely employed in transferring subjects to the wood, and does the work of a number of copyists, and more accurately. There are five editors and four assistant editors in the management of their publications, and the annual pay-roll is $600,000. They issued eighty new works in 1875, and the product of this industry that year was 2,765,650 volumes, and 11,210,450 sheets of the Weekly, Bazar, et cetera. An idea may be formed of the extent of their printing operations by a consideration of the fact that the white paper consumed in the establishment each day costs about $2,000.

Book-binding is an essential part of book-making. The tablets of stone, wood and metal, seem to have been made into volumes by fastening them together by flexible hinges. When more pliable papyrus and parchment came into use, the sheets were fastened together at the edges, and fixed at one end to the scroll round which it was wound. It is said that King Attalus of Pergamos, first ordered the squaring of books, and the covering of them with boards, leather, or cloth naturally followed. The binder put the title on the cover, and in turn decorated the latter. The ornamentation of book-covers was finally carried to a great extreme of luxuriousness, late in the fourth century, when precious metals and stones were seen upon some of them. Only the rich could then own a book, for it was written. St. Jerome rebuked this extravagance, saying “Your books are covered with precious stones, and Christ died naked before the gate of his own temple.” Goldsmiths and enamellers were not book-binders; they were only their assistants in ornamenting the work.

When the art of printing began to multiply books, there was a great change in the manner of book-binding. Costly decorations were abandoned, and chaste designs were used. Gilding came to be largely employed, and the inlaying of different colored leather produced pleasing effects. Now, machinery saves a vast amount of hard labor in the book-bindery, and facilitates the production. A single bindery in the city of New York, has turned out 10,000 books bound in one day. Three-fourths of the machinery used in book-binding now, was invented in the United States.

Book-binding is an extensive industry in our country. There were 500 establishments engaged in the business in 1870. They employed 7,697 persons, of whom 3,175 were feminine. There was an aggregate invested capital in the business of $5,329,000, and the aggregate product that year, was over $14,000,000. These establishments paid in wages more than $3,000,000.

It is proper to mention in connection with book-making that there are in the United States about 700 job printing establishments, independent of newspaper and purely book printing-offices, in which about 6,000 persons are employed, and receive annually in wages about $3,000,000. The annual
product is about $9,000,000. There were 31 type foundries in this country, in 1870, in which over 1,300 persons were employed, and nearly $2,000,000 capital invested. The annual product was valued at $2,180,000.

We have observed that a hundred years ago, there was only a single public library, outside of colleges, on this continent. Now they number 1,100, having each 1,000 volumes and upwards. There were 150 public libraries, in 1873, containing from 10,000 to 25,000 volumes each; 75 containing 25,000 or more volumes each; 37 from 25,000 to 50,000 each, and 15 over 50,000 each. The 75 alluded to are among the most important libraries of the United States, and contain an aggregate of 3,725,200 volumes. Of these nine contain over 100,000 volumes each. The library of Congress at Washington city, has nearly 270,000 volumes; the Public Library of Boston, 262,000; Harvard University 201,000; Astor Library and Mercantile Library of New York, about 152,000 each; Mercantile Library of Philadelphia, 105,000; Boston Athenæum 104,000, and Yale College 101,000.

The ancient Chinese, Egyptians, Greeks and Romans, had quite extensive libraries or bibliotheca, as the Greeks called them, in which were deposited writings of every kind. Some of them contained a vast number of volumes or rolls. The famous one at Alexandria, founded by the Ptolemies in the third century before Christ, contained 700,000 volumes or rolls, when the Arabs, at the command of Caliph Omar, burned it in the year A.D. 640. That ruler justified the act, by the assertion that "If these writings of the Greeks agree with the book of God [Al Koran] they are useless, and need not be preserved; if they disagree, they are pernicious and ought to be destroyed." These manuscripts supplied fuel for heating 4,000 baths in Alexandria for six months.

The Romans established public libraries. Julius Cæsar intended to form one which should contain all the works of Greek and Latin literature, but died before he accomplished it. Augustus and Trajan both established public libraries, but they all perished under the tread of the barbarian invaders. A library at Constantinople, founded by Constantine, and containing 120,000 volumes, was partially destroyed by the iconoclasts in the eighth century. During the Dark Ages in Europe, the Moslems cultivated literature, and had some fine libraries. It is said that one at Cairo contained 1,600,000 volumes or rolls.

From the downfall of the Roman empire until the fourteenth century, all the libraries in Europe were in the monasteries, and they were very meagre. With the revival of letters, libraries increased, and to the labors of the monks we are indebted for the preservation of many precious books, either the originals or careful transcripts. Now Europe is full of great libraries, some of them possessing the rarest literary treasures. The National Library at Paris contains 2,000,000 printed volumes, and 150,000 manuscripts. The British
Museum has 1,100,000 printed volumes. The Royal Library at Berlin contains 700,000 printed volumes, and 15,000 manuscripts, and that of Dresden 500,000 printed volumes, and 3,000 manuscripts.

The public and private libraries in the United States are rapidly increasing. In 1860, the number was 27,730, containing in the aggregate 13,316,379 volumes. In 1870—in the space of ten years—the number of libraries had increased to 164,815, with a total number of 45,528,938 volumes. Of these libraries, 108,800 were private, containing a total of 26,072,420 volumes. The Sunday school libraries of the United States contain 8,346,153 volumes; and other circulating libraries, 2,536,128. These figures show the amazing strength of implements for popular education now, and mark, with other statements which we have considered, a great contrast with those in existence here a hundred years ago.

An industry recently established in our country, and having an intimate relation to the acquisition and diffusion of learning, is that of manufacturing metal pens.

The quills of birds have been used for centuries for pens, especially since fine paper has been produced. The goose and the swan yielded the quills for ordinary purposes; for finer writing the crow. Quills were almost universally used here until within fifty years, although a few persons had pens made of gold but without hard points, many years earlier. I have seen a gold pen that was presented to an officer of the Continental army by Washington, in 1778, and another that belonged to General Schuyler at about the same time.

Steel pens were first made in England, in 1803. In 1810 Peregrine Williamson, of Baltimore, obtained a patent for metallic writing pens; and in 1820 the manufacture of the famous Gillott steel pens was begun in Birmingham, England. Finally an American clergyman, visiting England, purchased of an American resident there, the right to manufacture gold pens with "diamond points." He induced Levi Brown, a watchmaker in Detroit, to manufacture gold pens, in the year 1835. In 1840, Mr. Brown went to New York and established the business in that city. Finally when gold and steel pens were both made by machinery, the Americans could compete successfully with Europeans in the manufacture; and in 1870, there were twenty-one establishments in the United States engaged in making gold pens, employing 240 persons, and giving an annual product valued at about $500,000. Three establishments for making steel pens, employed 260 persons, and gave an annual product valued at $180,000. This industry is extending here.

The manufacture of black lead pencils is also becoming a prominent business in our country. They are manufactured, as a rule, from pulverized graphite; the "Cumberland" is made from the mineral in its native state.
Much fine graphite is found in Siberia; also in Norway, Spain and Ceylon; and some of excellent quality has been found in this country. Until very recently our lead pencils have been nearly all imported, largely from the house of Faber, established in 1761, and which has a branch in the United States. Now superior lead pencils are manufactured by the American Lead Pencil Company, at their factory in Hudson City, New Jersey. Much of the graphite used by them is from Georgia; and they make every known grade of pencils.

Ink is another article of great importance in the diffusion of learning. That used for writing by the ancients seems to have been solid, much like the Chinese or India ink; but fluid ink has been employed for centuries. The science of chemistry has been invoked in aid of its manufacture, but the ingredients are simple. A superior quality of writing ink is now made in the United States, in which task there were twenty-seven establishments engaged in 1870, employing 160 persons and giving an annual product of nearly $367,000 in value.

Printers' ink is altogether a different composition. It is about the same now in its essential excellence as when Guttenberg showed his first sheet printed from movable type. I have before me an illustrated book printed in Paris in 1536, or 340 years ago, in which the ink appears as black, and the printing as clean, and the paper as firm as if the work had been done in 1876. Great care and skill is required in the mixing and grinding of printers' ink, as well as the use of the best materials in making the finer kinds, especially colored inks, which are now quite largely manufactured in our country, and extensively used. In 1870 there were sixteen establishments in the United States, engaged in this industry, in which 155 persons were employed and who gave an annual product of more than $600,000 in value.
CHAPTER XLIII.

LITERATURE, Science and Art have kept pace, in our country, with its material progress. The literature of the English-American colonists was closely assimilated in form and character to that of England, but from the beginning of the old war for independence it gradually assumed a distinct American spirit and substance.

During the earlier colonial period, as we have observed, there was a considerable number of works written and published in America, but they were generally of a religious and controversial character and presented few original features. The earliest literary production in the colonies was a translation of Ovid's *Metamorphoses*, made by George Sandys, in Virginia, in 1623, and published in London in 1626, in folio form, with full page illustrations admirably drawn, and engraved on copperplate. A perfect copy of that work is before me, bearing the autograph of Miles Standish, written in 1643.

The first original work published in New England was a volume of poems by Mrs. Anne Bradstreet, daughter of Governor Dudley who, at the age of sixteen years, married Simon Bradstreet and accompanied him to America, where he became Governor of Massachusetts in 1680. The first collection of her poems were published in 1640, when she was twenty-seven years of age. Cotton Mather said of her works that they were "a monument to her memory beyond the stateliest marble."

Eliot's translation of the Bible into the Indian language, issued in 1663, was the first publication of the Scriptures in America. It was followed by other similar translations; and then John Newman prepared and published a Scripture Concordance which was the precursor of Cruden's work of a similar kind. Religious writers soon monopolized the colonial press. There were some eminent theological writers, like John Cotton, Thomas Hooker, Roger Williams, John Davenport, Charles Chauncy, John Norton and the Mathers. Finally in the late colonial period Jonathan Edwards loomed up in the literary horizon as one of the greatest metaphysicians of his time, and Benjamin Franklin stood by his side as the acute American philosopher, scientist and statesman.

Franklin's maxims, essays and scientific papers were read with avidity; and before the revolution he was better known in Europe than any other
American. The spirit of his writings was catholic and large-hearted, and they went forth with a puissance that is felt to-day, for they were directed to the great object of benefiting his fellow men. The thoughts of Edwards were continually on the future; and he taught that the highest concern and most dutiful work of a human being was to save his own soul from perdition and gain heaven. Franklin believed that heaven might be more surely gained by doing unto others as he would that others should do unto him, than by theoretical goodness or the efficacy of belief.

At the period of the Revolution politics naturally took possession of the public mind and expelled from it polemical theology. The ardent theologian became a sharp political combatant; and with the change in topics there appeared a change in methods of expression. American writers seemed determined to cast off allegiance to the British conventional ways of expression, and they assumed an independent tone and method of utterance that was decidedly American. The State papers put forth by the first Continental Congress, were presented in a style which drew forth the applause and expressions of the admiration of the great Chatham in the British parliament. Edwards did not live to hear more than the distant rumblings of the tempest that swept over his country afterward, and shook the thrones of the earth. How he would have stood in relation to that tempest we may not even conjecture. Franklin was a colossus of strength when the storm roared, and his spirit forms a conspicuous part of our national life.

The tendency of Franklin's mind made him naturally a champion for the rights of man; and his writings all through the period of the Revolution abound with evidences of this great desire of his earnest soul. With him labored a goodly company ready in the use of the pen, who were fitted for the grand task of not only laying the political foundations of a free State, but a solid support for a national literature. Franklin and Washington, Jefferson and Adams, Hamilton, Madison and Jay, were the chief architects of that literary foundation upon which we have since nobly built. Their writings are models for the vigorous, incisive, and practical expressions of thoughts, wholly devoid of that affectation of learning which too often dims the lustre of the most brilliant intellectual performance. Their aim when they wrote, was practical goodness; the result is a substantial blessing for their country and the world, and enduring fame for themselves.

From 1776 until the period of the war of 1812, early in the present century, the most eminent American writers were the earnest statesmen who had helped to achieve their country's independence, and were fashioning the form of its national life. The Federalist, written chiefly by Hamilton (assisted by Madison and Jay), will ever remain a monument of literary excellence and political sagacity. The Edinburgh Review said, long ago, that it exhibited an "extent and precision of research, and an acuteness of
understanding, which would have done honor to the most illustrious statesmen of ancient or modern times."

There were some poets in that period whose versifications harmonizing with the feelings of the people, gave them temporary eminence. Philip Freneau, the most popular of them all, wrote occasional pieces, which simply outlived the occasions. Timothy Dwight wrote some servid poetry in smooth versification. Colonel David Humphreys wrote some tolerable rhymes, and assisted Trumbull, Barlow, and Hopkins in the composition of *The Anarchiad*, a satirical poem. Joel Barlow, who considered himself the greatest American poet (but was mistaken), wrote very heavy poetry. His greatest work, *The Columbiad* (the result of many years' labor), partly illustrated by the pencil of Robert Fulton, has long been out of print and forgotten. Barlow was employed by the Congregationalists of Connecticut to revise the Psalms and Hymns of Dr. Watts. He also undertook a revision of the Bible, in its style of phraseology. One day he met Oliver Arnold, a half-crazy rhymer, in a book-store in New Haven. "You can talk in rhyme, I understand," said Barlow to him: "let me hear you." Arnold, putting his arms akimbo, and looking the proud poet full in the face, said in just criticism:

"Joel, you're a sinful creatur,  
You murdered Watts and spil'd the metre;  
You tried the word of God to alter,  
An' for your sins deserve a halter."

The poems of that day, having the most vitality, were, probably, *McFingal*, by John Trumbull, *Hail Columbia*, by Hopkinson; and the ode called *Adams and Liberty*, by Robert T. Paine. *McFingal* was a satire on the Loyalists and the British in general, written in Hudibrastic verse. It was immensely popular then. The first canto was published in 1775, in a thin pamphlet, and ran through thirty editions. It excited laughter in every farm-house in the land, and made volunteers flock to the Continental army. The complete poem, in four cantos, was first published at Hartford, in 1782. Francis Hopkinson's humorous poem of *The Battle of the Kegs*, had a similar effect. Some of the prose writers of that day were better poets than the rhymer.

History and Biography received considerable attention at an early period of our national life; and before the war with England in 1812-'15, Jeremy Belknap wrote a history of New Hampshire; George B. Minot prepared a continuation of Hutchins's History of Massachusetts; Benjamin Trumbull wrote a history of Connecticut; Samuel Williams a history of Vermont, and Robert Proud (a Friend) a history of Pennsylvania. Hannah Adams compiled a history of New England, and William Gordon, Mercy Warren and
David Ramsey wrote histories of the Revolution. The latter also prepared a history of South Carolina.

Belknap wrote a series of American Biographical Sketches, which were the precursor of Sparks's American Biography; but Chief-Justice Marshall, in his Life of George Washington, produced the most important biographical work of that period. Rev. Mason L. Weems wrote the most popular life of Washington (judging by its sales) that has ever been published, it having passed through more than forty editions, and is published yet. There were "Memoirs" in abundance, the most conspicuous of which was Graydon's.

Charles Brockden Brown was the first American novelist. His Wieland; or The Transformation, published in 1798; his Secret Witness, issued in 1799, and his "Arthur Mervyn," in which he gave a vivid picture of the ravages of the yellow-fever in Philadelphia, were all republished in London. There was a novel written in the United States in the same decade, called Charlotte Temple. It was from the pen of Susannah Rowson, daughter of a lieutenant in the English Royal Navy, who came to this country, with her husband, was an actress in a Philadelphia theatre for awhile, and afterward conducted a school successfully in Medford, Newton and Boston. Charlotte Temple was a story of life, "almost literally true," concerning a social scandal which affected the reputation of several American families. Twenty-five thousand copies of the work were sold in a few years, and it is yet published. An edition was issued in 1864.

Mr. Brown was one of the earliest and most prolific of the magazine writers of that period, and was a cotemporary and fellow-laborer in this field with Hugh H. Brackenridge. He was a regular contributor to The Columbian Magazine, and one or two of its successors or cotemporaries; and in 1799, he began the publication of The Monthly Magazine and American Review, that lived only a year. Indeed all of the magazines which had been started in America previous to that time, were short-lived. The first issued was the General Magazine and Historical Chronicle, published by Franklin, in Philadelphia, in 1741, in imitation of the Gentleman's Magazine of London. It lived only six months. Another published the same year in the same city, did not survive until its third number. Nearly as brief was the existence of all that were issued before the Revolution. The Literary Magazine and American Review started by Brown in 1803, lived five years, and was considered remarkable for its longevity.

The most eminent of the theological writers of that time were Samuel Hopkins, Nathaniel Emmons, Bishop William White, Timothy Dwight, and Edward Payson. These men fought bravely for orthodoxy against the assaults upon it by the French encyclopaedists and their disciples in this country, but they did not condescend to notice much the coarse and shallow
essay against Christianity by Thomas Paine, called *The Age of Reason*. The eminent services of Paine during the Revolution should give him a conspicuous place in the hearts of Americans. The effect of his memorable pamphlet *Common Sense*, in kindling a desire for independence in the hearts of the Americans, gave some color of truth to his bitter remark to the first president, that his pen had done as much as Washington's sword in achieving the independence of the Americans. That pamphlet had a circulation of 100,000 copies.

During the period we are considering, science was represented in American literature most conspicuously by Dr. Franklin and David Rittenhouse. The best and earliest of American writers on medical science were Drs. Benjamin Rush and James McClurg. The department of ornithology was ably represented by Alexander Wilson, who published a metrical account of a pedestrian tour to Niagara Falls, in 1805, entitled *The Forester*. Wilson's only surviving disciple is Titian R. Peale, now of Holmesburg, Pennsylvania, who was the painter and naturalist of the United States South Sea Exploring Expedition, undertaken forty years ago. John Bartram was the principal American writer on botany; and Dr. Samuel L. Mitchell was our first writer on chemistry whose wonders, partially revealed by Priestly, were then attracting much attention. The principal miscellaneous writers of the period were Francis Hopkinson, Joseph Dennie (editor of the *Portfolio*, and one of the most accomplished magazine writers of his day), H. H. Brackenridge, and David Everett.

Since the year 1820, when Sidney Smith sneeringly inquired in the *Edinburgh Review*, "Who reads an American book?" our native writers have explored and elucidated every department of learning, and have built the goodly superstructure of American literature upon the sure foundation laid toward the close of the last century. The war of 1812-15—the second war for independence—had been fought, and won by the Americans. The policy of our national government had become settled. The crisis which attended its establishment had passed, and the intellectual development of the country, spreading in new and unexplored paths that led away from the domains of political literature, has kept pace with its material development. At the present day, there is no department of human knowledge which American scholars and scientists have not explored.

In history, jurisprudence, theology, science, and general literature; in the production of elementary books for schools, and in the diffusion of practical knowledge concerning the business of husbandry and the mechanic arts during the last fifty years, our authors have not been exceeded in exactness and clearness of statements; in preciseness and fullness of information; in excellence of diction, and in useful endeavor, by those of any country on the globe. Within that time, the style and tone of our national literature
has partaken more and more of the national character. In the department of imaginative writing especially, is that quality conspicuous.

Within this period nearly all of the geological surveys and geographical explorations of our continent, by which our vast mineral, agricultural, and commercial resources have been revealed, have been thoroughly prosecuted, and the results spread before American readers in many volumes. The history, character, religion, language, literature, and social and moral condition of the savage tribes in our domain, have been investigated and described with the pen and pencil. Henry R. Schoolcraft and George Catlin led the way among the more modern explorers of the Indian domain, and made pictures in words and color of their habits; and the late Samuel Gardner Drake was the first who wrote an impartial history of the tribes of North American savages and barbarians. Francis Parkman has given us several volumes of picturesque narratives of the relations between the Indians and the Europeans.

In this later period William H. Prescott stands highest as a historian, and Washington Irving and Jared Sparks appear more conspicuous than any others in biographical literature. In imaginative literature, Irving and James Fenimore Cooper appear as leaders in the army of prose writers. Cooper wrote twenty-four novels and left his throne—to whom? Hawthorne, perhaps. William Cullen Bryant, our literary patriarch, is confessedly at the head of the poets of America. He began his career upon Pegasus at the age of less than thirteen years, when he wrote a remarkable political poem entitled The Embargo: or Sketches of the Times: a Satire; and he crowned his old age with the honor of making the best translation of Homer’s great Epic, extant, after he had passed the Scripture limit of active human life. The mantle of his genius, when he shall put it off at the bidding of the Master, may properly be laid upon the shoulders of the brilliant Longfellow or of the gentle Whittier. Is there anything more beautiful in American literature than Whittier’s Hymn sung at the opening of the Centennial Exhibition.

The literary records of this period abound with the names of eminent men who have written upon political economy, law, jurisprudence, theology, metaphysics, natural science, politics, social topics, ethics, institutions and morals. The intellectual life of our country is now exceedingly active. There is a sententious method of writing which is almost epigrammatic in style. The use of the telegraph, the expensiveness of which demands economy in words, may have had much to do in the creation of this custom. The object now seems to be to compress much thought in the fewest words.

The Newspaper and the Common School are diffusing knowledge with amazing plenitude; and the boy of fourteen years to-day has more general information than the man of twenty-four, thirty or forty years ago. Our literature is now generally healthful, and is growing more so; and the future,
in this regard, is filled with signs of blessed promise for the generations that are to come. The periodical literature of our country has become an immense intellectual power in the land, embracing as it does all topics relating to human knowledge; for a number of a magazine may contain more valuable information for the popular mind than a ponderous volume.

Periodical literature is applied to that which is contained in publications issued at stated intervals. These are of two kinds, one devoted to literature and criticism and the other to the sciences, arts and specific branches of knowledge. In consequence of the enormous increase in the number of books, scholars felt the necessity of some critical publications which should give them, in brief space, the substance of knowledge sought. The periodical press does this; and the want was first supplied by Denis de Sollo, who, in 1665, issued at Paris the first number of the Journal des Savants. It grew in importance and in 1701 it was placed under the direction of a commission of learned men. It was published continuously until 1818, a period of 153 years. This was the beginning of the periodical publications.

Italy and England first followed the example of France. The earliest of English magazines proper, was The Gentleman’s Magazine, commenced in London by Cave in 1732, to which Dean Swift, Dr. Johnson and other writers contributed. It is still continued, but its character is materially changed; and it is now more nearly assimilated to that of the best American periodicals. The Quarterlies followed and continue to be valuable critics of current literature and public contributors of solid learning.

We have observed that Franklin published the first magazine issued in America, in 1741. Several of these periodicals, issued weekly and monthly, were published before 1776; after the war the first one that appeared was the Columbian Magazine, edited by Matthew Carey. That was in 1786 or two years after he came to America from Ireland. It was published in Philadelphia, and at the end of three years Mr. Carey abandoned it and undertook the compilation, from newspapers of the time, of historical matter, to which he gave the name of the American Museum.

The Portfolio, established in Philadelphia in 1801, was the first American periodical that reached the age of over ten years. The Analectic Magazine which was first published in 1813 and lived seven years, was edited for two years by Washington Irving, and these were followed by short lived periodicals in considerable number. The New York Mirror, begun in 1823 by George P. Morris and Samuel Woodworth—both clever poets—continued until 1842 (a period of longevity only six years less than that of the Portfolio) when it was merged into the Home Journal.

In 1830 Louis A. Godey established the Lady’s Book in Philadelphia and afterwards employed Mrs. Sarah Josepha Hale as assistant editor. This work is yet issued monthly by its founder, and in its literary department he is
still assisted by Mrs. Hale, who is now eighty-one years of age. It is the oldest living periodical in America excepting the North American Review, having existed forty-six years. In 1832, Charles Fenno Hoffman established the Knickerbocker Magazine in New York, which continued chiefly under the editorial charge of Louis Gaylord Clark until 1860. At about the time of the birth of the Knickerbocker, the Family Magazine, published most of the time by J. S. Redfield, was begun and lived eight years. It was the first illustrated magazine published in this country, and died in 1841.

Harper's New Monthly Magazine was founded in 1850, with the late Henry J. Raymond as editor, and still continues. Putnam's Monthly was begun in 1853, but was suspended in 1859. It was revived in 1867, and in 1869 it was merged into Scribner's Monthly, edited by J. G. Holland, which yet continues a well-illustrated and very popular monthly. The Atlantic Monthly, still issued, was established in Boston in 1857 with James Russell Lowell as editor, and has contained contributions from the best New England writers and others. The Galaxy, now published by Sheldon & Company, New York, was founded in 1855 under the editorship of Messrs. Church, and is one of the leading magazines of the country, not illustrated. Lippincott's Magazine, in Philadelphia, the Overland Monthly, published in San Francisco, and the Lake Shore Monthly in Chicago, are among the later magazines in the United States which have obtained a deservedly wide circulation. Littell's Living Age, in Boston, and the Eclectic Magazine in New York, both founded in 1844, are depositories of the choicest literature of Europe. The precursor of these publications was Select Views of Literature, solely devoted to reprints from the foreign periodical press, which was established in Philadelphia in 1811. It was followed in 1821, in the same city, by the Saturday Magazine, and in 1822 by the Museum of Foreign Literature. In 1833 the Select Journal of Foreign Periodical Literature appeared in Boston.

A multitude of magazines, designed chiefly for the delight of the gentler sex in our country, have appeared and disappeared. They have generally been filled mostly with light reading; and quite a number still exist. The first of these, called the Ladies' Magazine, was published in Philadelphia in 1791; and in 1807, the Ladies' Weekly Miscellany was established in New York. The Ladies' Companion was started in 1820, in New York, and survived until 1844. The Lady's Book and Peterson's Magazine are now among the most extensively circulated of this class of periodical literature.

Periodicals for children have risen and fallen in great numbers. The first one appears to have been the Young Misses' Magazine, published in the little village of Brooklyn in 1806. The most popular of that class of periodicals now is the St. Nicholas, published by Scribner & Co., and edited by Mrs. Dodge, daughter of the late Professor Mapes. Of American periodicals having history and biography as the chief features, the American
Register, founded in 1810, in Philadelphia, seems to have been the earliest. The chief living ones are the New England Historical and Genealogical Register, founded in 1847, and for several years edited and published by Samuel G. Drake; the Historical Magazine, published in Boston in 1857, by C. B. Richardson, and edited by John Ward Dean; and the American Historical Record, published in Philadelphia by Chase & Town, in 1857, and edited by Benson J. Lossing. It has since been merged into Potter’s American Monthly, edited by J. H. Morris.

The publication of review literature in this country began in Philadelphia in 1811, in the American Review of History and Politics, by Robert Walsh. The most permanent and valuable of this class of periodicals is the North American Review, begun in Boston in 1815, and is still published. It has been edited successively by Messrs. Tudor, E. T. Channing, Dana, Edward and A. H. Everett, Sparks, Palfrey, Bowen, Peabody, Lowell, Norton, and Henry Adams. It has ever held a high rank in its class, and is the oldest living member of the family of periodical literature in America, it being sixty-one years of age. Other quarterly reviews have started up, run short-lived careers, and disappeared; and in this they have been followed by a host of other critical works of the periodical class. The International Review, begun in New York in 1874, is published six times a year. Periodicals devoted to the interests of the various sciences abound here, and are very useful as repertories of every step taken in the paths of scientific discovery. Some of the leading periodicals of the United States have a scientific department, and do much toward popularizing science.

The theological periodical literature of our country is very abundant in weekly and monthly issues. The earliest of these publications was the Theological Magazine, published bimonthly in New York, from 1796 to 1798. The New York Missionary Magazine, a bimonthly periodical, was issued in the same city, in 1800; and the same year the Connecticut Evangelical Magazine was established at New Haven, and lived fourteen years. The Monthly Anthology and expositor of Unitarian sentiments was begun in Boston in 1803, and was followed, in 1812, by the General Repository. These have been followed by a host of "Magazines" and "Reviews," published in the interest of various denominations of Christians, and devoted to the peculiar doctrines and church government of each. Among the oldest and most ably conducted of the living theological periodicals, is the Princeton Review, commenced in 1825, by Dr. Charles Hodge, as the Biblical Repertory, and united in 1871 with the Presbyterian Quarterly Review, when the titles of the two were combined.

There is noticeable in the theological literature of our country now, a salutary change in the tone of utterances. There is less bigotry in thoughts expressed; less dogmatism in opinions; less denominational Pharisaism; visi-
bly a greater regard for the prevalence of vital religion than for denominational success; in a word there is more of the Spirit of the Master whom all profess to serve. Purely denominational literature is becoming less and less strenuous in its requirements, because it is less acceptable to the people than formerly; and it leans more and more toward a catholic spirit of unity and brotherly love. It is to be hoped that this tendency will more and more increase, until denominational literature shall disappear altogether. It is a hindrance to spiritual progress, for there is no spiritual sweetness in it.

It is probable that the limner who shall draw a brief outline picture like this, of American literature at the next centennial of the Republic, will perceive the poverty of our collective achievements now as clearly as we do those of our ancestors a hundred years ago. We seem to have done much within the century just closed; but in the broad field before us, and with full liberty to cultivate it, who can estimate the wealth of intellectual garnerings that will then give luster to our country?
CHAPTER XLIV.

ONLY a few names appear on the list of scientific men in the colonies before the Revolution and for twenty years afterward. Franklin and Rittenhouse were the most illustrious scientists in this country a hundred years ago. They had made philosophical investigations in old and new fields, and had written much on speculative philosophy before the old war for independence.

Franklin, the "incarnated common sense," had drawn lightning from the clouds with a kite-string, at the middle of the century, and proved its identity with frictional electricity; and Rittenhouse had become an accurate mathematician, a skillful mechanician and an eminent astronomer before the transit of Venus in the summer of 1769. He combined mechanical skill with scientific knowledge. He made a wooden clock before he was seventeen years of age; and he constructed a planetarium which shows the movements of the heavenly bodies for a period of 5,000 years, and their positions in each year, month, day and hour, with such accuracy as not to differ sensibly in all this time from those given in the astronomical tables.

That planetarium was sold to Princeton College, where it may yet be seen, bearing the following inscription: "Invented by David Rittenhouse, A.D. 1768; repaired and extended by Henry Voight. 1806: both of Philadelphia." When the planetarium went to Princeton, the legislature of Pennsylvania ordered another one to be made and presented it to the University in Philadelphia, where it remains. So much was this piece of mechanism esteemed that when the British occupied Philadelphia, General Howe detailed a guard to protect it from possible injury. Cornwallis was preparing to rob Princeton College of the original, when Washington's great guns compelled him to attend so assiduously to matters of greater personal concern, that he left it behind.

Rittenhouse, who was a grandson of the first paper-maker in America, was employed by the American Philosophical Society to observe the transit of Venus, on the 3d of June, 1769. He did so with great skill, at an observatory erected at Norriton, Pennsylvania, for the purpose. He made a similar observation on the 8th of December, 1774, from a small observatory erected...
in the rear of the State-house in Philadelphia, from which, in July 1776, the Declaration of Independence was read.

There was very little knowledge of the exact sciences in our country a century ago. No college curriculum contained any notice of them, excepting mathematics; and the student at Harvard who, on his knees before the president, received corporal chastisement, the operation beginning and ending with prayer, knew far more about the orations of Cicero or the odes of Horace than he did about the growth of the rod that was laid over his shoulders. There was no thought of applying chemistry to farming; nor were the steady and easy going brains of the people disturbed by the question, "Why does a candle burn?" Had any man then proposed to apply science to farming and elevate it above an art, he would have been voted crazy; had he proposed to make lightning his servant in carrying messages to his friends a thousand miles away, a commission of lunacy would have decided that he was incapable of managing his own estate, if he had any. Had he declared his belief that the Creator was more than six days, of twenty-four hours each, in making the "earth, sea and sky," and proposed to weigh the planets in a balance, he would have been ostracized as an infidel or a presumptuous fool. But these things are now as common as air, in the popular mind. The boy of sixteen summers now may talk philosophically of the "devonian system" of rocks; of the swarming "asteroids;" of the "carbonates and sulphates;" of "spectrum analysis" and chemical "fertilizers," and not be deemed a prodigy.

Between the breaking out of the Revolution and the close of the first decade of this century, the most conspicuous American scientist who appeared, was Benjamin Thomson (Count Rumford) who was a native of Massachusetts. He taught school at Rumford (now Concord), New Hampshire, where he married a rich widow. Sympathizing with the loyalists, he was driven from Rumford, went to the British army in Boston, and was sent on an errand to England by General Howe, where he became a clerk of the Secretary of State for the colonies. He returned to America and became the leader of an organized band of loyalists in arms; but at the close of the war he retired to England, where he was knighted and became Sir Benjamin Thomson.

In 1784, Sir Benjamin entered the service of the Elector of Bavaria, where his scientific knowledge, military skill and versatility of talent caused his rapid promotion, first to the position of State Councilor, then to lieutenant-general, and very soon to a "Count of the Holy Roman Empire," with the title of Count Rumford, the name of the place where he had left his wife and child. Before the end of the century he became a noted philosopher, and devoting his time, at the close of his public duties, to study and investigation, he made one of the most important discoveries in science, of the
present century. He demonstrated what Bacon and Locke had hinted at, namely, that heat, instead of being a material substance, is only a mode of motion. The fact was questioned for a long time; now it is universally admitted. Of his essay upon this topic, Professor Tyndall says: "Nothing on the subject more powerful, has since been written."

Count Rumford founded the Royal Institution in England, and did not forget his native land, though he never returned to it. At his death he bequeathed an annuity of a thousand dollars to Harvard College; also, at the death of his daughter (who died at Concord in 1852), the whole of his remaining property, for the purpose of founding "a new institution and professorship, in order to teach by regular courses of academical and public lectures, accompanied with proper experiments, the utility of the physical and mathematical sciences for the improvement of the useful arts, and for the extension of the industry, prosperity, happiness and well-being of society." The Rumford professorship was established in 1816.

Meanwhile the celebrated Dr. Joseph Priestly, who had been persecuted in England by the church and state, and was avoided, socially, by his philosophical associates because of his bold enunciation of his Unitarian theology, came to America. He arrived in New York in 1794, and settled on the farm of his son in Pennsylvania. His fame as a philosopher had preceded him. In 1773, the Royal Society had given him the Copley medal for his "Observations on the Different Kinds of Air"; and the following year he announced his great discovery of oxygen gas, which he erroneously called "dephlogisticated air." He demonstrated that the red color of arterial blood is due to its combination with oxygen from the atmosphere; the fact of the abstraction of oxygen from the atmosphere in the process of combustion and putrefaction; and he recognized the property of vegetables to restore this constituent of the air. He discovered several other gases—the nitrous oxide, the carbonic oxide, the sulphurous, and ammoniacal gas.

The expectation that Dr. Priestly would do much toward a diffusion of scientific knowledge in this country, was disappointed. Theology took a stronger hold of his mind than science, after he came here, and his fame as a philosopher rests upon his achievements before he became a resident of the United States. Priestly lectured, and also wrote much on theological subjects during the ten years of his life after his arrival in America. His great discoveries in chemistry have made his name immortal.

In 1874, the Centennial year of Priestly's discovery of oxygen gas was celebrated at Northumberland, Pennsylvania, where the philosopher lived and died, by a brilliant gathering of the chemists of the United States. On the same day there was a similar gathering at Birmingham in England, where, in 1791, a fanatical mob destroyed Dr. Priestly's library, with his valuable books, manuscripts, and philosophical apparatus. The convention at North-
umberland, sent to the convention at Birmingham, by the Atlantic cable, the following note:

"Northumberland, Pa., July 31, 1874.

"The brother chemists at the grave, to their brothers at the home of Priestly, send greeting on the anniversary of the birth of chemistry."

Two hours after this note was sent, a reply was received, reciprocating the greeting, and informing the convention that on the following day a marble statue of "Priestly Discovering Oxygen" would be unveiled at Birmingham, and presented to the town by Professor Huxley. This incident marks a wonderful change in society within a century. Reason and Common Sense are rapidly assuming the rightful mastery over the usurpers Ignorance and Bigotry. It also marks wonderful progress in science. A message was sent more than three thousand miles, and an answer received, in the space of two hours!

The Science of Chemistry which investigates the composition and certain properties of material substances, takes the lead, now, of the other sciences, in the pathway of real usefulness. It is a science that was evidently known and practiced in ancient times. Pictures in the tombs of the Libyan mountains, discovered by Belzoni and others, show that the ancient Egyptians possessed a knowledge of chemistry in the production of enduring colors, of which the modern world is yet ignorant. Moses, the foster-child of Pharaoh's daughter, whom the priests taught all of the scientific mysteries known in the temples, made use of his chemical knowledge while at the head of his people, in the wilderness. They set up a golden calf to worship. Moses in his anger "burnt it in the fire, and ground it to powder, and strawed it upon the water, and made the children of Israel drink of it." Kitto says that in the Arabian desert may be found a certain plant which, put into a crucible with gold, will form a flux that reduces the metal to powder. The latter, put into water, makes one of the most nauseating of drinks. Moses undoubtedly knew the chemical property of this plant, and used it for the punishment of the "children of Israel."

The ancient priests possessed pharmaceutical knowledge founded upon the science of chemistry. All the way down from those remote ages until the present century, inquisitive minds had been groping after chemical knowledge—the Why and the How of the compositions of nature. Suidas the Greek, almost a thousand years ago, defined it as the "art of making gold and silver"; and from that time (as before) the alchemists sought diligently for the philosopher's stone, that they might transmute the baser metals into gold. It was not until the latter half of the last century that chemistry was fairly enthroned among the exact sciences, by Bergman, Scheele, Priestly and Lavoisier. So it was that the scientists and instructors in our republic were
furnished at the beginning of our national career with a solid foundation for analytical investigation and correct tuition.

Toward the close of the last century, Dr. Benjamin Rush, of Philadelphia, Drs. John Maclean and James Woodhouse, of Princeton, and Dr. Samuel L. Mitchell, of New York, all gave instruction in chemistry, in the colleges at their respective places of residence. In 1802, Robert Hare, of Philadelphia, then only twenty years of age, led by chemical investigation suggested by French theorists, invented the compound blow-pipe, the most powerful means yet discovered for producing artificial heat. He invented other implements for chemical analysis, and became one of the leading scientists of our country.

Benjamin Silliman, the elder, was elected professor of chemistry in Yale College in 1802, and occupied a conspicuous place in scientific circles in America for more than fifty years. His Journal of Science is his most enduring monument. The science of chemistry was then in its infancy, and Silliman did not enter upon his duties in the College until he had prepared himself by two years' study under Dr. Woodhouse, in Philadelphia.

Among the later conspicuous representatives of chemical science, as well as the physical sciences, in this country, is Dr. John W. Draper, of New York, a native of England, who came to the United States in 1833. He and Dr. Wolcott Gibbs (now Rumford professor at Harvard College), particularly, are distinguished as original investigators, whose published treatises have done much toward the advancement of chemical science.

In 1832, Dr. Samuel Guthrie, of Sackett Harbor, New York, published his discovery of an anæsthetic compound, which Dumas, when he analyzed it, called Chloroform. Dr. C. T. Jackson, of Boston, one of the most active scientific investigators in our country, and who has published numerous papers on chemical and geological subjects, claims to have discovered the anæsthetic efficacy of ether. His credit for this discovery was disputed by Dr. W. T. G. Morton, of Boston, and Dr. Horace Wells, of Hartford.

There are other expert chemists in our country (and their number is rapidly increasing) whose labors are given not only for the pure love of the science, but to render it useful in the arts in which human industry is engaged. They are carrying on investigations to this end, with the greatest assiduity. Following the lead of Liebèg, they are making our soil more productive. In the textile fabrics, the immense value of their work is everywhere apparent, in the economy of labor, time, and money. Chemistry is assisting paper-makers to keep up with the enormously increasing demand for their product in this country. It has supplied tanners with a substitute for the diminishing bark. A few hours will now suffice for bleaching linen in a manner which, a few years ago, occupied months in the process. The dyer is indebted to chemistry for some of his most beautiful colors,
extracted from the most forbidding substances in appearance, and the process is rendered more facile and permanent. Chemistry may be applied with great benefit in every department of metallurgy; and to it the miner and engineer are indebted for explosive compounds which save an incalculable amount of muscular labor.

At the Centennial of chemistry at Northumberland, Dr. J. Lawrence Smith gave an idea of the vast importance of the science of chemistry in the processes of our everyday life, saying: "Industrial chemistry links itself with every modern art in such an intimate manner, that were we to take away the influence and results of chemistry, it would be almost like taking away the laws of gravity from the Universe; industrial chaos would result in one case, as material chaos would in the other."

The manufacture of chemicals, such as acids, alkalies, salts, colors for the dyer, the painter, the printer, et cetera, is an important industry in the United States. The oldest and most extensive of these chemical works are those of Harrison Brothers & Co., of Philadelphia, founded in 1793 by John Harrison, son of an English emigrant, and member of the Society of Friends. Young Harrison spent about two years in Europe, during which time he completed his studies in chemistry under Dr. Priestly, and obtained what information he could concerning the best processes for manufacturing oil of vitriol or sulphuric acid. On his return, though then only twenty years of age, young Harrison began the manufacture of the oil of vitriol on a small scale in Green street near Third street, in Philadelphia.

Circumstances caused Mr. Harrison to abandon the business, and until the year 1804, he practiced his profession, that of a chemist. Then he resumed the business, on a somewhat larger scale, for the demand for oil of vitriol was increasing as manufactures increased; and yet his single small establishment, with a chamber about eighty feet in length, was capable of supplying the whole demand of the United States at that time. The capital employed was about $5,000; but he soon afterward extended his business, by adding the manufacture of antimony, mercury, copperas, et cetera, and then he employed about $40,000 capital. His annual product was 300 barrels of oil of vitriol.

It is believed that Mr. Harrison was the first man in the world who brought platinum to his aid in the concentration of sulphuric acid for commercial purposes. In 1813, Dr. Eric Bollman, a learned Swede, residing in Philadelphia, who had brought from France the method then recently discovered by Dr. Wollaston for concentrating crude grains of platinum into bars and sheets, produced masses weighing upwards of two pounds, and sheets more than thirteen inches square. At the suggestion of Mr. Harrison, these sheets were used in making a platinum still for the manufacture of oil of vitriol by that chemist.
In 1807, Mr. Harrison began the manufacture of white lead, and was the second man who engaged in that industry in this country. He afterward added the manufacture of quite a variety of chemicals; and the business has been carried on by Mr. Harrison and his sons and grandsons without interruption, until the present time.

In 1861, the firm found that their then extensive works in Kensington District were too limited, and they built larger ones at Gray's Ferry, on the Schuylkill, in the southwestern part of Philadelphia, where they occupy ten acres of ground. The modest acid chamber of 80 feet on Green street, and its product of 300 carboys a year, has grown into several series of chambers, about 200 feet in length, and capable of producing 35,000 to 40,000 carboys of oil of vitriol each year, for sale, besides a large quantity used by the firm in the generation of muriatic, nitric, and acetic acids.

The enormous increase in our cotton and woolen manufactures and in other interests requiring acids, have made a great demand. The oil of vitriol is a powerful aid in the promotion of our national prosperity, for it enters into the production of textile fabrics: refining coal oil; galvanizing; manufacturing fertilizers, et cetera. Liebig has remarked: "The quantity of sulphuric acid made in a country is a sure index to its wealth and prosperity."

The establishment of Harrison Brothers & Co., at Gray's Ferry, consists of a large group of factories, in which the making of these various acids, colors, et cetera, are carried on, and they form an interesting and instructive picture to the eye of the scientific as well as the curious observer. The buildings are all spacious, and thoroughly adapted to the business, and that business is very extensive. When in full operation they make about 150 carboys of muriatic acid a day, and about 2,000,000 pounds of acetic acid a year. This amount of the latter, reduced to the strength of ordinary table vinegar (for which it is largely used), would make about 60,000 barrels of forty-two gallons each. Some of the finer grades are extensively employed in the manufacture of what is called "cider vinegar."

All of these acids are largely used in the production of colors, of which Harrison & Co. are the principal manufacturers in the United States. Their color works are in three buildings, which cover half an acre, made solidly of stone and three stories in height. The mill-house, devoted exclusively to the grinding of white lead and colors, is also a fine stone structure, having a milling capacity for preparing over 4,000 tons of paints in oil a year, and an equal quantity of dry material. Their buildings and apparatus for the oxidation of lead for the numerous consumers of this product, are extensive and complete; and every precaution is taken for the health of the operatives, by a process covered by a patent held by the firm. Their apparatus is capable of an outpour of 1,500 tons of oxides a year; and when all their works now in course of construction, shall be completed, they can produce nearly 5,000
tons of white lead a year. The motive power of the works is afforded by five steam engines varying from eight to one hundred and seventy-five horse power.

These works are admirably located about three miles from the mouth of the Schuylkill; and the largest vessels may come up and discharge their cargoes at their wharf. They are also connected with the whole railway system of the country, by a side-track of the Philadelphia, Wilmington and Baltimore railway, which extends into their yard.

The capital invested in the Gray's Ferry works is about $600,000, and the productive capacity of the establishment annually, is about $15,000,000. When their enlargement, now in progress, shall be completed, their productive capacity will be increased four-fold. The capital above-named is independent of that invested in several works at the sources of supply of raw materials for the factories at Gray's Ferry.

Astronomy, mathematics and the physical sciences, have all as active, accurate and profound devotees in our country, as in any other on the globe. These sciences have made great advances here, within the last half-century, by the investigations and discoveries of these earnest workers.

One of the most distinguished of our mathematicians in the earlier part of this century, was Nathaniel Bowditch, whose father felt impelled by stress of circumstances, to take him from school when he was ten years of age, and put him at work in his cooper-shop. The genius of the boy triumphed over every obstacle. Without teachers he mastered languages and became acquainted with some of the most profound secrets of science. While he was a youth at sea, a sailor taught him the elements of navigation, and he became one of the most expert voyagers of his time. He wrote and published one of the best books on practical navigation ever issued. Leaving the ocean he turned to science as a solace, and made his name immortal by his translation of the great work of Laplace—*Mécanique Céleste*—a work which, at that time, only two or three persons in America, and not more than a dozen in England, could read critically in the original. Bowditch's genius supplied deficiencies in the composition of the great French astronomer, who, filled with his subject, grasped conclusions without always indicating the process by which he was led.

Since Bowditch's time, astronomical science has made important conquests in our country as well as abroad. In 1847, a great telescope was set up at Cambridge, Massachusetts; and the next year, the Messrs. Bond discovered with it an eighth satellite of Saturn, which had never before been visible to the human eye. Two years later these investigators discovered with that instrument, a third ring surrounding Saturn, dusky and almost nebulous in appearance.

It had long been suspected that Sirius, the brightest of the fixed stars,
was double. The fact was proven by a son of Alvan Clark, of Cambridge, who, on a winter night in 1862, when exploring the heavens with a great telescope which his father had just completed for the University of Mississippi (and now at Chicago), discovered the companion star of Sirius. It is conceded, that in exquisiteness of workmanship and performance, the object-glasses fashioned by Alvan Clark are superior to any made in America or in Europe.

Several comets have been discovered by American astronomers. William C. Bond, of Cambridge, first discovered one in February, 1846, having a periodic revolution of ninety-five years. In October, 1847, Miss Maria Mitchell (now Director of the observatory at Vassar College), discovered a comet, at her private Observatory in Nantucket, which four days afterward passed centrally over a fixed star of the fifth magnitude, without in the slightest degree obscuring it. At one time the star appeared like the proper nucleus of the comet. This visitant of our system, (which is named "Miss Maria Mitchell") was discovered two days afterward, by De Vico, at Rome.

About one-third of the asteroids—minute planets existing between Mars and Jupiter where a member of the solar system is missing—have been discovered by American astronomers. Only 13 were known before the year 1850; now 138 appear on the Berlin star-maps. Professor James Ferguson, of the Naval Observatory, was the first American who discovered a before unknown asteroid. That was in 1854. Since that time—a period of little more than twenty years, Americans have discovered 44. Professor Peters has discovered 23, and Professor Watson, 16.

The electro-magnetic telegraph has been brought into the service of astronomy for the automatic regulation of time, the great value of which is obvious to the mind, on a moment's reflection. This application was first made by Dr. John Locke, of Cincinnati, in 1848, for which service Congress awarded him $10,000. Our observatories until about a quarter of a century ago, were furnished with foreign instruments. Since that time American opticians have, in many instances surpassed, in the perfection of their work, the constructors of Europe. Among these, the late Henry Fitz, of New York, and Charles A. Spencer, of Canastota, New York, appear conspicuous; but the palm of greatest excellence must be awarded to Alvan Clark, just mentioned, whose attention was turned to the subject late in life without previous preparation. Lewis M. Rutherford, of New York, who has successfully made photographing subservient to astronomy, has constructed some admirable instruments for his own use in this special field, and with them has produced most remarkable results. Dr. Henry Draper has used great skill and achieved success in the improvement of reflecting telescopes, by the use of silvered glass, fashioned by his own hand. His Memoir on the subject, is a standard authority.
The subject of physical astronomy has, within a few years, absorbed much of the study of American scientists, as well as those abroad, especially concerning the physical condition of the sun. In these inquiries, our countrymen have been specially industrious and successful, having made many valuable researches and discoveries. In this labor, the astronomer to-day is greatly assisted by the employment of spectrum analysis, conceived by Professor Kirchoff, of Germany. Knowledge in this branch of astronomy is likely to be accelerated more by this instrumentality than by the use of the telescope.

In the field of the sciences most intimately connected with astronomy, such as heat, light, electricity or magnetism, Dr. John W. Draper, of New York, appears in the foremost rank in our country. He has many earnest co-workers. Dr. Draper was one of the earliest investigators of the phenomena of the spectrum. He grasped the entire subject in its physical, thermal, and chemical aspects, as it relates to vision and the organic world. He laid the foundation of the science of spectroscopy, which has attained great importance in the investigation of both terrestrial and celestial chemistry.

Dr. Draper was one of the earliest improvers of Daguerre’s great discovery, and he and his disciples have made much use of the photograph in their investigations. With this instrumentality, Mr. Rutherford and Dr. Henry Draper, already mentioned, have produced remarkable results. The first suggestion of the relation between the spectra of incandescent bodies and their physical condition or chemical composition, was made by Dr. J. W. Draper, in 1847, in a memoir on “The Production of Light and Heat.” This memoir stimulated investigations concerning the physical condition of the sun, now pursued so vigorously. In these investigations, Mr. Rutherford, Dr. Wolcott Gibbs, and Professor Young, of Dartmouth College, appear most conspicuous as coadjutors of Dr. Draper. Probably the most important contribution to the spectroscopy of the stars, is a photograph of the spectrum of Alpha Lyra, taken by Dr. Henry Draper, “showing in the invisible region four great groups of lines never before seen.”

Count Rumford presented the American Academy of Sciences, with the sum of $5,000 (which has increased to about $20,000) to be devoted to stimulating the investigation of various phenomena connected with light and heat, by the presentation of medals, one of gold and one of silver made from the same die, as honorary rewards to successful research. The bestowal of one of these Rumford medals is the highest testimonial of approbation that American science can bestow. At a meeting of the Academy in the spring of 1876, the Rumford gold medal was bestowed upon Dr. John W. Draper for his researches in radiant energy.

Into the mysteries of electricity or magnetism, our American philosophers have been diligent and successful investigators. In 1819, Oersted di-
covered the intimate relations of these forces (or single force, it may be) in nature, to which Pope evidently alluded in the following lines, written almost a hundred years before:

"Wars in the sun; refreshes in the breeze;
Glows in the stars, and blossoms in the trees;
Lives through all life; extends through all extent;
Spreads undivided; operates unspent."

Oersted's discovery was followed by confirmatory ones by Arago, in France, and Davy, in England. Ampère, in France, followed, by a discovery that satisfied him that magnetism is only one of the forms of electrical power. Sturgeon, in England, introduced a coil of copper wire around a piece of iron bent in the form of a horse-shoe, and, introducing it to a galvanic current, made it a feeble magnet. Here Professor Joseph Henry, one of the most eminent scientists of our country, took up the subject, and by careful investigations, made rapid strides toward achieving the grand result first absolutely reached by Professor Morse, in perfecting a recording electromagnetic telegraph—a result made possible only by the batteries of Daniel and Grove, which were not known until 1836.

Professor Henry was the first to produce an electro-magnet in the full sense of the term, that was capable of several applications, among them as a motive power in mechanics. He constructed magnets that could sustain nearly 3,000 pounds weight. Professor Henry illustrated the practicality of an electro-magnetic telegraph, by an apparatus fitted up in the Albany Academy, in 1831, by which a bell was rung at a distance of a mile. Then followed the Morse telegraph, and the great wonders achieved by that invention on the land and under and across the seas.

In the several departments of Natural History, American scientists have done much noble work within the last fifty years. Our Government, by setting on foot explorations under the immediate control of the War Department, has done much toward the acquirement and distribution of knowledge concerning the geology, mineralogy, botany and zoology of our country. These explorations have been made under the immediate direction of the Board of Topographical Engineers, and the results, in the aggregate, have been marvellous in the development of scientific facts, and the resources of our country. Many and varied are the laborers and the labor in this interesting field of observation. The former are continually increasing in number and strength, and the latter is rapidly extending the theatre of its operations. The names of Dana, Gray, Audubon and Agassiz will never grow dim on the pages of the history of science.

An important aid in scientific investigations is the Smithsonian Institution at Washington city, founded by means of funds left for the purpose
by James Smithson, of England, who bequeathed to the government of the United States, in trust, on certain conditions, a sum of money to be used for "the increase and diffusion of knowledge among men." The amount received, in the year 1838, was $515,169 in gold, and in 1865, a residuary legacy of over $26,000. Managers called "Regents of the Smithsonian Institute," consisting of the Vice President of the United States, the Chief-justice, the mayor of Washington city, and three members of each house of Congress were appointed; a building was erected; a library and museum were begun, and in 1845 Professor Joseph Henry was appointed Secretary of the Board, which office he has now held thirty years. He is ably assisted by Professor Spencer F. Baird.

The United States Government has assumed the expense of keeping the grounds around the building of the Smithsonian Institute in order, and Congress makes an annual appropriation for the support of the museum. The chief service performed by this institution is to aid in making researches in the fields of mineralogy, Indian philology, astronomy, meteorology, (now conducted by the Signal Office) natural history, climatology and the whole range of natural sciences; also to diffuse this collected knowledge by publications, and receive similar publications in return, and to carry on a correspondence upon important topics with every part of the globe where civilized men are dwelling.

Schools of science for instruction in mining, engineering, agriculture, et cetera, have been established, as we have observed, by national endowments of public land. There are now almost fifty of these schools in our country, all but three of which have been established within the last fifteen years. The exceptions are the Agricultural and Mechanical College of the University of North Carolina, that went into operation in 1795; the Sheffield School of Yale College, founded in 1846, and the Maryland Agricultural College opened in 1858.
MOST intimately connected with the physical sciences is the art of
the Pharmaceutist and the practice of healing. Indeed the sphere
of a thoroughly trained and conscientious physician lies partly
out of the domain of the physical sciences, and within that of moral science,
for it is often that he finds opportunities for administering "to a mind disea-
sed" the most soothing moral curatives. How often have the consolations
of religious truths uttered by a physician to some despairing soul, healed
mental pain, and assisted in the recovery of the body from mortal sickness.
Viewed in this aspect, the Physician stands at the portals of the temple of
Science and of Benevolence, ready to enter either, as duty may call him—a
loving disciple of philosophy and humanity.

The progress of medical science in our country, has kept pace with others
during the century just closed. When that century began, the profession
abounded with charlatans, ignorant and impudent, and the number of real
and thoroughly educated physicians in our country, were very few. A writer
of the time said: "The quacks abound as the locusts of Egypt"; and anoth-
er, writing of New York, observed: "That place boasts the honor of
above forty gentlemen of the faculty, and far the greater part of them are
mere pretenders to a profession of which they are utterly ignorant."

The quacks undoubtedly often scattered disease and death in communi-
ties, by the mal-administration of medicine. Dr. John Morgan, of Philadel-
phia (Director-general of the hospitals of the Continental army at one time),
seems to have been the first to adopt and publicly advocate the idea that
medical men should only prescribe remedies, leaving the apothecary to
compound them. This could not be done in the sparsely settled rural
districts—so sparsely settled that a skillful physician was often called upon
to ride on horseback, from twenty to one hundred miles to see a single
patient. The profession at that time, out of towns, was a very laborious
and unremunerative one. The doctor's fees were often paid in farm produce:
and he was generally compelled to combine farming with his professional
duties, in order to keep the wolf from the door. Clergymen in the country
were generally compelled to do likewise for the same purpose.

Until a few years before the Revolution, there were no medical schools
in this country, and young men who could afford it, went to Europe for instruction. Leyden then had the most popular of these schools, under the great Boerhaave, but at his death, that at Edinburgh, with Cullen at its head, was the favorite of American students. While Drs. Morgan and Shippen were attending medical lectures there, they conceived the plan of a medical school in their own country. It was favorably received, when presented, and in 1765 the Medical College of Philadelphia was founded. Two years later the Medical College of New York was established.

Dr. Thomas Bond, of Philadelphia, was the first physician in this country who gave clinical lectures at the bedside of patients. These were given in the Pennsylvania Hospital.

There was so much prejudice against dissections, that none were performed, excepting by stealth, until just before the war for independence. This prejudice stood in the way of the advance of anatomical knowledge. At that time the practice of mid-wifery was almost exclusively in the hands of women, and the science of obstetrics was not much cultivated. Dr. Shippen, on his return from Edinburgh, devoted much time to the study of the subject, and was the first public teacher of mid-wifery in America.

Through medical literature and schools, advancement in medical knowledge and consequently in medical skill, in this country, has been greatly promoted. There was some medical literature afloat during the concluding quarter of the last century, in small books and pamphlets. Dr. Rush was a voluminous writer, and others contributed important medical knowledge through the medium of the press; but the first periodical devoted to the subject was the Medical Repository, a quarterly magazine published in New York in 1797.

It was at about that time that Jenner, in England, made the greatest medical discovery that has occurred in a hundred years, namely the efficacy of vaccination for saving life from the fatal effects of small-pox. It was readily adopted in America after some opposition. It has been said, that "the lancet of Jenner has saved far more human lives than the sword of Napoleon destroyed." The first vaccination performed in this country was by Dr. Waterhouse, in Boston, in 1799, on four of his own children, with virus obtained from Jenner. In 1801, the operation was first performed in New York, by Dr. Seaman, and in 1802, an institution was established in that city for the vaccination of the poor gratuitously.

During the present century medical colleges and schools have greatly multiplied; and medical journals have more and more abounded. At this time there are 60 medical and surgical schools and colleges in the United States, of the "regular" or allopathic order; 8 of the homœopathic class; 3 of the eclectic; 11 dental and 13 pharmaceutical—95 in all. Some of these are departments of Colleges and Universities, and a few of them have valu-
able libraries. The homeopathic Female Medical College of New England contains 15,000 volumes. The next, in size, is that of the Medical College (“regular”) of Georgia—5,000 volumes.

These institutions are doing much for the promotion of medical science. There are “Schools” of medicine—Allopathic, Homœopathic, Thomsonian and Eclectic. Sanitary appliances are more efficient, and are better understood and observed; and there is a general division of labor. The various duties performed by a single physician a hundred or even fifty years ago, are now performed by a dozen or more expert specialists. Now the teeth are pulled and filled by a dentist; the eyes are treated by the oculist, and so on; and these men, making one thing the object of their special study, become more expert.

There is far more general enlightenment in the medical profession now, than formerly. The laws of health are better understood by the doctors and the people, and quacks are comparatively few, for common sense easily detects the ass under the lion’s skin. The compounds of the pharmacist are less noxious than formerly, for the “extracts” are more pure. Physicians have discovered that there is more efficacy in good nursing than in much medication, and that the lancet is an assassin; as a consequence longevity is likely to appear more and more conspicuous on our records of mortality.

In surgery much progress has been made during the present century, and especially within the last thirty or forty years. A most beneficent and powerful coadjutor for the surgeon has been discovered in America, known as chloroform and ether, to which brief allusion has been made. Its discovery forms an epoch in medical history, as conspicuous as that of Jenner’s fifty years before. By the application of anaesthesia the terrors of the surgeon’s knife are now dispelled, for pain is vanquished by a mysterious agency.

As we have observed, the successful application of anaesthesia by inhalation of ether or etherization in surgery, was first demonstrated in Boston in 1846; and its first application in operative mid-wifery was also made in Boston in 1847. Shortly after the discovery of etherization, Dr. Simpson, of Edinburgh substituted for sulphuric ether chloroform, as an anaesthetic agent, and that American discovery has been more employed abroad than ether. Neither of them are dangerous agents when judiciously employed. More than 12,000 cases in which chloroform was used were passed in Grey’s hospital, London, before a serious accident occurred, and it was used in the Crimean war 25,000 times without causing a single death. It was employed to an equal or greater extent during our late Civil War with a similar result. The amount of suffering prevented by this blessed agency is incalculable.

The medical profession in this country are now working assiduously with boards of health in cities and large towns, for the discovery of diseases and methods for their removal; and their labors will undoubtedly lead to the
important and greatly desired result, by such a discovery. By these investigations the physician may greatly magnify his profession; and he may become, not a mere prescriber of medicine but a genuine philosopher whose noblest function may be to prevent rather than to cure diseases. He may illustrate the truth of the old saying that "an ounce of prevention is better than a pound of cure."

The hospital is an excellent clinical school for the student and practitioner of medicine and surgery, as well as a refuge for the sick poor and the stranger. It is essentially the outgrowth of Christianity, (whose founder was an eminent healer of the sick) with its germs in the shelters of Egypt, Greece and Rome. The early Christians took special care of their poor and sick as a duty. St. Chrysostom built a hospital at his own expense, at Constantinople toward the close of the fourth century; and in the eleventh century they were erected by Christians in the Holy Land, for the use of sick pilgrims. At that time they began to be popular institutions in the cities of Europe. The Hotel-Dieu in Paris, now covering five acres, and the oldest and largest hospital in the world, has been established full 400 years.

The earliest public hospital in America was founded at Quebec in 1639. The earliest within the domain of our Republic was opened in Boston in 1717, for the use of persons sick with contagious diseases. The first general hospital chartered in the colonies, was the Pennsylvania Hospital, created in 1751. Twenty years afterward the second one—the New York Hospital—was chartered, Dr. Samuel Bard being chiefly instrumental in planting that institution there. Institutions of this kind have greatly increased within the last half century in our country, and they are now more abundant here than anywhere else on the globe, in proportion to the population.

Our country also abounds with other benevolent institutions for the help of the afflicted sons and daughters of men. The deaf and dumb, the blind, the insane, the idiotic and the inebriate, are all cared for.

The first named unfortunates who have not the sense of hearing and in consequence want the faculty of speech, are the least afflicted of the classes named, for they possess larger powers than either of the others. The number of deaf mutes and the deaf people in our country is much larger than is generally supposed—larger than the decennial censuses reveal. Only those who make aural surgery a specialty have any conception of the extent to which deafness, in a more or less degree, prevails.

The proportion of deaf and dumb in our Republic, to the whole population, in 1870, was less than that of any people on the earth. According to the census that year the number was one in 2,380. The average number is probably about one in 2,000, a trifle less than in Great Britain, the next most favored country in this respect. The whole number in the United States and Territories, reported in 1870, was 16,205. Of this number 8,916
were masculine and 7,289 were feminine. The larger number of these—2,560—were between fifteen and twenty years of age.

It is only within a little more than a century that regular schools have been established for the intellectual instruction of the deaf and dumb. Aristotle declared that "of all the senses, hearing contributes the most to intelligence and knowledge;" and this dictum was alleged to prove that the deaf and dumb were incapable of intellectual instruction. And St. Augustine asserted, in the fourth century, that they were incapable of exercising faith. For ages these unfortunates were neglected, and it was not until the sixteenth century that any systematic attempt was made to teach the deaf and dumb. Under the Roman law and codes founded upon it, the legal status of the deaf and dumb was that of the insane or idiotic. In the United States and Great Britain they are placed on an equality with other citizens.

When intellectual instruction was believed to be possible, much was accomplished toward the results we now see of efforts in that direction. Benevolent men from time to time sought to instruct the deaf and speechless. Treatises on the subject appeared. It was not, however, until about 1760 that Thomas Braidwood established a school for their instruction near Edinburgh, the first regular institution for the purpose that was opened in Great Britain.

Much has been done for the instruction of the deaf and dumb in the United States. In 1793, Dr. W. Thornton published an essay, in Philadelphia, on "Teaching the deaf to speak," but no attempt was made to establish a school for the purpose here until 1811, when a grandson of Braidwood attempted it, first in New York, and then in Virginia, but he was unsuccessful. Finally, through the efforts of Dr. M. F. Cogswell, of Hartford, Connecticut, whose daughter had become deaf in her infancy, a school for the silent was established there. He was ably seconded by his neighbor, the Rev. T. H. Gallaudet, who had taken great interest in his daughter, and whose character, in every respect, seemed fitted for the work. The latter went to Europe to acquire the art of instruction, and when he returned, in the summer of 1816, he was accompanied by an expert French teacher. The school was opened in a rented building, in 1817, and the same year it was chartered by the Connecticut legislature, under the name of the New England Asylum for the Deaf and Dumb. Congress indorsed it with a grant of a township of land in Alabama, the proceeds of which now form a fund of about $340,000. Because of the national aid, the institution was named the American Asylum. Mr. Gallaudet remained at the head of the institution (the first successfully established in this country) until ill-health compelled him to leave the post. His grateful pupils erected a monument to his memory after his death.
On the day when this institution was opened at Hartford, a charter was given for the New York Asylum for the Deaf and Dumb, now doing a good work in the city of New York. In the establishment of this institution, Dr. Samuel W. Akerly, Dr. Samuel L. Mitchill, Rev. James Milnor, and others, were very active. By the exertions of Harvey P. Peet, LL.D., who was at the head of this institution from 1831 to 1867, it became the largest and most efficient of like institutions in the world. Mr. Peet's son and successor, Isaac Lewis Peet, LL.D., fully sustains the character of the asylum built up by his father. The Pennsylvania institution was started in 1820, by Joseph Siexas; and another was established at Danville, Kentucky, in 1823, by J. A. Jacobs.

These earlier institutions for the instruction of the deaf and dumb are still flourishing, and many others have since been founded. There are now thirty-six in the United States, and a National Deaf Mute College, which was established at Washington city in 1864. By the thorough training of both sexes in all these schools, habits of industry are formed. In some of them, branches of the mechanic arts are taught, and the pupils are thus fitted for the battle of life. There are now, in our country, about 4,400 pupils in these institutions, of whom about 1,900 are girls. Of the 277 teachers employed, 72 are deaf mutes.

The national college for deaf mutes is known as the "Columbian Institution." The object of its organization was to give to competent deaf mutes and others, who by reason of deafness cannot be educated elsewhere, the opportunity to receive a thorough education in the studies usually pursued in American colleges. For that purpose, Congress granted a collegiate charter, in 1864. This college bears the same relation to other institutions for the deaf and dumb that colleges for hearing and speaking persons bear to primary schools and academies.

The Columbian Institution is the first of the kind ever created. Edward M. Gallaudet, Ph. D., LL.D., son of the first manager of the Hartford asylum, is the president, and is assisted by five professors, two tutors, a lecturer on natural history, and an instructor in drawing and painting. Rev. Thomas Gallaudet (oldest brother of Dr. Gallaudet) has recently established in New York a home for aged and infirm deaf mutes, which is under the care of the Episcopal church mission to this class of citizens.

The blind, in our country, receive a full share of public sympathy and kindness. It is observed that, as a class, they have less vitality than those who have their sight, and that is doubtless one cause of their blindness. Many are born blind; but "there are many who are not born blind," Dr. Howe remarks, "who are born to become blind." According to the most carefully compiled statistics, the causes of blindness are 38 per cent. congenital; disease after birth, 47 per cent., and accidents, 15 per cent.
editary blindness is extremely rare. Of 700 persons in the Pennsylvania institution for the blind, only twelve of them had either parent blind.

In Great Britain and Ireland, small-pox has been the chief post-natal cause of blindness, next to inflammation. The general exemption from that disease in this country is doubtless one of the principal causes of the smallness of the percentage of blind persons here, in proportion to population, compared with Great Britain. According to the census of 1870, there were about 20,000 blind persons in the United States, out of a population of little more than 38,000,000; in the United Kingdom, having a population of 30,000,000, there were about 39,000 blind persons. In Ireland, out of a population of 5,800,000, there were 6,879 blind persons. Of the 20,000 in the United States, about 3,000 were foreign born. About one half of the blind in our country are over forty-eight years of age.

The first public asylum for the blind of which we have any record, is one yet existing in France, which was established by royal authority in the year 1260. This was intended for the physical comfort of soldiers who had served in Egypt, and were afflicted with ophthalmia. In the sixteenth century, plans began to be devised for the intellectual instruction of the blind, but it was not until 1784 that any institution was established for the purpose. At about that time, the celebrated Hûy began his labors in their behalf, and achieved great success by means of raised letters and figures, and musical and other signs.

The first public provision for the sightless in the United States, was the founding of the "Perkins Institute and Massachusetts Asylum for the Blind," in 1829, through the exertions of Dr. John D. Fisher and others. It was opened in 1832, with the late Dr. Samuel Gridley Howe as director, who occupied that position until his death in 1875, a period of forty-three years. Under his able management it has ever been a leading institution of the kind in this country. It received its first name from the fact that Colonel Thomas Handasyd Perkins, of Boston, gave to it his mansion in Pearl street in that city, which was exchanged, in 1839, for the Mount Washington Hotel, in South Boston, where it has remained ever since. Other gentlemen have subscribed liberally for its support.

Almost simultaneously with the creation of this institution, similar ones were founded in New York and Philadelphia. In this benevolent work, Drs. Akerley and Russ, of New York, and Samuel Wood (a benevolent bookseller) and Robert Vaux, of Philadelphia, were specially conspicuous. The success of these institutions excited great interest throughout the country; and Dr. Howe, with a detachment of pupils of the Perkins Institute, visited seventeen States, and exhibited the proficiency of his scholars before their respective legislatures. The result was a greatly increased interest in the subject. Before 1840, there were five institutions for the
instruction of the blind in our country; now there are twenty-seven, with an aggregate of about 2,000 pupils. More than 6,000 blind persons have been under their care since Dr. Howe began his labors.

Probably the greatest achievement in intellectual instruction ever performed, was by Dr. Howe at the Perkins Institution, in the education of Laura Bridgeman, who was born the year it was founded, and at the age of two years was deprived of sight and hearing, and consequently was without the faculty of speech. Her mind seemed to be utterly shut in from a comprehension of all external objects, and forever barred to the reception of mental instruction.

At the age of eight years, Laura became a pupil of Dr. Howe. With skill, patience, and untiring effort, that philanthropic man soon unbared the gates of her understanding, and let in a flood of intelligence which she received with eagerness. The processes we may not stop here to explain. She became an intelligent young woman, who learned to read with raised letters, and to spell and write correctly. She is yet, at the age of forty-seven years, an inmate of the Perkins Institution, and is beloved by all who know her, for her moral sense is well developed. She is fond of reading, especially the Bible; runs a sewing machine; makes much of her own clothing; is scrupulously neat in her person and attire; is very regardful of the rights of others and tenacious of her own, and is usually cheerful and happy—never more happy than when she can sit and chat with some one with the finger alphabet about acquaintances.

Printing for the use of the blind was attempted in the sixteenth century, by making letters in intaglio—sunken. Experiments were afterward tried with better success, with cameo or raised letters. Haüy first introduced a system of embossed letters, on stiff paper, and a few books were so printed in France. The first one printed in the English language was by James Gall, at Edinburgh, in 1827. Phonetic alphabets were afterwards introduced; but the raised alphabet, first made by Dr. Howe in 1834, is used in printing all the books for the institutions for the blind in the United States.

Places of refuge, and for the comfort and care of the insane, a still more unfortunate class of citizens, are well supported by State aid in our country. Insanity appears not to have been so prevalent in ancient as in modern times. The employments of men and women then were not so conducive to cerebral excitement and disease, as within the last two or three centuries; and only a few cases appear on record before the Christian era. No provision was made for insane persons in the Mosaic law; but the philosophy of insanity appears to have been understood more than 400 years before Christ, when Hippocrates wrote: "By the brain we become mad and delirious, and fears and terrors assail us, and dreams and untimely wander-
ings, and ignorance of present circumstances. All these we endure from the brain, when it is not healthy.”

Until a very recent period, the treatment of the insane was cruel. Their keepers seem to have been, for ages, disciples of Celsus, who wrote eighteen hundred years ago; and even so late as the beginning of this centennial period of our history, Dr. Cullen, the eminent head of the medical school at Edinburgh, recommended “stripes in the treatment of the maniacal.” But in 1792 Phillippe Pinel, at the head of the Bicetre in Paris, satisfied that kindness was more powerful than chains, took off those of fifty-three patients in that institution who had been made furious by cruel treatment, and tamed them by his own gentleness. From that time the treatment of this unfortunate class rapidly changed, and the proportion of cures more rapidly occurred.

In this country the humane system prevails in all the institutions for the treatment of the insane, and the mad-house is no longer a forbidding place, clustered with traditions of horror and the orgies of howling maniacs, but as a rule, order and serenity reign in them. The first asylum in this country was founded in 1773, at Williamsburg in Virginia, and was the only one in the United States until 1818, when the Somerville, Massachusetts, institution was incorporated. That was followed in 1821 by the Bloomingdale Asylum, in New York, and in 1824 by the asylum at Hartford, Connecticut.

There are now sixty-six institutions for the care of the insane in our country, in which about 16,000 persons are under treatment. A larger number are in almshouses, or are taken care of at their homes. The total number in the United States in 1870 was about 38,000 out of a population of a little over 38,000,000. This number is a much less per cent. than in any other country. In England, the population of which, in 1870, was a little more than 22,000,000, the number of insane persons was nearly 55,000, of whom about 36,000 were treated in 176 public institutions.

Among humanitarian efforts for the relief of the “ills that flesh is heir to,” institutions for the care of idiots assume a prominent place in importance and interest. These institutions, like most of the purely benevolent ones of our day, have originated within the century just closed. More than 200 years ago the good Vincent de Paul (who deserved as he received canonization), the founder of the congregation of the Sisters of Charity, undertook the benevolent work of instructing imbeciles at the priory of St. Lazarus, in Paris. He was not very successful, and for almost two centuries the attempt seems not to have been repeated. In 1818 Mr. Gallaudet admitted an idiot boy into the Asylum for the Deaf and Dumb at Hartford, and improvement in his mental capacity was visible. Other imbeciles were afterward admitted to that and other like institutions. At the same time
like efforts were put forth in France, but little was done until 1838, when
Dr. Seguin undertook the education of idiots in Paris.

The first movements in our country made in that direction, when
thorough training of the imbecile was attempted, were simultaneous in
Massachusetts and New York. The feasibility of organizing an institution
for their treatment was first publicly suggested by a series of letters from the
pen of the late George Sumner, in which he described his visits to the
schools for idiots, in Paris, in 1845.

Through the efforts of Dr. Frederick F. Backus, of Rochester, New York,
who was a member of the New York State Senate, the subject was brought
before the legislature in the form of a bill for the creation of such an institu-
tion. Legislative action occurred in Massachusetts at the same time, and the
result was the establishment of an experimental school in a wing of the
Perkins Institute, in Boston, in the autumn of 1848. In New York the
"New York Asylum for Idiots" was created in 1851, and in 1855 it was
permanently located in a fine building erected for the purpose at Syracuse,
New York. Other similar institutions have been formed, and at the
present time there are ten in the United States.

The number of idiots in our country, in 1870, was 24,527, of whom 14,485
were masculine, and 10,042 were feminine. All but 1,645 were born in the
United States. Of the whole number, 140 were also deaf and dumb; 105
blind, and 11 both deaf and dumb and blind. New York has the largest
number—2,486; Ohio next—2,338, and Pennsylvania had 2,250. The idiot
is regarded by physiologists as a continued infant, and the system of instruc-
tion used is that which seems to be best calculated to develop the mind of
an infant. By pursuing this plan vast beneficent results have been obtained.

From the beginning of the Christian era, the care of orphans has been,
in a degree, the public concern of the church, though for long seasons, like
the centuries of the Dark Ages, this charity, like all other humanitarian ob-
jects, was sadly neglected by the Christian world. It was feebly revived
during the seventeenth century, and at near its close, orphan houses became
quite numerous in Europe. One of the largest in the world now in exist-
ence, is that at Halle, founded by Auguste Hermann Franke, about the
year 1690.

Orphan houses or asylums, were first established in this country by the
Moravians in Pennsylvania and Georgia; and in 1740, the eminent George
Whitfield laid the foundation of one about ten miles from Savannah, in
Georgia.

The first Orphan house established in the United States after the Revo-
lution, was the “Charleston Orphan Asylum” chartered in 1790. In 1807,
the “Orphan Asylum Society of the city of New York,” and the “St. Ste-
phen’s Female Orphan Asylum” of Philadelphia, were chartered. The former
grew out of the "Society for the Relief of Widows with Small Children," and owes its origin to Mrs. Joanna Bethune. It was organized in 1806; and at first it was attempted to place the children in families, as the Homes for the Friendless now do. But their number soon rendered this difficult. The Asylum was established in Bank street, New York, and in 1840, it was removed to its present delightful situation on the banks of the Hudson, between Seventy-third and Seventy-fourth streets.

From that time until 1828, a period of twenty-one years, no other orphan asylum was established here. In that year the "Annapolis (Md.) Orphan Asylum" was founded; and in 1832, the "Hebrew Orphan Asylum" was established in the city of New York. From that time until 1840, only twelve others were founded. Since 1840, they have rapidly accumulated, and there is not, probably, a town of 10,000 and more inhabitants in our country, that does not contain one or more institutions of this kind. The number of orphan asylums in the United States at this time, is a little over 400.

Preventive and reformatory Institutions are among our most important public charities. The first of the kind in the United States was the "New York House of Refuge for Juvenile Delinquents," founded in 1824 by John Griscom, Isaac Collins, James W. Gerard and Hugh Maxwell, who were active members of the "Society for the Prevention of Pauperism and Crime." It was opened on the first of January, 1825. The institution still exists, and occupies a considerable space on Randall's Island, New York. A "House of Reformation," on a similar plan was established in Boston in 1826, and a "House of Refuge" in Philadelphia in 1828. Similar institutions have since been established in other States, some of them being classed under the title of Reform Schools. There are now 34 of these establishments in the United States; and in all of them some mechanical trade or other industry is taught.

Besides these houses of refuge there are other institutions for the protection of the young, such as Homes for the Friendless, Juvenile Asylums, and Industrial Schools; and in the city of New York was established in 1853 a "Children's Aid Society" whose operations have done an incalculable amount of good. It was founded chiefly through the instrumentality of Charles L. Brace, who is still the chief manager of the Society. The principal object is to rescue from the paths of vice and immorality, children in the city of New York, who are uncared for, and find for them good homes at the West and elsewhere. Similar societies have been formed in other large cities, and work with marked success. The parent society in New York has the oversight of industrial schools, the news-boys' lodging house, boys' meetings, et cetera, and puts in places of safety from the dangers of city life, several hundred children each year.

The first Home for the Friendless was founded in the city of New York
about thirty years ago. It originated in the "American Female Guardian Society" of New York, the directors of which were engaged in the rescue of young girls from ruin. These Homes take charge of very young children as well as those of 13 to 14 years of age, and have schools and work-rooms in which the older ones are taught and employed. By these Homes, now numerous in our land, thousands of children have been put into paths of usefulness and honor. It has been ascertained, by perpetual correspondence concerning each child that goes out from one of these Homes, that full 90 per cent, grow up virtuous and exemplary.

There are also Missions for homeless children, and Societies for the encouragement and protection of unchaste young women who have become penitent and desire to lead virtuous lives. There have also been established, within a few years, societies for the prevention of cruelty to children, suggested by the "Society for the Prevention of Cruelty to Animals," founded by Henry Bergh, in the city of New York.

Most of the above named institutions are supported largely by private gifts, though most of them receive some aid from the State. They have already done much toward social regeneration and are capable, by the generous fostering care of the people, of doing much more. They are among the most gratifying evidences of the social advancement of our people within the century just closed. No such institutions were thought of here, a hundred years ago; indeed they have been the growth of the last fifty years.
CHAPTER XLVI.

The Fine Arts, embracing in their broader scope, Architecture, Painting, Sculpture, Engraving, Music, Poetry, and the Drama, have made much progress in our country within a century. Their development has not been so rapid as the national growth in other directions, for obvious reasons, yet Horace Walpole could not have dreamed of a result in America such as we see to-day, after the lapse of a little more than a century from the time when he wrote this sentence: "As our disputes and politics have traveled to America, is it not probable that poetry, and painting, too, will revive amidst those extensive tracts, as they increase in opulence and empire, and where the stores of nature are so various, so magnificent, and so new?" That was written fourteen years before the Declaration of Independence.

At that time, there were only two real artists in America of native growth, West and Copley, and they became essentially English painters, for they went to London before the war for independence began, and never returned. But other painters were then budding, such as Charles Wilson Peale and John Trumbull, who were destined to become historians on canvas of the men and events of our revolutionary era.

A few painters from Great Britain plied their art in America in colonial times. Watson and Smybert, Wollaston, Taylor and Williams, Hesselius and Theus, had all painted portraits in the colonies between 1725 and 1755. Smybert, it is believed, painted the first group of portraits on one canvas ever produced in this country. It represents Bishop Berkeley and his family; and it may now be seen in the art gallery of Yale College.

Architecture is the only one of the Fine Arts born of necessity. When men left their cave-dwellings, they first lived in tents, and then built houses. The career of architecture then began, but it was probably not a fine art before painting and sculpture were known.

Domestic architecture has passed through several stages of development in our young country, such as the log cabin of the early settler, with oiled paper for window-panes; the substantial one-storied clap-boarded farm-house of the permanent colonist, and the more stately and pretentious two-storied
and gambrel-roofed house of the more opulent freeholder. Through these three periods our people had passed at the time of the Revolution. The latter style prevailed, with some modifications, until within the last forty or fifty years. Then came the Grecian and the Italian villa styles, with porticos, colonnades, and verandas. These were modest and neat in appearance, and comfortable in arrangements. They were succeeded by the flashy and pretentious so-called "Gothic" houses, with their gables, pinnacles, and oriel windows. The whole country was soon disfigured by these dwellings that were

"All up and down, and round and square;
Things copied from the Lord knows where;
Stuck on at random everywhere—
Indeed a house to make one stare,
All corners and all gables."

We are now passing through the French or Mansard-roof period. Our dwellings are much more cheerful and convenient, as a rule, than ever before, and our domestic architects have arrived at a degree of perfection in planning and executing nowhere surpassed. Much of this cheerfulness is due to the free use of glass, pure and colored, not only in the construction of windows, but of ornamental and useful articles for household decoration and use.

Since the "Crystal Palace" was built in London, in 1851, chiefly of glass and iron, and repeated in New York in 1854, those materials have grown more and more in favor every year, for the construction of business houses and public buildings. Our country now abounds in these structures, especially in cities; and it is said that there is much more glass used in the United States, in various forms, than in any other country in proportion to the population.

The manufacture of glass has become a very important industry in the United States. In 1870, there were 201 establishments engaged in the business, employing 13,822 persons, to whom wages to the amount of almost $8,000,000 were paid. They employed a capital of over $14,000,000, and gave an annual product of the value of $19,245,000, in cut, plate, stained, window, and other kinds of glass. About one-third of the persons were engaged in making window glass, the annual product of which was valued at almost $4,000,000.

The oldest and one of the most extensive glass manufactories in the United States, is that of Whitney Brothers (Thomas H. and Samuel A. Whitney), at Glassboro', Gloucester county, New Jersey. Glassboro' is a village of almost 2,500 inhabitants, with a good supply of churches and schools, and is about eighteen miles south of Philadelphia. The establish-
ment of Whitney Brothers was founded in 1775, by seven brothers named Stenger, all practical glass-blowers. They went into the forest, cleared off the trees, built log houses and a factory, and began operations in the autumn of 1775. In 1780 they failed in consequence of the depreciation of Continental money, and the property went into the possession of Thomas Heston, who became associated in the business with Thomas Carpenter in glass making.

After many changes in the proprietorship, these works were merged into new ones that had been constructed, in which the Stenger family were interested, and which are now the Whitney works. After other changes in the ownership, Thomas H. Whitney, the senior of the firm of Whitney Brothers, bought one-third of the establishment, in 1835. In 1841, the Whitneys bought other glass works there, and incorporated them with their own, and by various enlargements, their present establishment has grown to its huge proportions. It now consists of four factories, respectively 110 by 80 feet, and 75 by 70 feet, in ground dimensions; and four others, two of them two stories in height. They have also various shops for mechanical business connected with their works, and other buildings for special uses. They have also planing mills and other machinery, requiring a sixty horsepower engine to drive them.

The entire buildings of the Whitney Brothers' glass-works, cover about twelve acres of ground; and a branch of the West Jersey railroad extends into their yard. The works employ about 400 persons, including about 100 boys from ten to eighteen years of age; and they produce 5,000 packages a month when in full operation, or 525 tons of glassware. Their pay-roll is $15,000 a month; and on the premises are consumed each month, 700 tons of coal, 300 cords of wood, 100 tons (2,240 pounds each) of English soda ash, 300 tons of washed sand, 15 tons of German and Missouri clay, 2,000 bushels of oyster-shell lime, 75 bushels of salt, 40 tons of packing hay and straw, and 100,000 feet of lumber for packing-boxes. One hundred dwellings for the workmen and their families form a part of the establishment. Many of the workmen live in their own houses. Connected with the works are 1,000 acres of highly cultivated farming land. The capital invested is about $800,000.

Three-fourths of the glass-blowers employed by Whitney Brothers, learned the trade at their works. Apprentices are taken to the number of 30. They are selected from the ranks of the assisting boys, who soon become skillful workmen.

A very interesting fact connected with these glass-works is, that one of the oldest and most respectable houses in Philadelphia, founded by Levi Garrett (now William E. Garrett & Sons), commenced to order bottles manufactured by the grandfather of Whitney Brothers in 1781, as the books
of that date show: and through all the changes during ninety-five years, the
business of the two houses has been continued with each other, without in-
terruption, or the slightest misunderstanding. Both houses are now in the
control of the third generation. This is an instance of constancy rarely to
be found in the business world.

There were no professional architects in our country a hundred years ago
The old colonial churches built early in the last century, especially those of
Virginia, whose ruins seen in our day attest their symmetry and beauty, were
built from designs procured in England, and were mostly constructed under
English master workmen. The churches were sometimes recipients of the
bounty of the monarch and high dignitaries in the church, and were quite
costly.

At the period of the Revolution, when a church edifice of more than
ordinary pretensions was to be erected in a city, plans were procured from
abroad, and the best house-builders were employed in the construction.
The rural church edifice (commonly called a “meeting-house”) of that day
was, in its style, only a shell of a dwelling-house on a large scale, with very
little external or internal ornamentation, and with a small belfry. There
was nothing in the style of architecture to inspire devotion; and the “meet-
ing-house” was simply a house for meeting, made as economically as possi-
able, painted white, if painted at all, with green blinds. It is only within a
few years that rural churches have been constructed in our country in con-
формity to any rules of ecclesiastical architecture.

Within a hundred years, movements known as the Greek and the Gothic
revivals in church and domestic architecture, appeared. The Greek revival
dates from 1762, when Stuart and Revett published the result of their
researches among the antiquities of Attica. The Gothic revival may date
from the building of Horace Walpole’s villa at Strawberry Hill, which was
completed in 1776. The modern development of the Gothic style did not
occur in England until about 1820, and several years later in this country.

The Greek style took possession of the public taste earlier. It was
adopted in the United States early in the present century, in the construc-
tion of the public buildings at Washington and elsewhere, and afterwards in
hotels, banks, theatres, rural churches and country dwellings. In joinery
the Greek forms of mouldings are almost universally used. But few dwell-
ings are now built in the Greek style, and fewer still in the mock Gothic, for
the French style prevails.

Within a few years Opera Houses and Music Halls have greatly multiplied
in our country, and the former are likewise used for theatrical performances.
Great attention has been given to the methods of constructing these build-
ings so as to produce the best acoustic results. Among the edifices devoted
to musical entertainments in our country, the American Academy of Music
in Philadelphia, holds a first rank. It was designed by N. Le Brun and G. Runge, and was first opened to the public in January, 1857, when the event was celebrated by a magnificent ball. The exterior of the building is in the Italian Byzantine style. Its auditorium is 120 feet in length, 90 feet in width, and 70 feet in height; and has a seating capacity of 3,000. The building, ground, and equipment cost about $375,000. It is generally admitted to be the best arranged building in our country for the purpose, in respect to acoustics, safety, and general comfort and convenience.

We have made very great improvements in our domestic architectures within a few years, in the matter of taste in style and convenience in arrangements; and no people on the earth are better housed than the Americans. Our building business supports, in a large degree, other important industries, such as carpentering and joining, lumbering and brick-making, quarrying and dressing stone, manufacturing edge tools and other implements, nails, screws, locks, bells and tiling; plumbing, gas-fitting and painting.

The business of the builder is one of vast importance in the United States. In 1870 there were 17,142 establishments engaged in that business, employing 67,864 persons, to whom more than $29,000,000 were paid in wages. These establishments employed over $25,000,000 capital, and the value of their products that year was $133,000,000. There were also 2,264 establishments engaged in brick and stone masonry, employing over 11,000 persons, who received $4,272,000 in wages. The value of their products was $14,588,000, and the amount of capital employed was about $2,547,000.

We have already noticed the productions of several of the above named industries; among them the manufacture of screws, and on page 221 alluded to the American Screw Company at Providence, Rhode Island. That establishment manufactures a greater portion of the screws made in the United States. It occupies seven acres of land; and when in full operation may employ about 2,800 persons, of whom 1,600 are women and girls. Between 4,000 and 5,000 machines are employed, which may turn out 5,760,000 screws (40,000 gross) in ten hours, which is about double the present consumption in this country. About 3,000 varieties, including bolts, are made there. The machinery is impelled by steam engines of 1,500 horse-power, and from 5,000 to 10,000 tons of coal are annually consumed. The daily consumption of iron is from twelve to twenty-five tons. The capital of the American Screw Company is $3,250,000, with a considerable surplus.

Brick-making is another important business dependent upon architecture. Most of the bricks used in our country before the Revolution were imported. In 1870 there were 3,114 establishments in the United States engaged in it, employing 43,300 persons and over $20,500,000 capital. They paid about $11,000,000 in wages, and gave a product of about $30,000,000. There were also over 700 plumbing and gas-fitting establishments, employing nearly
5,000 persons and $4,000,000 capital, paying $2,300,000 in wages, and giving an annual product of the value of $10,400,000. In painting (mostly employed on buildings) there were over 3,000 establishments engaged, giving work to 11,000 persons, using nearly $3,000,000 capital, and paying over $4,000,000 in wages. Their annual product was more than $13,244,000.

In the production and sale of lumber there were 26,945 establishments engaged in 1870, employing about 164,000 persons and $162,000,000 capital. Wages were paid by them to the amount of $46,271,000; and the product that year was valued at $252,339,000.

In the dressing of stone in various forms 923 establishments were engaged, in which 13,200 persons were employed, and capital to the amount of $11,288,000 was invested. Wages amounting to about $8,000,000 were paid, and the annual product was $21,317,000.

Reference has been made to our earlier painters and their works. Their pictures, although not exhibiting the higher excellencies of the art now attained, are exceedingly valuable as truthful delineations of the men and women and their costumes of the period of the Revolution. The works of Charles Wilson Peale and John Trumbull are of incalculable value in this regard. Fortunately for history and the sake of truth in art, West had boldly revolutionized the system of historic painting then in vogue, by substituting reality for ideality. His painting of the "Death of Wolfe," when exhibited at the Royal Academy, was condemned by the critics as "unchronical." They denounced real red coats, bright buttons, boots and blunderbusses, which distinguished the British soldiers then, and clamored for half naked warriors such as Homer had described. West boldly replied to their criticisms: "This event occurred in a year, in a country and among a people unknown to the Greeks; the painter and the historian should be governed by the same rules."

West persevered and triumphed, common sense prevailed, the critics were soon silenced, and the revolutionist was applauded. Art, faithful to nature and fact alone, was commended to our painters at the very beginning of the Republic, and so was laid the healthful foundation on which has been built a magnificent superstructure. How much more truly valuable, in every point of view, is the simple, truthful statue of Washington in his real costume, made by Houdon, than the more costly and pretentious one by Greenough (admirable as a work of art), in which there is scarcely a word of truth found
below the neck. When the South Sea islander shall stand among the ruins of our national capital, and view that statue exhumed, he will be made to believe a lie, for it will tell him that Washington went half naked like the heroes of Homer, or the savages of our forests.

Stuart and Allston, Dunlap, Jarvis and Vanderlyn, became worthy cotemporaries of Peale and Trumbull in their later years, but there was very little encouragement for them to cultivate art on a higher plane than that of portraiture. The later and persistent efforts of Morse to win success in historical painting were significant failures. There were no means in our country for stimulating the cultivation of a taste for art. Very few individuals possessed other pictures than family portraits; and there was no public display of paintings before the establishment of the New York Academy of Fine Arts in 1802, of which Chancellor Robert R. Livingston, then United States Minister at the French Court, was president. In the board of managers were distinguished men—John Trumbull (Vice President), Dewitt Clinton, David Hosack, John R. Murray, William Cutting and Charles Wilkes. There was only one artist (Colonel Trumbull) in the board of directors. "We had then," says Dunlap, "gentlemen of every profession but that of an artist, constituting an Academy of Fine Arts." Mr. Livingston, under their directions, purchased in Paris and sent to New York, a number of casts of the antique. The association was incorporated in 1808, with the title of "American Academy of Arts."

This Academy did not prosper. One exhibition of its statuary was given, and then for twelve or fifteen years it languished and was almost forgotten. Then Clinton, Hosack and others gave it a temporary vitality, and a public exhibition was made in the autumn of 1816. De Witt Clinton delivered an address (the first it is believed spoken before an Academy of Fine Arts in this country), resigned his position as President of the Academy, and was succeeded in office by Colonel Trumbull.

Unwise management and alleged injustice to the young artists who were studying in the Academy, caused great dissatisfaction. They held a meeting in the autumn of 1825, and organized a "Society for Improvement in Drawing," of which Samuel F. B. Morse was chosen President. Their rules directed that "the lamp (a can containing about half a gallon of oil, into which was inserted a wick four inches in diameter and set upon an upright post about ten feet in height) should be lighted at six and extinguished at nine o'clock P. M. Each artist also had a small oil lamp of his own." The members of this association, composed of about forty artists, withdrew from the Academy, and it died.

In January following, at a meeting of the Drawing Association, Mr. Morse offered a plan for the formation of what he called the "National Academy of the Arts of Design in the United States." The proposition
was adopted; the new Academy was organized on the 15th of January, 1826, by the choice of Samuel F. B. Morse, President, with fourteen associate officers. Only two of those officers, namely, General Thomas S. Cummings, (who was elected Treasurer), and Ashur B. Durand, now survive. The Academy then founded is a flourishing and most useful one, and is cherished with pride by the artists of our country. The Association owns a handsome building on the corner of Twenty-third street and Fourth avenue, in New York, made in the style of the Doge's palace at Venice. The first exhibition in it was given in the spring of 1865.

In 1805, seventy gentlemen, mostly lawyers, met in Independence Hall, in Philadelphia, for the purpose of considering the subject of the founding of an Academy of Art in that city. They formed an association to "promote the cultivation of the Fine Arts in the United States of America, by introducing correct and elegant copies from works of the first masters in Sculpture and Painting." The first President was George Clymer, one of the signers of the Declaration of Independence; and there were twelve directors chosen, only two of whom, Charles Wilson Peale and William Rush, were professional artists.

The first exhibition of the Philadelphia Academy of Arts was held in March, 1806, in which were over fifty casts of antique statues in the Louvre, two paintings by West, and a few others by European artists. Its first annual exhibition was held in 1811; and at its second annual exhibition the next year, there were several meritorious pictures by American artists. By purchase and by gifts, the collections of the Academy were unsurpassed in this country, in 1845, when fire destroyed the building and most of its contents. Now the Academy has a valuable collection in a superb building on Broad street, which was first opened to the public in April, 1876.

When these Academies were founded there was very little art culture in the United States. The field and the work-shop absorbed the attention of a greater part of the people, while the untraveled wealthy ones had no opportunity for obtaining a taste for or knowledge of art from observation. Within forty years a great change has occurred. The annual exhibitions of these academies have had much to do in effecting it. They were assisted by the perpetual exhibitions of the Art Union established in New York twenty-five or thirty years ago. Since then there have been frequent exhibitions of fine works of art in most of our principal cities, and many opulent citizens who have made collections, have generously devoted a certain portion of time to a public view of them. Easy communication with Europe has made our people acquainted with the best works of art there; and the photograph displays to the eyes of all, the forms of the works of the great masters of art, ancient and modern. The consequence is that a taste for art has become very general in our country. Wretched
pictures that pleased a few years ago, are now our abomination; and the
walls of many of the lowliest cottages which were disfigured by cheap
colored lithographs in 1860, now present a real work of art in a good
photograph or engraving.

In portraiture and landscape painting our artists are unrivaled. This
fact is well attested by the pictures in the Art Department of the Centen-
nial Exhibition. The secret of this excellence may be found, possibly, in
the climate in which the American artist lives, and the models before him.
Like the pure, bracing air of Greece, that was conducive to exquisite physical
development, independence of spirit, and the growth of art in its highest con-
ditions, that of America contributes to the same results. The Grecian
sculptors excelled because they were familiar with perfect models in the
men and women around them. Our landscape painters have constantly
before their eyes an infinite variety of models of grand and beautiful scenery
on the earth, in the sea, and floating in the firmament; and with these
objects their sensibilities are continually touched, and every fibre of their
being responds in vibrations which are made manifest on canvas.

In genre pictures—pictures which illustrate scenes in every-day life—our
artists display, in that Exhibition, a remarkable excellence, which is not sur-
passed by any foreign painters. In water color painting, too, there is great
excellence displayed, and showing very great improvement in that depart-
ment of art in our country. As a whole, the works of American artists dis-
played at the Centennial Exhibition are not disparaged by comparison with
those of foreign artists; and our people will there learn the important fact,
that from our native artists may be obtained pictures of at least equal merit
with any that may be produced abroad. Historical painting has received
such feeble encouragement in our country, that very little has yet been
done in that branch of art.

Water-color painting is coming rapidly into favor in our country. It
has long been a special favorite in England. With us, its career as a
specially studied art has been brief. Until within a dozen years, in public
exhibitions of art, water-color paintings were insignificant in character, and
occupied insignificant places. It was so late as 1850, when the first attempt
to form a water-color association was made in this country by a few well-
known designers and engravers. A class was formed, and in December, that
year, the first "Society of Painters in Water-Colors" in the United States
was organized. It was a failure, and nothing more was done in that direc-
tion until in 1866, when the Artists' Fund Society, in New York, made a
special feature of that branch of art, in their annual exhibition held in the
National Academy of Design. The public were delighted with the display,
and a number of artists started a movement for the organization of a new
water-color society. Such an association was organized at near the close of
1866, and its first exhibition was held in the galleries of the National Academy of Design the succeeding winter. Delighted visitors crowded the galleries, admired, but did not buy. Prejudices had to be overcome, and they were speedily overcome. During the six weeks of the exhibition of the Society in 1874, pictures were sold to the amount of $20,000.

The art of Sculpture in America is assuming an importance and an excellence that promises successful rivalry with that of Europe, in the near future. It has become popular, and the demand for statuary, especially in portraiture, is rapidly increasing. There is a healthy idea taking possession of the public mind, that the best monument that can be erected in honor of a hero, a statesman, or a philanthropist, is his likeness in stone or brass; and it is pleasing to think that good taste will not much longer tolerate the heathen practice of piling up a heap of stones as such a memorial.

Sculpture was almost unknown to our people a hundred years ago. At the time of the declaration of independence, there were only four statues in this country, namely, that of Lord Botetourt, at the College of William and Mary, in Virginia; the equestrian statue of King George the Third, in the Bowling Green, in New York; a statue of William Pitt, at the intersection of Wall and William streets, in New York; and a statue of the same statesman in Charleston, South Carolina. That of Botetourt, and the two of Pitt, were made of marble, and that of the king was of lead. Only the statues of Botetourt, at Williamsburg, and of Pitt, in Charleston, are preserved. That of the king was melted and run into bullets by the republicans to fight his armies with; and the one of Pitt that stood in New York, had the head and arms broken off by the British soldiery when they occupied that city. These statues were all made in Europe.

For many years after the Revolution, statuary was not popular in the United States, and no native sculptor of much eminence appeared before Horatio Greenough and Hiram Powers, about forty years ago. Greenough produced the first marble group executed by an American. It was "The Chanting Cherubs," made for James Fenimore Cooper.

Until within thirty or forty years, there was a prudish feeling in this country that made nude statuary an abomination. So sensitive were the ladies of Philadelphia concerning the antique figures displayed at the exhibitions of the Academy of Art, that one day in the week was set apart for the visits of the gentler sex only. As the delineation of the human figure in marble, as it came from the hands of its Creator, employs the highest skill of the sculptor's art, Greenough and Powers had to wait long for the chaplet of fame which their countrymen finally placed on the brow of each. Happily for art, this prudery has now almost faded out.

Greenough and Powers have passed away; so also has Thomas Crawford, whose genius equalled that of either of the two just named, in origin-
ality and power, as his Washington monument, at Richmond, his bronze figure of Liberty that surmounts the dome of the National Capitol, his colossal marble figure of The Last of his Race, in the vestibule of the library of the New York Historical Society, and the Peri in that library hall, attest.

Among the older of our living sculptors, are Henry Kirke Brown, Erastus D. Palmer, Thomas Ball, Clark Mills, and W. D. Story, the latter a son of Chief-Justice Story, who has resided in Rome since 1848. At the head of the younger members of the profession stands J. Q. A. Ward, a pupil of Mr. Brown. Besides these we have Randolph Rogers, J. T. Hart, Launt Thompson, John Rogers, and J. A. Bailly, and Misses Harriet G. Hosmer, Emma Stebbins, Margaret Foley, and Vinnie Ream. John Rogers has become famous for his admirably executed statuette groups, which illustrate our history and social life. These are extremely popular. His chief contribution to art for the Centennial year, is a fine single figure of Washington, after Houdon, and is a most faithful likeness.

Marble statuary cannot long endure the effects of our climate, in the open air, without injury to the surface, and it is becoming a prevailing practice to make figures to be so exposed, of bronze. The casting of bronze statuary is a comparatively new industry in our country, and has grown up within a quarter of a century. It was introduced by Mr. Brown, the sculptor, in the year 1848. He went, that year, to Mackinaw, for the purpose of making drawings and models of Indians who came there to receive their annuities from the government. On his return to New York, he cast several of these models in bronze. Some of his friends requesting duplicates of them, he made several sets.

The following year Mr. Brown was commissioned by the Art Union in New York, to make, in bronze, twenty-one casts of an Indian Hunter. This led to a similar order the following year (1850) for a statuette; and soon afterward he received a similar order for a life-sized bronze statue called "The Angel of the Resurrection," which is now in the Alleghany cemetery at Pittsburgh, Pennsylvania. Meanwhile he had made numerous small works in gold, silver and bronze, which were cast in his own studio; but finding that bronze-founding was opening a business which, if pursued further, would interfere too much with his profession as a sculptor, he abandoned it, and transferred his workmen to the Ames Manufacturing Company, at Chicopee, Massachusetts, where his colossal statue of De Witt Clinton was cast; also the equestrian statue of Washington, now in Union Square, New York, and several others of his productions, that Company having made the casting of works of art in bronze a special part of their business from that time.

Clark Mills, aided by the national government, afterwards established a
foundry near Bladensburgh, a few miles from Washington city, where he cast his own works, and Crawford’s statue of Liberty. Within a few years Robert Wood and Company, of Philadelphia, (see page 221) have been successfully engaged in the business of casting works of art in bronze, equal in excellence to any made in Munich. They have cast five of Brown’s works, six of Thompson’s, four of Bailly’s, and several others.

We have many skillful artists who are better known as designers of vignettes and draughtsmen for engravers on steel and wood. At the head of the first division of this class of living artists, stands A. B. Durand, the veteran line engraver and excellent landscape-painter. At the head of the present designers of vignettes for bank-notes and for other engravings on steel and wood, for the illustration of books, F. O. C. Darley holds the first place. His works are very numerous, and universally admired. Caricature is a branch of art in high favor with the Americans; and Thomas Nast is the foremost artist in that line. The vigor of his satire, the versatility of his thought and invention, and his wonderful facility in execution are most remarkable.

Engraving, like painting and sculpture is an ancient art, especially seal-engraving and the cutting of cameos for stamping plastic substances. In the Egyptian collections of the New York Historical Society is a pure gold signet ring, made 600 years before the time of Joseph, as exquisitely wrought in intaglio as any die-sinker could do it now. Herodotus tells us of a map of the world engraved on a plate of brass 500 years before Christ. The Chinese claim to have printed from engraved wood blocks a thousand years before Christ; but the art of engraving, for printing on paper, was not known in Europe before the fourteenth century. Early in the fifteenth century it was practiced in Germany, and led to the discovery of the art of printing with movable types.

In metal engraving plates of copper were used until early in the present century, when Jacob Perkins, of Newburyport, Massachusetts, discovered a method of decarbonizing steel so as to make engraving upon it possible. It gradually took the place of copper, and now all metal engravings of a fine character are made on steel.

In our country the graphic art is only a little more than a century old. Nathaniel Hurd, of Boston, made some creditable engravings on copper before the Revolution. In 1762, he engraved and published a caricature, and in 1764, a portrait of Rev. Dr. Sewall. He is spoken of by a contemporary writer as possessing a “Hogarthian talent” in art and humor. Paul Revere, an artist inferior to Hurd, engraved a portrait of Dr. Mahew in 1766; a caricature in 1768, and a picture of the “Boston Massacre” in 1770. He was also employed in engraving the plates for the Continental money. Amos Doolittle engraved scenes connected with the skirmishes at Lexington
Illustrations of a higher order from the hands of American engravers were put in an edition of Josephus's *History and Antiquities of the Jews*, published by William Durell, in New York, in 1791. The names of the engravers were C. Tiebout (the first American engraver who went to England for instruction), Tisdale, Rollinson, Allen, Doolittle, Tanner and Anderson. The latter was the late Dr. Alexander Anderson, then only sixteen years of age, who was the first who engraved on wood in this country.

Engravings on copper and steel of the highest degree of excellence, have been produced in the United States, within the last sixty years. The most eminent American line engraver of that period, is Ashur B. Durand, one of the founders of the National Academy of Design, and yet living at the age of eighty years. His engraving of Trumbull's picture of the "Declaration of Independence," first brought him into notice; that of Vanderlyn's "Ariadne," is considered one of the best line engravings ever produced in our country. Mr. Durand abandoned engraving in 1835, and has since devoted his art-life to landscape painting.

The art of engraving on steel has been carried to the highest perfection in this country by the bank-note engravers. By a combination of mechanical ingenuity and artistic skill, the art of bank-note engraving is now so perfect, that counterfeiting is almost impossible. It is now carried on in this country by three companies in the city of New York—the "American," the "National," and the "Continental." A large part of the bank-notes, bonds, and postage and revenue stamps used by many of the principal nations of the world, including our own, are made by these corporations.

I have said that Dr. Anderson was the first engraver on wood in this country. He had copied in type metal about one-half the illustrations of *The Looking Glass for the Mind*, in 1794, when he saw specimens of the celebrated Bewick's engravings on wood. It was a new revelation to young Anderson, then nineteen years of age. He tried wood as a substitute for type-metal and succeeded. From that time until a few months before his death, in 1870, when he was nearly ninety-five years of age, Dr. Anderson (who had studied for a physician in his youth and received the honorary title of M. D. from Columbia College) practiced the art of wood-engraving, a period of about seventy-five years. His last finished work, completed just before his ninety-fourth birth-day, is in possession of the writer.

For more than thirty years, Dr. Anderson had only two or three fellow craftsmen in his art; two of whom, Lansing and Morgan, were his own pupils, and for the first quarter of the present century he made nearly all the wood-cut illustrations for books published in this country. He made the earlier pictures for Webster's Spelling Books, and the first tract sent
forth by the "American Tract Society," entitled "An Address to the Christian Public," was decorated with an effective vignette on the title-page from his hand, and was followed by a host of others in a long series of several hundreds illustrated by him. Dr. Anderson was even tempered, abstemious, and exceedingly regular in all things. He once said to the writer, "I would not sit up after ten o'clock at night to see an angel." He lived a pure, simple, blameless and useful life, which was crowned with great "length of days."

Wood-engraving was not much practiced in our country in the illustration of books, until within the past thirty or forty years. Forty years ago there were not more than a dozen engravers on wood in the United States; now their number probably is more than 500, the best of whom equal in skill the best of those in Europe. Books, newspapers, all kinds of publications are now illustrated by wood-engravings, and the power of this art, as an implement for popular education, is incalculable.

Other processes for producing pictures that may be typographically printed like wood-cuts have been discovered within a few years. Among the earliest of them was "Cereography," discovered by Sidney E. Morse, but which was never carried much beyond outline, such as maps. The photographic process has more recently been combined with these discoveries, and now a kind of stereotype plate is made from drawings or from engravings on wood or steel, in the most perfect manner in fac simile with great expedition and at a very cheap rate, that may be printed typographically. A daily illustrated newspaper called The Graphic is now published in New York, many of the illustrations of which were in the artist's brain only a few hours before the publication.

Lithography is an older process for producing pictures for printing without engraving. It was first successfully practiced by Aloys Senefelder, in Munich, at the close of the last century. Earlier than his discovery of the art a process for making pictures by the use of stones was invented. In 1728, Dufay, a member of the French Academy of Sciences, described a method which he had employed for producing a relief picture on stone. He made a drawing on the surface of a polished slab of stone, with varnish, and used an acid to cut down the part of the stone unprotected by the varnish, leaving the lines raised like those of a wood engraving. In this way, it is said, he produced some exquisite results. A similar method was invented by William Blake, an English painter, in 1788. Blake declared that the knowledge was spiritually taught to him. He used plates of copper, instead of stone, and succeeded very well.

It is also said that Senefelder made his discovery almost by accident. Too poor to pay for the engraving of his own works of art, he attempted to reproduce them in relief, himself, on stone, a cheaper material than copper,
by having that substance eaten away by aqua-fortis. He was ignorant of
the composition of the varnish used by engravers for etching ground, and
knew nothing of Dufay's experiments. He compounded a crayon, made
of wax and tallow, colored, and with this greasy substance he prepared
to make his drawing. One day his mother wished him to write a memoran-
dum of some clothes she was about to send to a laundress. Not having paper
and ink at hand, he wrote the list on his prepared stone, with his greasy
crayon. When he was about to clean off the stone he discovered the
process by which lithographic pictures proper are now made, namely, making
the drawing on a polished stone slab with a greasy crayon that will repel
water and receive a greasy ink. The stone is wet with water, when the ink
is applied and adheres only to the drawing for which it has an affinity.
The white paper is laid over the whole, and being submitted to a heavy
pressure, receives the ink from the drawing and absorbs the water on the
stone. So a fac-simile of the drawing is transferred to the paper.

The art of Lithography was introduced into America in 1821, by Messrs.
Burnet and Doolittle. It steadily gained in favor as a cheap method for
multiplying pictures. At length chromo-lithography made its appearance
and is now very extensively used in ornamentation; also with great success
in making copies of oil paintings. In this process as many as thirty or
forty colors have been used in the production of a picture, one color be-
ing sometimes printed over another in making various tints and shades
of tints. This art has been brought to great perfection in Europe
and here. Some of the productions of Louis Prang, of Boston, appear to
be equal in excellence to most of those of London, Paris, and Vienna.
This art was introduced here, about thirty years ago. These "chromos" as
they are called, are now made with such perfection, that only an expert may
detect the copy from the original when they are standing side by side. It
is said that the first successful attempt made in the United States to ac-
complish this object, was by E. C. Middleton, in Cincinnati, before the
year 1866.

Photography is one of the wonders of art and science. As its name
implies, it is delineation by light. The Sun is the artist directed in its per-
formances by Man. The principle was known to the alchemists of the
middle ages, but the first steps toward its practical application in the pro-
duction of pictures was made by Daguerre, in France, simultaneously with
the perfecting of Morse's Electro-magnetic Telegraph. The researches and
publications of Dr. John W. Draper of New York, concerning the chemical
action of light, had led to this result.

The operations of the daguerreotype, as the product of Daguerre's instru-
ment was called, were limited. The scope was soon much enlarged by the
labors of Talbot in England and Dr. Draper in the United States. In this
country Dr. Draper took the lead in the expansion of the daguerreotype process, into that of the photographic. A negative was produced upon a translucent ground. By that means the picture of the negative could be indefinitely multiplied; and then the triumphs of photography began.

The influence of this discovery in the realm of art has already been wonderful. It has expelled miniature painting and largely the painting of life-size portraits. It enables the man of moderate means to possess a whole gallery of perfect copies in form if not in color, of the best productions of ancient and modern masters of art in all its departments. It promises to supersede the more toilsome and expensive process of engraving on copper and steel; and photo-lithography is reproducing rare books in the greatest perfection. The most ancient Greek manuscript of the New Testament, discovered at Mount Sinai by Tischendorf, has been photographed in four large volumes, folio, at the expense of the Emperor of Russia; and the British Government has caused the "Domesday Book" to be multiplied by the same process.

Photography is lending powerful aid to science; and to social life it has become an almost indispensable friend. It is evidently yet in its infancy; what it will be in its full maturity we may only conjecture. The art is practiced, as one of our industries, very largely, and is rapidly extending. In 1870 there were nearly 1,100 photographic establishments in the United States, and employing nearly 3,000 persons, of whom 450 were women and girls. There were about $2,000,000 capital invested in the business, and the product that year was valued at about $3,700,000. Probably an addition of one-fifth might be made to these figures, in giving the present state of that industry.
CHAPTER XLVII.

POETRY has never been cultivated in this country as a profession, and we have no poet-laureate officially crowned as originally in Germany and now in England. Here poetic composition is the solace and amusement of persons of genius, and not a special vocation; and our poets have all been and are men engaged in other pursuits. Freneau was a merchant, navigator and editor; Trumbull was an active lawyer; Dwight was a laborious clergyman and school-teacher; Humphreys was a soldier, diplomatist, manufacturer and farmer; Hopkins was a physician in extensive practice; Barlow was a soldier, bookseller and merchant; Sprague was a merchant and banker; Bryant has been almost a life-long editor of a daily newspaper; Longfellow a college professor, and Whittier a farmer and editor. We have already briefly considered the poets and poetry of our country.

The drama has been from time immemorial the most cherished and attractive amusement of the more refined people. It seems to have been coeval with painting and sculpture, portraying the sayings and actions of men. Traces of it may be found among the most barbarous nations, ancient and modern; but in Greece it first received symmetry of structure. At first it consisted only of odes recited, songs chanted, and dances performed. So Æschylus found it 500 years before Christ, and out of these crude materials he created the drama as we now have it, divided into tragedy and comedy. He banished the bacchanalian lewdness of the song and dance, introduced dialogues and invented scenery and costume. He created the histrionic art; and in the persons of himself, Sophocles and Euripides, who were contemporaries, were seen the three greatest tragic poets the world has ever produced.

From the Greeks the Romans derived the drama, and they added Farce to Comedy and Tragedy. The pure drama was too refined for the coarser dwellers in Italy, who did not enjoy intellectual pleasures: they preferred a gladiatorial combat to the most exquisite composition of the Greek poets. During the midnight that shrouded Europe after the downfall of the Roman empire, and through the brighter Middle Ages that followed, the drama existed in modified forms, sometimes to the scandal of the Church; and finally in the time of the later Henrys and Elizabeth, histories began to be
written for the stage, and the era of Shakespeare dawned upon the world. Then the drama took a shape and substance, that has not since been surpassed in the soundness of its instruction and the healthfulness of its influence.

The early English settlers in America regarded the theatre as an abomination, and the drama, even in books, as of doubtful morality because it was allied to the play-house. The consequence was, that until the middle of the last century, the masses of the American colonists no more suspected the existence of the nuggets of wisdom that lay concealed in the dramas written from the period of Elizabeth to that of the Second George, than they did the mines of precious metals in California or Nevada. We have no record of a dramatic performance in America until about twenty-five years before the Revolution, though there was a play-house in New York, (where there was greater latitudinarianism than in some of the other colonies) as early as 1733. We have briefly noticed on page 51 the histrionic movements here down to the close of the Revolution.

After the Revolution efforts were made to revive the performance of the drama, in the young Republic. Hallam, who had gone to England, returned, and in March, 1785, opened the theatre in Philadelphia. The press praised the performance, and one of the newspapers expressed a hope that “Shakespeare, Addison and Young might be permitted once more to enforce on the citizens the love of virtue, liberty and morality.” To commend the theatre to the public, it was stated that the actors had given £100 to the poor of the city. But the players (a feeble company) were coldly received, and they soon went to New York.

The advent and departure of Hallam’s company gave rise to an interesting debate in the Legislature of Pennsylvania, elicited by a proposition to prohibit theatrical performances in that province. It was contained in a bill for “suppressing vice and immorality.” General Anthony Wayne, the hero of Stony Point, opened the debate in opposition to the bill, asserting that a well-regulated theatre was universally acknowledged to be an efficient engine for the improvement of morals. Robert Morris also boldly declared himself to be a friend of the theatre. So also did Mr. Clymer, another of the signers of the Declaration of Independence, who said, “No civilized state is without a theatre; it serves to refine and purify manners.” Dr. Logan felt that it might be dangerous to civil liberty, and cited the case of the prohibition of the theatre by the government of Geneva as “inimical to their liberties,” also that the kings of France and Sardinia had endeavored to establish a theatre in Geneva to subvert the republic. Mr. Smiley thought that by “drawing the minds of the people to amusements, they were led to forget their political duties.” Mr. Finley saw in a theatre regulated by government, a “dangerous tool in their hands.” General Wayne thought that the pro-
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hibition of plays during the war, by Congress (see page 51), “was an ill-judged measure, as plays might have been represented that would have stimulated to heroic action.” The clause in the bill was rejected.

This debate indicated the state of public feeling at that time concerning the moral status of the theatre. It has gone on privately ever since, and the division of sentiment has been seen in our day, as great as in Philadelphia society, ninety years ago. Then, however, the plays were not always chaste, and sometimes vulgarity passed for wit; and there was much incongruity in the appointments of the stage. Dunlap says he saw John Kemble play the Moor (with his sister, Mrs. Siddons, as Desdemona) in a scarlet British military suit, with white silk stockings, his face blackened, and his hair queued in the fashion of the day. The scenery was wretched, and often inappropriate; the play-houses were small affairs, dimly lighted, and badly ventilated; and, as a rule, the moral lessons to be drawn from the drama were not inculcated in the theatres. The dramas were all of foreign origin; and the characters in them and the actors on the stage were all of transatlantic birth. It was not until the closing decade of the last century, that a native American actor was seen on the stage; it was in the person of John Martin, of New York.

Attempts to popularize the theatre by giving it a tone of nationality, were failures. Royal Tyler, of Boston, wrote a comedy called "The Contrast," purely American in characters and scenery, and it was performed in 1786. It was the first drama written by an American, that was presented on the stage. Godfrey's "Prince of Parthia" had been published in 1765, but had not been acted. Tyler's play was deficient in plot, dialogue and incident, and it soon disappeared from the boards. His farce called "May-day, or New York in an Uproar," brought out the next year, had the same fate. In 1789, William Dunlap's comedy "The Father," was presented on the stage in New York, and met a similar destiny. Colonel David Humphreys translated from the French, the tragedy of "The Widow of Malabar." It was acted a few times in 1790, and was soon forgotten. A tragedy called "Bunker Hill," written by John Burk, the historian of Virginia, was very popular in Boston for a time in 1797, because of the local interest it excited. A writer of the time said "it is the most execrable of the Grub street kind," and "to the utter disgrace of Boston theatricals has brought them full houses." Attempts have since been made by Americans to produce dramas, but the Republic has not yet presented to the world of letters a really great dramatic writer.

At the beginning of the present century, the theatre in this country and abroad had immoral features in its management which the greatest purity in the dramas performed could not counteract; and this state of things continued until about thirty years ago when public sentiment demanded reform,
and it was effected. The severest denunciations of the theatre as a focus of vice, were justified; and the drama, which may be one of the brightest of intellectual and moral amusements, and a school of instruction to be cherished by a religious people, was utterly debased by the vicious associations with which it was compelled to appear. And it is within a much shorter period of time that the popular drama in its presentation on the stage, has been pruned of much that was objectionable; and now no respectable or sensible theatrical manager will present upon the stage, in word or deed, aught that is offensive to morals or shocking to good taste.

The most useful and most successful of the theatres in our country, are those of comparatively small dimensions. The presentation of the drama is more perfect in a small theatre than in a large one. The audience is brought nearer to the actors, and the latter are not compelled to make grimaces in expressing passions by the face, nor to speak in unnatural tones. Everything appears more in accordance with nature, to the audience. There is no overstraining of the attention which produces weariness, but there is real enjoyment of the play. By these means, and the purity of the drama performed, the "refinement and purification of manners," spoken of by Clymer, are fully obtained.

The Fifth Avenue Theatre in New York city, under the management of Mr. Augustin Daly, a native of North Carolina, and yet a young man, may be presented as a model play-house in our country at the present time. As a dramatic critic writing for the daily press, Mr. Daly became familiar with the excellencies and deficiencies of the theatres; and when, in 1869, he established the Fifth Avenue Theatre on Twenty-fourth street, near Broadway, he introduced radical improvements. His theatre was burned on New Year's day, 1873, and on the 3d of December, the same year, his present superb theatre was opened on Twenty-eighth street, near Broadway. It is admirably constructed for good acoustic effects, and the comfort, convenience, and safety of the audience; and it is lighted by clusters of gas-burners within porcelain globes, which make them pleasant to the eye. The whole theatre is decorated in good taste.

The seating capacity of the Fifth Avenue Theatre, in parquette and two galleries, is 1,500, and there is an average attendance the year round, of 750. The dimensions of the stage are 45 by 60 feet; the number of the orchestra is 15, and the average number of the performers is 43. The cost of the building and furnishing was $250,000; the annual expenditures are $175,000, and the annual receipts $225,000. The whole number of persons employed—actors, supernumeraries, help, et cetera—is about seventy.

At the time when Mr. Daly established the Fifth Avenue Theatre, the New York stage was, from the nationality of its managers and their predilections, almost exclusively English in tone. Mr. Daly perceived that some
Interior view of
Augustin Daly's Fifth Avenue Theatre, New York.
of the flashy and not altogether moral performances on the stage then drew full houses for many nights continuously. He believed that the attraction was largely due to the elegant stage costumes and exquisite scenery employed, and he conceived the idea that similar accessions to perfectly unexceptionable plays would draw full houses. He also conceived the idea that the creation of an American drama, to be performed by American actors, was not only desirable, but would be acceptable, and he tried the experiment suggested by these ideas, and succeeded admirably. With great skill and industry, Mr. Daly remodeled old plays, fitting them for our country and time, and wrote new ones of the same character, which at once became very popular, some of them having been performed from 100 to 150 nights in succession, to delighted audiences. One of these ("Divorce") ran 300 successive nights. "Pique," a play with the scenes laid in New York and New England, and in which there is not an objectionable word or act, was begun in December, 1875, and at the time of this writing (late in June, 1876) has been performed over 200 times in succession. The theatre is well filled every night, at high prices, by intelligent and respected citizens. This fact attests the agreeable truth that refinement and morality are now essential in making the theatre popular with the better classes of society.

The Opera, a species of drama in which vocal and instrumental music form the most conspicuous part, in connection with acting and stage accessories, is now very popular in Europe and the United States, and affords an opportunity for the popular enjoyment of the most scientific music. It has superseded the grand Oratorio, which thirty years ago, gave exquisite delight and spiritual instruction to the souls of men.

When we think of Music as a divine means for the elevation of human character, and that it may touch a sympathetic chord in every human bosom, we may well seriously ponder the question whether, within the last forty years, we have not retrograded—stripped music of much of its usefulness as a spiritual educator, by giving it the operatic form, which very few persons can really comprehend. The simple songs of other days are now seldom heard in our land; and the confident assertion: "Let me make the songs of a people, I care not who makes the laws; I will govern," has very little significance now. The Opera form of music has invaded our church choirs, usurped the realm of the sweet melodies of the olden times, and made congregational singing, so desirable in real worship, almost impossible. And the sweet psalms and hymns sung so clearly by our ancestors, are now so smothered by vicious musical enunciation, that it is almost impossible to follow the words of a choir of singers without a book. This habit justified the one who wrote on the fly-leaf of a psalm book in a church:
"Could old King David but for once
To this good house repair.
And hear his psalms thus warbled forth,
Good gracious, how he'd swear!"

There was very little musical culture in our country a hundred years ago. Very few persons possessed a spinet or a harpsichord, and the piano was unknown here. The spinet and harpsichord have passed into oblivion, and the piano is now found in almost every well-to-do family in the land. It has had a decided influence upon musical art wherever it is known, through the composers for that instrument. About 1840, Thalberg first composed dramatic music for the piano, and has been followed with brilliant success by Rubenstein, Clara Schumann, and Von Bulow, in Europe, and in this country by Frederick Louis Ritter, Professor of Music at Vassar College. The divine art of music should be cultivated as widely as possible, especially in its more simple forms, as a refining, humanizing power, whose mission is to promote the amenities of life, sweeten the temper, still the passions, and make mankind better and happier.

The manufacture of musical instruments is quite an extensive industry in our country. In 1870, there were 156 establishments engaged in making piano-fortes; 76 in making organs and materials; 22 in constructing melodeons, house-organs, and materials, and 83 in making other musical instruments. These various establishments employed, in the aggregate, 7,167 persons, to whom $5,107,291 were paid in wages. There were $9,554,761 capital invested, and the annual product was about $14,000,000.

A hundred years ago, as now, society here was composed of a variety of religious denominations, consisting of Baptists, Congregationalists, Dutch Reformed, Episcopalians, Lutherans, Methodists, Presbyterians and Roman Catholics. The denominational lines were then more sharply drawn than now, for there was much sectarian zeal and not a little bigotry.

The record of the Baptists in this country is a noble one. In the colonial period they were often persecuted in various places, but they were never persecutors in turn, for at the very foundation of their organization lay the great principle of religious liberty. These disabilities retarded the expansion of the denomination, and a few years before the breaking out of the Revolution there were only fifty-five Baptist churches in America. But when the results of that revolution gave free scope to religious liberty, the Baptists rapidly increased; and less than ten years after the war there were a thousand churches here. To the influence of the Baptists, it is said, we are largely indebted for the first amendment to the National Constitution, guaranteeing religious freedom to every citizen.

The Baptist denomination is now subdivided into Associated, Old School, Six Principle, Seventh Day and Free-will Baptists. These all agree in the
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fundamental idea concerning baptism, that it is only valid by actual immersion. There is now still another sub-division, called Open Communion and Close Communion Baptists, the latter refusing to partake of the Lord’s Supper with professing Christians who have not been immersed. The whole number of Baptists in the United States at this time, included in church membership, is probably about 1,600,000, having nearly 20,000 church organizations, 1,800 edifices and as many ministers, and almost 5,000,000 sittings. Their church property is valued at nearly $50,000,000. The increase of the Baptists far outruns that of our population.

The Congregational church, an organization that maintains the independence of each congregation of Christians, and their sufficiency to perfect and preserve their own organization, was early established in the English-American colonies. There is really no Congregational church as representing the great body of that denomination, but a collection of Congregational churches. They have, however, like individuals, formed associations of churches.

The root of Congregationalism may be found among the movements that gave birth to the Puritans in Queen Elizabeth’s reign. The Separatists and the Non-conformists nurtured the principle, and the “Pilgrims” who came from the church of John Robinson in Holland (who has been called the “Father of Modern Congregationalism”), brought that system of church government to America. Congregationalism might properly have been called the “State church organization,” in New England, at the period of the Revolution, for it almost universally prevailed in that region.

There are now, in the United States, nearly 3,000 Congregational organizations, with about 2,850 edifices, 1,200,000 sittings, and a church membership of about 350,000. In the Sunday schools of that denomination are almost 400,000 pupils; and it sustains or takes an active part in several colleges and missionary enterprises. It publishes several periodicals, embracing four quarterly and seven weekly. The collective church property is valued at nearly $30,000,000. Formerly the Congregationalists were associated with the New School Presbyterians in the American Board of Commissioners for Foreign Missions, but the union was lately dissolved and that board is now under the control of the Congregational churches.

The doctrines and order of the Reformed Dutch church were settled by a Synod held at Dort in 1618, after which the church was carried with zeal from Holland into all the Dutch colonies East and West. It was introduced into New Netherland (now New York), in 1628, by Rev. Jonas Michaelis, who organized a consistory at Manhattan and administered the sacrament. He was succeeded in 1633 by Rev. Everardus Bogardus, who caused the first church edifice built by that denomination in America, to be erected on what is now Broad street, New York. Bogardus married the widow
Anneke Jansen, whose farm in the city of New York now belongs to Trinity church.

The progress of the Reformed Dutch church in America was slow, after the English took possession of New Netherland. In 1763 the English language was first used in its pulpit; and down to the end of the first quarter of the present century, the Dutch and English were both used, as occasion seemed to require, in most of the pulpits of that denomination. The minutes of the General Synod were first kept in English in 1794.

A separation from the ecclesiastical control of the Church of Holland took place in 1771. At the close of the Revolution a General Synod was formed. Already Queen's College (now Rutger's) had been chartered, for the perfection of young men for the ministry, and from about the close of the last century the growth of that denomination in the United States has been steady. At a meeting of the General Synod at Geneva, New York, in June, 1867, it was voted to drop the word "Dutch" from the title of the church, and it is now known as the "Reformed Church." A revised constitution was adopted in 1874, when the number of communicants was nearly 70,000. The number of church organizations was 490; of edifices 475; of sittings about 230,000, and the value of its property about $1,000,000. Of the 490 organizations over 300 were in the State of New York.

The Episcopal (Protestant) Church in America derives its origin from the Church of England. It was regarded by the Puritans, who settled in New England, as a persecutor, and it found very little favor there. Propositions to establish an Episcopacy in America were warmly opposed; and there was no bishop of the Church of England here until 1784, when Samuel Seabury, D. D., was consecrated bishop, at Aberdeen, having been chosen to that high office by the Episcopalians of Connecticut. In 1782, a plan was formed for the establishment of an independent church in America, and such an organization was effected in 1785, at a convention held that year, when a petition was sent to the English church asking for the consecration of bishops for the American church. William White, D. D., of Pennsylvania, and Samuel Provoost, D. D., of New York, had been respectively chosen to fill the office, and they were consecrated at Lambeth Palace Chapel in February, 1787. In 1790 James Madison, of Virginia, was consecrated at the same place.

The English prayer-book, altered to meet the changed political circumstances of this country, was set forth in its present form, in 1790. Until 1835, the dioceses of the Protestant Episcopal church in America corresponded with the number and extent of the several States; then on account of the increase in the population, divisions of dioceses began. Now there are five dioceses in New York, two in New Jersey, three in Pennsylvania, and two in Maryland. The church has now fifty organized dioceses, which
are associated in a general convention that meets once in three years, consisting of all the bishops in the exercise of actual jurisdiction, and clerical and lay delegates.

The church has now nearly 3,000 organizations, with about 2,550 edifices, and 1,000,000 sittings; and it holds property valued at over $37,000,000. The number of communicants is about 250,000, and the number of "priests and deacons"—authorized ministers—is nearly 3,000. Its annual collections and disbursements, chiefly in support of the poor and missions, are over $6,000,000; and its gain in membership is from twenty to thirty per cent. above the increase of the population of our country since its organization.

This church had always enjoyed a remarkable degree of unity, until 1873, when an organization known as the "Reformed Episcopal Church" separated from it, under the leadership of Bishop George David Cummings, D. D. At the end of the first year after its organization it had forty ministers, thirty-six churches and more than 3,000 communicants in the United States. It has since spread into Canada.

The Presbyterian church, in the United States, was founded by Francis MacKemie, a zealous Scotch-Irishman, toward the close of the seventeenth century. It was made up of many elements and bore different names; but in 1716 it was sufficiently consolidated to form a synod. Controversies disturbed it, and after the appearance here, about 1740, of George Whitefield, parties were formed which were soon known by the name of the Old Side and the New Side, the latter insisting most on vital piety as the best qualifications for a minister, and the former demanding educated men to fill the pulpits. The denomination was split; two synods were formed, and that of the Old Side established the College of New Jersey, at Princeton, to educate young men for the ministry. So the church stood at the period of the Revolution, both parties continually increasing in number.

After the Revolution the standards of the church were revised, the Westminster Confession of Faith was adopted, and the form and government of the Scottish church, with slight modifications, were chosen for the Presbyterian church in the United States. At the beginning of this century, there was a great secession in Kentucky and Tennessee, and the body known as the "Cumberland Presbyterians" was formed who, in 1875, had 25 synods, 110 presbyteries, 2,250 congregations, 1,250 ministers, and 100,000 communicants. There was another secession in 1838, when the Old and New School Presbyterians presented separate organizations, but they were united in 1871.

The civil war caused the formation of a Southern Presbyterian church, separate from that of the North, which still continues. But all are flourishing. The aggregate number of Presbyterian organizations now, in the United States, is probably about 8,000, with more than 7,000 edifices, 2,730,000 sittings, and property valued at full $55,000,000.
The Methodist church, founded by John Wesley, first took root here when some disciples of the founder came to New York from Ireland in 1766, and were formed into a class by Philip Embury, who was assisted by Captain Webb, a British officer, whom Wesley had ordained a local preacher. Wesley sent two missionaries to America in 1769, who began the work with vigor; and in 1771 Francis Asbury was sent to superintend the entire work. The first Methodist conference was held in 1773, which consisted of ten preachers all of foreign birth.

The Methodist Society in America was nearly extinguished during the Revolution, but it revived in full vigor immediately afterward. At a conference of sixty ministers, held in 1784, the Episcopal form of government was adopted, and the Episcopal office was made elective. The church spread rapidly, and it was the first to officially recognize the National Constitution and to give a pledge of loyalty to the States. In 1812 the church in the United States, which numbered only five members in 1766, had 195,357 members, and 688 preachers. Until 1872 the general conference was composed exclusively of preachers. Then a lay element was introduced, and laymen are now members of that body.

In 1789, the Methodists established a Book Concern, on a borrowed capital of $600; now that interest employs a capital of about $1,500,000. They have numerous schools, and the value of their school property is $8,500,000. They have 13 bishops; 80 annual conferences; about 11,000 itinerant preachers; 19,000 Sunday-schools, and a membership of 1,400,000. They have nearly 22,000 church edifices, and 7,000,000 sittings; and their church property is valued at about $80,000,000.

The earliest settlement of Lutherans within our domain, was made in New Netherland about the year 1626. When Penn's charter for Pennsylvania was given, large numbers settled in that province. They also went to Virginia and Georgia; and two or three years after the first synod was held, at the middle of the last century, there were forty congregations, and a total Lutheran population of 60,000. They were numerous at the period of the Revolution, and have much increased since. In 1875, there were 53 synods, 2,546 ministers, 4,595 congregations, 560,000 communicants, and about 1,000,000 sittings. The value of their church property was estimated at $15,000,000; and they have founded and support many institutions of learning.

The German Reformed church in the United States is an off-shoot of the Reformed church of Germany. It was planted in this country by Rev. G. M. Weiss, who, with about 400 Palatines, settled in Montgomery county, Pennsylvania, in 1727. In 1870, there were 1,256 societies, 1,145 edifices and about 432,000 sittings.

The Friends or Quakers, who appeared in England at about the middle of
the seventeenth century, suffered much persecution in Massachusetts and elsewhere, late in that century. When the province of Pennsylvania, founded by one of their number, was established, a great many settled there, and held the political control of the State down to the period of the Revolution. At that time they were numerous, also, in New Jersey and Rhode Island. There were not a few in New York, and they were everywhere noted for the purity of their lives and good citizenship.

The Friends, like other sects in our country, have had divisions. About fifty years ago there was a separation into two bodies, one called "Orthodox," the other "Hicksites." The latter were followers of Elias Hicks, whose doctrines savored of Unitarian theology. But the separation never extended beyond this country, where it is still maintained. The whole number of Friends in the world, it is estimated, have not, at any time, exceeded 200,000, of whom about 100,000 are in the United States, at this time. In 1870, there were 692 congregations; 662 meeting-houses, with nearly 225,000 sittings; and the value of the society's property was estimated at about $4,000,000.

The Roman Catholic church is a mighty power in the world. The footsteps of its children were seen among the earliest of the pioneers in this country. They built a church at St. Augustine more than 300 years ago, and they established the first convent in New Orleans, in 1727. The first cargo of wheat sent down the Mississippi from Illinois, was raised at a Jesuit mission. The Jesuits first cultivated the sugar-cane in Louisiana; and the latest survivor of the signers of the Declaration of Independence was a Roman Catholic, Charles Carroll, of Maryland. His cousin, Rev. John Carroll, was the first Roman Catholic bishop consecrated for the United States, in 1790, and the first bishop consecrated in the United States, was Rev. Leonard Neale, in the year 1800. The first Roman Catholic Diocesan Synod was held at Baltimore, in 1791.

Under the influence of the perfect religious freedom which our national constitution guarantees to every citizen, and by the operation of our liberal naturalization laws, the Roman Catholics have rapidly increased in our country. At the close of 1874, there was claimed to be a Roman Catholic population of 6,000,000. They had 7 archbishops, 53 bishops, 4,873 priests, 4,871 churches, and 1,902 chapels, with about 2,000,000 sittings. Their church property was valued at $61,000,000.

There were Moravians or "United Brethren" here in considerable numbers, at the period of the Revolution. They were principally of the Teutonic race, very exemplary in their lives, and earnest Christian workers in the foreign missionary field upon which they entered in 1732. They sent a small colony to Georgia in 1735, and a remnant of them made the first permanent settlement of Moravians in our country, at Bethlehem, Pennsyl-
vania, in 1740. In their church government they have an episcopacy, and claim an unbroken Episcopal succession through 174 bishops, since 1467. At Bethlehem, Lafayette, who was wounded at the battle on the Brandywine, found repose and good nursing; and there the nuns, as the single women were called, made a beautiful crimson silk banner, bearing elegantly wrought needle-work, for Pulaski, which Longfellow has immortalized in his "Hymn of the Moravian Nuns." In 1875, the Moravians had, in this country, 75 churches, 8,315 communicants, and a population of 14,737. The Moravians are often confounded with the "United Brethren in Christ," who have about 1,450 organizations in this country, 950 edifices, with 270,000 sittings. This sect arose among the Germans, in Pennsylvania, at about the year 1760.

Several other denominations of Christians have appeared in our country since the Revolution, the most important of which are Unitarians, Universalists, and the Evangelical Association, the latter sometimes called the German Methodist church. The Unitarians are not very numerous, but are very influential in society. The organization in this country had its birth in Boston; and a larger portion of that religious body may be found in Massachusetts. Of the 331 Unitarian societies in the United States, in 1870, there were 180 in Massachusetts. At that time the Unitarians in our country had 310 church edifices, with about 155,500 sittings. Their distinctive theological dogma is the unity of God.

The denomination known as "Christians," who are numerous in the West, and who, in 1870, had 3,570 societies in the United States, 2,822 edifices, and about 866,000 sittings, are unitarian in their theology. So, for the most part, are the Universalists, whose distinctive doctrine is the final salvation of all souls through Jesus Christ. In 1870, the Universalists had 719 societies in the United States, and 602 church edifices, with about 211,000 sittings. In the same year, the Evangelical Association had 815 organizations, 641 edifices, and 194,000 sittings.

The Second Adventists, a religious body that originated in the United States with William Miller, between thirty and forty years ago, have, at this time, 339 church organizations, 69 ministers, and over 8,000 members. They believe in the speedy second advent of Christ, and the end of the world. The greater number of this sect exist in Michigan, where they had 39 societies in 1870. In the same year, there were in the United States, 189 Jewish organizations, with 152 synagogues, and 73,265 sittings. The Mormons, also, had 189 societies, 171 church edifices, with about 88,000 sittings. The Swedenborgians, or the Church of the New Jerusalem, had 90 societies, and 61 edifices; the Shakers, 18 societies or communities; and the Spiritualists, 95 societies, and 22 edifices. The aggregate organizations of the twenty-five religious societies in the United States, in 1870, was
The various denominations have seminaries of learning in which the peculiar theology of each is taught. In 1873, there were in the United States 110 schools of theology, from which the Commissioner of Education received reports. There were also 37 schools of Law, a profession that holds the highest rank in the United States because of the eminent ability and legal learning of the great body of its members, and the distinguished list of expounders of the law which our national history presents. From the beginning, the judiciary of the United States has been most conspicuous for its wisdom and purity, and has nobly performed the functions of a coordinate branch of the national government.

There are several organizations in our country designed to promote the growth of religion and morality. The most conspicuous of these are Bible, Tract, Missionary, and Temperance Societies, and Young Men's Christian Associations.

The first Bible Society in the United States was formed in Philadelphia, in 1808. Others speedily followed in several States; and in 1816, when the American Bible Society was formed, there were between 50 and 60 of the local societies. About 60 delegates from these societies met in New York, in May, 1816, and founded the American Bible Society. Elias Boudinot, L.L.D., was chosen President, with 23 vice-presidents, a domestic and foreign corresponding secretary, a recording secretary, a treasurer, and 36 managers. All of the latter are laymen of seven different denominations. The avowed sole object of the Society was "to encourage a wider circulation of the Holy Scriptures, without note or comment."

This Society was incorporated in 1841, and in 1853, made its permanent home in a building in New York, near the junction of Third and Fourth avenues, which, with the ground, cost about $300,000. In the first year of its existence, it issued 6,410 copies of the Scriptures; it has since issued in one year nearly 1,900,000. It has printed the Bible or parts of it, in twenty-seven new translations, and prepared and published the entire Bible, in raised letters for the use of the blind.

The Baptists seceded from the American Bible Society in 1836, and formed the American and Foreign Bible Society, conducted entirely by their denomination. The Rev. Spencer H. Cone was its first President, and Rev. Charles G. Somers was its first corresponding secretary. It has collected and expended about $1,200,000 in Bible circulation; published the Scriptures in forty different languages, and circulated over 4,000,000 copies in foreign lands. A secession from this Baptist Bible Society occurred in 1850, when the American Bible Union was formed.

The first undenominational Tract Society in the United States, was
formed in Boston, in 1803, and was called the "Society for Promoting Christian Knowledge." Local societies of a similar nature soon sprung up, of which the New England Tract Society formed at Andover, in 1814, was the most efficient. It made its abode in Boston in 1823, with the name of the American Tract Society. In 1825, another American Tract Society was formed in New York, for the purpose of uniting all local societies. That of Boston agreed to the union, and it continued until 1859, when the hesitancy of the Society to publish tracts on the subject of Slavery, caused the Boston Society to withdraw and resume its independent position. They yet stand apart, but both are working for the same grand object.

The New York Society owns a large building in which all of its publishing operations are carried on. Their average daily issue is about 54,000 copies, of which 4,000 are volumes. In 1842, a colportage system was begun, and from that time to 1875, the colporters sold 10,500,000 copies of publications, and gave away 2,780,000 copies. The various denominations also have tract and publication societies, which send out vast numbers of books, tracts, pamphlets and periodicals. In 1874-75, the Methodist Book Concern issued 352,770 volumes, and 35,055,428 tracts, et cetera; and the Congregational Publication Society issued 140,000 volumes, and 1,820,000 tracts, pamphlets and periodicals.

In the missionary field, foreign and domestic, the labor is so varied and extensive, that we may not, in the brief space allotted here, attempt any details. It may be sufficient to say that in the great work of Christianizing and civilizing the heathen world, so successfully carried on within the present century, the Americans have done their full share. In the cause of Temperance too, in which such vital interests of society are involved, they have labored most zealously and effectually.

The first modern Temperance Society was formed in 1789, by 200 farmers in Litchfield county, Connecticut, who agreed not to use "any distilled liquor in doing their farm-work the ensuing season." In 1811, organized societies began to be formed, but the total abstinence principle was not adopted until 1836, when a national convention held at Saratoga, took that higher stand. The Washingtonian Society, the first founded upon total abstinence principles, was organized in Baltimore, in 1840, by six men of intemperate habits, who signed a pledge of total abstinence, and at the first anniversary of the Society, 1,000 reformed drunkards marched in procession. The battle against the monster evil, Intemperance, in whose train are seen all the crimes to which society is exposed, is still going on with various weapons—political organizations, legal enactments, moral suasion and the activity of numerous societies. But the dragon is yet abroad in the land, devouring homes, debasing souls, and destroying the health and happiness of millions.
One of the most important of our social instrumentalities for the promotion of morality and vital religion, are the Young Men's Christian Associations. In 1844, George Williams, of London, who is now (June, 1876,) visiting the Centennial Exhibition, quietly put forth efforts in behalf of young men which led to the institution of the Young Men's Christian Associations as we see them now. When news of the admirable work of the London Association reached America, in 1852, similar societies were organized here, in a few places. They grew steadily but slowly, until 1866, when a revival of these associations was manifested. In this good work, the New York Association took the lead. In 1866, there were only 60 associations in the United States; now there are over 700. Then they had no property; now they have in buildings and funds alone, over $3,000,000. These associations, linked by a national union, and working in good fellowship with similar associations in other lands, are performing a most important labor for society and Christianity.

From a review of the reports of all the different countries in Europe, in 1875, it appears that in Great Britain and Germany the associations are most strong. In the former, they numbered about 350, with about 40,000 members, of whom over 5,000 belonged to the London Society and its branches. In Germany they were not so strong, numbering about 200 societies with 10,000 members. In Holland they were numerous but small. There were 225 associations with only 4,000 members. In France 30 associations, and in Belgium 18 associations, were at work. In Switzerland there were about 100 organizations.

On the Continent, particularly in Germany and Switzerland, buildings have been erected to furnish lodgings for traveling young men, especially of the artisan class. The religious work, the Bible class, devotional meetings and active Christian efforts by the members are the features in which these associations in all lands, essentially agree.

The scope of the work of these associations is very broad. They primarily seek to make young men helpful to young men in the ways of usefulness, by affording them means for pleasant social enjoyment such as wholesome reading, instructive conversation, pleasant gathering places, music and lectures. They assist in finding employment for worthy ones out of work; to relieve the distressed in body and mind, and to afford consolation to the wretched; in a word, they seek to do and are doing, thoroughly practical Christian work, to the extent of their ability. They are noble coadjutors of the Church in the elevation of the human race.

An indication of the kind of work done by these associations in our country is given in the last report (1876) of the Bowery branch of the Young Men's Christian Association of the City of New York. To obtain countenance and relief a party must be worthy, destitute, and willing to
work. These are the simple requirements. In 1875, the Bowery branch of that Association, aided and registered 2,862 persons. Of these 2,586 were under 42 years of age, 217 between 40 and 50, and 59 were over 50 years of age. There were 478 professional men: 1,186 tradesmen, 686 laborers; 337 farmers, and 165 youths. Of these 1,211 were natives of the United States, and 1,651, of foreign countries; 783 were of American, and 2,079 were of foreign parentage; 2,359 were single and 503 were married; 2,215 claimed to be Protestants, and 634 Roman Catholics; 2,464 could read and write, and 334 were well educated. In the relief work, 9,621 lodgings were furnished; 7,157 free meals were given, and 87,532 meals were sold; 38 men were sent to hospitals, 180 were restored to friends, and 906 were furnished with employment.

Here we pause in our task of delineating, in sketchy outline, the history of the progress of our country during the past one hundred years. With the result of that progress, every American citizen ought to be satisfied, and render grateful thanks to the Good Father for casting his lot in such a land and at such an epoch.
CHAPTER XLVIII.

The result of the late Civil War, which ended in 1865, satisfied the American people that the republican form of government, properly administered, and our Republic itself were not, any longer, subjects of "mere experiments," as monarchists had long persistently asserted, but that ample demonstration had been given of the power of republicanism resting upon patriotism and virtue, and of the Republic of the West. In taking a retrospective glance at the history of that Republic since 1776, when its birth was decreed, Americans felt that they had reason for great satisfaction with the result, and that a proper celebration of the centennial year of the nation's existence ought to be held, to which the other nations of the earth might, with propriety, be invited.

As the centennial year approached suggestions concerning a celebration in 1876 appeared in the newspapers. Among the leaders of this movement was Hon. John Bigelow (now Secretary of the State of New York); General Charles B. Norton, United States Commissioner at the Paris Exhibition in 1867; Professor John L. Campbell, of Wabash College, Indiana, and Colonel M. Richards Muckle, of Philadelphia. The latter gentleman appears to have been the first to suggest the holding of the celebration in Fairmount Park, Philadelphia, which he made in a letter addressed to the President of the United States, written on the 4th of July, 1869. In that letter Colonel Muckle proposed, as a feature of the celebration, "to erect a building in Fairmount Park for a musical festival of one week's duration, the said building to afford accommodation for 100,000 persons, while the performers shall number 1,200." For this cause the writer asked the President's approval.

Finally a communication by the Franklin Institute of Philadelphia, addressed to the municipal authorities of that city, in which the use of a portion of Fairmount Park for a centennial celebration was asked for, was presented to the Select Council by John L. Shoemaker, a member of that body. Mr. Shoemaker offered a resolution for the appointment of a joint committee of seven from each Chamber of the municipal corporation to take the subject into consideration. The resolution was adopted; the proposition
was carried out, and Mr. Shoemaker was made chairman of the joint commission.

Steps were now taken to interest the Legislature of Pennsylvania and the National Congress in the matter. The Pennsylvania Legislature passed a resolution soliciting Congress to take action in favor of an international celebration to be held at the city of Philadelphia, on the occasion of the one-hundredth anniversary of American independence. They appointed a committee of ten to go with the joint committee of the municipal Chambers of Philadelphia on a visit to Washington city to present a memorial on the subject to Congress. They went, and placed a memorial in the hands of the Hon. Mr. Kelly, a representative of Pennsylvania, in Congress, who laid it before that body. He urged the selection of Philadelphia as the most appropriate place for such a celebration, for in that city the Declaration of Independence was adopted and signed by fifty-six of the members of the Continental Congress in session in the State-house there, in 1776.

The subject took the usual course in Congress, and early in March, 1870, Hon. Daniel J. Morrell, another representative of Pennsylvania, presented a bill, providing for a centennial celebration in Philadelphia. It was afterward modified somewhat, and on the 3d of March, 1871, it became a law. The object of the act was set forth in the following preamble to it:

"Whereas, The Declaration of Independence of the United States of America was prepared, signed, and promulgated in the year 1776, in the city of Philadelphia; and

"Whereas, It behooves the people of the United States to celebrate, by appropriate ceremonies, the centennial anniversary of this memorable and decisive event, which constituted the 4th day of July, A. D. 1776, the birthday of the nation; and

"Whereas, It is deemed fitting that the completion of the first century of our national existence shall be commemorated by an exhibition of the national resources of the country and their development, and of its progress in those arts which benefit mankind, in comparison with those of older nations; and

"Whereas, No place is so appropriate for such exhibition as the city in which occurred the event it is designed to commemorate; and

"Whereas, As the exhibition should be a national celebration, in which the people of the whole country should participate, it should have the sanction of the Congress of the United States; therefore," etc.

This act provided for the appointment, by the President of the United States, of a Commissioner and alternate Commissioner, for each State and Territory of the Union, who were to be nominated by the respective governors of the States and Territories. It also provided for the holding of the
celebration or exhibition at Philadelphia; and that the national government should not be liable for any expenses attending the celebration or exhibition.

When the Commissioners and alternate Commissioners were appointed by the President, they were invited to assemble at Philadelphia, on the 4th of March, 1872, for the purpose of organization. On that day, twenty-four States, three Territories, and the District of Columbia were represented in a body assembled at the Continental Hotel, where they were temporarily organized by the choice of Mr. Atwood, of Wisconsin, chairman, and J. N. Baxter, of Vermont, secretary. Then they went, in a body, to Independence Hall, where they were formally received by Mayor W. S. Stokley, who made an address of welcome, to which General Joseph R. Hawley, of Connecticut, responded. From Independence Hall the Commissioners went into the chamber of the Common Council, where, after prayer by the Rev. Dr. Hutter, they proceeded to business. On the following day, permanent officers of the commission were chosen, composed of the following named gentlemen:

For President, Hon. Joseph R. Hawley.
For Temporary Secretary, Hon. Lewis Wain Smith.
For Executive Commission, Hon. William Phipps Blake.
For Counsellor and Solicitor, John L. Shoemaker.

Official changes were afterwards made. John L. Campbell was appointed the regular secretary; Alfred T. Goshorn was chosen first vice-president; and Robert Mallory was substituted for Mr. Byrd. The official Executive Commission was succeeded by that of Director-General of the Exhibition, and Mr. Goshorn was chosen to fill that important position. At the opening of 1876, the officers of the Centennial Commission were as follows: President, Joseph R. Hawley; Vice-Presidents, Orestes Cleveland, John D. Creigh, Robert Lowry, Thomas H. Coldwell, John M'Neil, and William Gurney; Director-General, Alfred T. Goshorn; Secretary, John L. Campbell; Counsellor and Solicitor, John L. Shoemaker.

The Commissioners and alternate Commissioners chosen by the President from the several States and Territories, were named as corporators, in an act passed on the first of June, 1872, which provided for raising funds for the purposes of the Exhibition, which, it had been determined, should be an international one. There were changes in these representatives of the States and Territories. At the opening of the Centennial year, the commissioners and alternate commissioners consisted of the following named gentlemen:

The act of June 1, 1872, provided for a Centennial Board of Finance, who were authorized to secure subscriptions to capital stock, not exceeding the sum of $10,000,000 in shares of $10 each. The Commissioners adopted rules for the organization of the Board of Finance, and they also provided under the act, for the opening of books of subscription to the stock on the 21st of November, 1872, to be kept open one hundred days to give the citizens of each State and Territory an opportunity to subscribe for stock not exceeding its specified quota, in accordance with the act of Congress. The act also provided for a meeting of the corporators and subscribers to the stock, to be held at Philadelphia after the expiration of the 100 days, to choose a board of directors (called the Centennial Board of
Finance), to consist of twenty-five stockholders, whose term of office should be one year, and until their successors should be qualified. That meeting was held in the spring of 1873, when the following named persons were chosen to constitute that Board, and there have been no changes:


There was also an Executive Committee appointed, which consisted, at the opening of 1876, of the following named gentlemen: Daniel J. Morrell, Alfred T. Goshorn, E. A. Straw, N. M. Beckwith, James T. Earle, George H. Corliss, John G. Stevens, Alexander R. Boteler, Richard C. McCormick, John Lynch, James Birney, Charles P. Kimball, and Samuel F. Phillips, with Myers Asch as Secretary.

At about the time when the books for subscriptions were opened, the president and secretary of the Commission sent out an address to the people of the United States, explaining the organization of the Commission, and the general design of the Exhibition. Soon afterward, a committee appointed for the purpose, presented a design for an official seal of the Commission, which was adopted. It is simple and elegant. In concentric circles around the edge of the seal is the title of the organization—"The United States Centennial Commission." In the centre of the seal is a view of the State-House as it appeared when the Declaration of Independence was signed in its great hall. Beneath the building are the words which were cast on the State-House bell in Colonial times: "Proclaim liberty throughout the land, and to all the inhabitants thereof."

Measures were immediately adopted for the preparation of the Fairmount Park Grounds, and the buildings for the Exhibition. Work was begun there in the spring of 1873, and on the 4th of July following, the Park Commissioners formally surrendered to the custody of the Centennial Commission the portion of the grounds which had been designated for the purpose—a grand plateau of 465 acres. The ceremony of transfer took place on these grounds, in the presence of a vast concourse of citizens. After prayer by
Bishop Simpson of the Methodist Episcopal Church, the President of the Park Commission, Hon. Morton McMichael, made the formal surrender with an address. The President of the Centennial Commission, Hon. Joseph R. Hawley, made an address of acceptance, closing with a direction to unfurl the National Flag, and have it saluted. As it fluttered in the breeze, the trumpeter of the City Troop gave a signal, when the Key-stone Battery fired thirteen guns in honor of the event. A military review followed; a large number of persons sat down to a notable banquet, and the interesting ceremonies of the day closed with a fine display of fire-works.

On the day before the transfer of a portion of Fairmount Park was made to the Centennial Commission, the President of the United States (Ulysses S. Grant) issued a proclamation, declaring that an exhibition would be held at the city of Philadelphia, of "Arts, Manufactures, and Products of the Soil and Mine," to be opened on the 19th of April, 1876, and closed on the 19th of October the same year. The time was afterward changed to the 10th of May, and 10th of November. The President's proclamation concluded with these words:

"And, in the interest of peace, civilization, and domestic and international friendship and intercourse, I commend the Celebration and Exhibition to the people of the United States; and in behalf of the government and people, I cordially commend them to all nations who may be pleased to take part therein."

This proclamation was followed on the 5th of July, by a note from the Secretary of State (Hamilton Fish) to all the foreign ministers in the United States, in which was inclosed the President's proclamation and the regulations adopted by the commission. In it he set forth the objects of the exhibition, and said:

"The President indulges the hope that the Government of —— will be pleased to notice the subject, and may deem it proper to bring the Exhibition and its objects to the attention of the people of that country, and thus encourage their co-operation in the proposed celebration. And he further hopes that the opportunity afforded by the Exhibition for the interchange of national sentiment and friendly intercourse between the people of both nations may result in new and still greater advantages to Science and Industry, and at the same time serve to strengthen the bonds of peace and friendship which already happily subsist between the Government and people of —— and those of the United States."

The question whether the exhibition should be national or international, was warmly discussed. It was finally settled by an act of Congress passed in June, 1874, requesting the President to extend in the name of the United States, "a respectful and cordial invitation to the governments of other nations to be represented and take part in the Centennial Exposition." A
few days afterward, the same body passed an act authorizing medals to be struck commemorating the one hundredth anniversary of the first meeting of the Continental Congress, and the Declaration of Independence, to be prepared at the Mint in Philadelphia, for the Centennial Board of Finance, upon the payment of a sum not less than the cost thereof."

The medal to commemorate the Declaration of Independence, is specially elegant in construction, and appropriate in design. On one side is a feminine figure representing the Genius of Liberty with a sword buckled to her girdle, the Shield of the Stars and Stripes leaning at rest, whilst with each hand she extends a welcome and a chaplet to other feminine figures, representing Art and Science, who present evidences of their skill and craft to do honor to the date, 1776, which is inscribed upon the platform. Around the whole are the words, "In commemoration of the hundredth anniversary of American Independence," and "Act of Congress, June, 1874." On the other side is a feminine figure representing the Genius of America rising from a recumbent position, grasping with her right hand the sword which is to enforce her demands, and raising her left hand in appealing pride to the galaxy of thirteen stars, which, indicating the original Colonies and States, are blazing in the firmament. Beneath is the date 1776, and around the whole the kernel of the resolution for independence, in these words, "These Colonies are, and of right ought to be, free and independent States."

At midsummer, 1874, all of the preliminary work for the great event was completed, the last act being the passage of a bill by Congress, on the 18th of July, for the admission, free of duties, of all articles intended for the International Exhibition. Contracts were soon made for all the principal buildings, five in number, at a total cost of $4,443,937. The Art Gallery (the first), was begun on the 4th of July, 1874, and cost $1,500,000; Horticultural Hall was begun on the first of April, 1875, and cost $251,937. A week later Machinery Hall was begun, and cost $792,000. In May, 1875, the Main building, covering twenty-one acres and a half, was begun, and cost $1,600,000, and Agricultural Hall was begun on the 15th of October, 1875, and cost $300,000. It was the last one completed, having been finished on the 1st of February, 1876. These buildings cover about forty-nine acres, and have annexes that cover twenty-six acres, making a total of seventy-five acres, a much greater space than was ever before covered by any similar exhibition buildings. Besides these, numerous other buildings have been erected by national and individual exhibitors, and by our several States and Territories, making the whole number of buildings on the Centennial grounds 190. An account of them is given in the Supplement to this work.

The Managers classified the Exhibition into seven departments, namely Mining and Metallurgy, Manufactures, Education and Sciences, Art, Machinery, Agriculture, and Horticulture. From the beginning, the women
of our country manifested great interest in the exhibition; and when, in June, 1875, it was found the applications for space from foreign countries were so numerous that, under the rules for classification, much work done by women would be thrown out, or lost among the crowd of masculine exhibitors, a separate building for women was suggested. The idea created much enthusiasm among the women of our land, and very soon ample means were provided for the erection and equipment of such a building. Under the lead of Mrs. E. D. Gillespie, of Philadelphia, and with the sanction of the Centennial Commission, a Women’s Centennial Executive Committee was formed, composed of the following named persons:

President, Mrs. E. D. Gillespie; Vice President, Mrs. John Sanders; Secretary, Mrs. Frank M. Etting; Treasurer, Mrs. S. A. Irwin. The remainder of the Committee consist of Mrs. Crawford Arnold, Mrs. Buckman, Mrs. James C. Biddle, Mrs. Henry Cohen, Mrs. Theodore Cuyler, Mrs. John W. Forney, Mrs. A. H. Francis, Miss Elizabeth Gratz, Miss McHenry, Mrs. Aubrey H. Smith, Mrs. Matthew Simpson, Mrs. Henry C. Townsend and Mrs. Richard P. White, of Philadelphia; Mrs. Bion Bradbury, Maine; Mrs. James T. Fields, Massachusetts; Mrs. F. W. Goddard, Rhode Island; Mrs. Worthington Hooker, Connecticut; Mrs. W. L. Dayton, New Jersey; Mrs. Bouligny, District of Columbia; Mrs. C. J. Faulkner, West Virginia; Mrs. Jourdan, Georgia; Mrs. Ellen Call Long, Florida; Mrs. M. C. Ludwig, Louisiana; Mrs. K. S. Mino, Mississippi; Mrs. E. D. Dickinson, Missouri; Mrs. Edward F. Noyes, Ohio; Mrs. F. R. West, Iowa; Mrs. J. R. Thorp, Wisconsin; Mrs. J. M. Crowell, Kansas; Mrs. J. Beveridge, Illinois; Mrs. H. I. Carey, Indiana; Mrs. S. B. Bowen, Montana; Mrs. Frederick MacCrellish, California; Mrs. L. C. Hughes, Arizona; Mrs. W. J. Hill, Idaho; Mrs. J. M. Washburne, Dakota; Mrs. M. J. Young, Texas; Mrs. W. S. Rand, Eastern Kentucky; Mrs. H. C. Coldwell, Arkansas.

The Women’s Executive Committee, sitting in Philadelphia, proposed to erect a building for the exhibition of the highest type of women’s work, in Sculpture, Painting, Literature, Engraving, Telegraphy, Lithography, Education of all kinds, et cetera, at a cost of $30,000. An appeal was made to the women of the country, through the members of the Executive Committee, and in about a hundred days, not only the requisite sum for the purpose was received or pledged, but a surplus for the interior decorations. A beautiful building was erected, called the “Women’s Pavilion,” covering 30,000 square feet, where woman’s work of the kind indicated, including the finer kinds of needle-work, is exhibited. The women of our country have done much more. With great assiduity a sub-committee of the Women’s
Centennial Executive Committee have gathered a vast amount of valuable information concerning women's work in religious, philanthropic and patriotic efforts, which include their labors in Homes, Asylums, Missionary fields at home and abroad, Sisterhoods, Industrial Schools, and the cause of Temperance and Moral Reform. And the women of our land contributed to the general fund of the Centennial Commission more than $100,000.

With steadiness, perseverance and untiring energy, the managers of the great exhibition pressed forward in their preparations for the opening at the appointed time, the 10th of May, 1876. The people throughout the country, and especially of Pennsylvania, had responded nobly to the call for $10,000,000, but at the opening of the Centennial year $1,500,000 were yet wanted to enable the managers to carry out their plans fully. Thirty-six nations had accepted the invitation of our government to participate in the grand Centennial festivities, and were preparing to come with their industrial treasures. Every patriot felt that nothing must be lacking to make the exhibition what we had promised it should be, and Congress was appealed to for the $1,500,000. After much debate when there should have been no debate, and a strong negative vote when every patriotic consideration should have made every vote an affirmative one, the appropriation was made; the great work was speedily accomplished, and on the morning of the opening day, everything was in readiness.

The weather that morning was lowering and threatening. The Signal Office prophesied "clearing," and such is the faith of our people in the oracular utterances from that Bureau, that everybody prepared for sunshine, and was not disappointed. The city of Philadelphia was radiant with flags at dawn; and at nine o'clock a great stream of human beings was ready to pour into the Centennial grounds. The privileged ones were allowed to enter first. More than seven hundred of the Women's Work Committee, each decorated with a brilliant silver star, led the van, and were followed by our representatives in Congress and those of Foreign Governments, who took seats upon the great platform under their respective flags. Before ten o'clock Dom Pedro, Emperor of Brazil, (the only foreign potentate present) with the Empress leaning upon his arm, arrived and took his seat, greeted by the cheers of the immense throng.

Tens of thousands of human beings pressed into the Centennial grounds, until more than 100,000 were there, while Theodore Thomas's orchestra, placed near the edge of the platform, played airs that were familiar to the ears of representatives of nations present, closing with our own "Hail Columbia." These sweet sounds repressed, in a great degree, the rising passions of the much-jostled multitude. At length the President of the United States appeared on the platform, when the orchestra performed the grand "Centennial Inauguration March" composed for the occasion, by Richard
Then Bishop Simpson of the Methodist Episcopal Church uttered fervent thanksgivings in the name of our people, to the Almighty, for his great goodness in the past, and implored his blessings in the future. He specially asked the bestowal of great mercies upon the women of our land who then, for the first time in the history of our race, had taken so conspicuous a part in a national celebration. "May the light of their intelligence, purity, and enterprise," he said, "shed its beams afar, until in distant lands, their sisters may realize the beauty and glory of Christian freedom and elevation."

When the "Amen" was uttered a burst of choral music went from the stage where Whittier's glorious hymn was sung by a thousand voices, accompanied by the organ and the whole orchestra. This was followed by the presentation of the buildings by Hon. John Welsh, president of the Centennial Board of Finance, to the United States Centennial Commission. Then a cantata, composed by Sidney Lanier, of Georgia, was sung, and General Hawley, president of the Centennial Commission, presented the exhibition to the President of the United States, who made a brief response. When these ceremonies were ended, the American flag was unfolded over the great tower of the Main building as a signal that the Centennial Exhibition was open. The orchestra and a thousand voices joined in Handel's magnificent Hallelujah Chorus, and then the immense crowd spread over the grounds and through the buildings.

Of all the pageant in Fairmount Park on that memorable day—the 10th of May, 1876—nothing will be remembered so long, or exert a more beneficent influence than John Greenleaf Whittier's Centennial Hymn, here given:

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Our fathers' God! from out whose hand
The centuries fall like grains of sand,
We meet to-day, united, free,
And loyal to our land and Thee,
To thank Thee for the era done,
And trust Thee for the opening one.

Here where of old, by Thy design,
The fathers spake that word of Thine
Whose echo is the glad refrain
Of rended bolt and falling chain,
To grace our festal time from all
The zones of earth our guests we call.

Be with us while the New World greets
The Old World, thronging all its streets,
Unvailing all the triumphs won
By art or toil beneath the sun;
And unto common good ordain
This rivalship of hand and brain.
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Thou who hast here in concord furled
The war flags of a gathered world,
Beneath our Western skies fulfill
The Orient's mission of good will,
And, freighted with Love's golden fleece,
Send back the Argonauts of peace.

For art and labor met in truce,
For beauty made the bride of use,
We thank Thee, while withal we crave
The austere virtues strong to save;
The honor proof to place or gold,
The manhood never bought or sold!

O! make Thou us, through centuries long,
In peace secure, and justice strong;
Around our gift of freedom draw
The safeguards of Thy righteous law.
And, cast in some diviner mold,
Let the new cycle shame the old!
SUPPLEMENT.

BUILDINGS FOR THE CENTENNIAL EXHIBITION.

On the morning of the 8th of May, or two days before the opening of the Centennial Exhibition, the Public Ledger of Philadelphia contained the following account of the buildings constructed in Fairmount Park for the purposes of the Exhibition:

The grounds of Fairmount Park have been decorated with several handsome fountains, monuments, rustic summer houses, summer pavilion of wire, etc., all of which add very greatly to their appearance. The entire surface of the grounds has been graded to the proper level, and a large number of wide promenades have been laid in asphalt. These are arranged so as to form the straightest possible connecting links between the different buildings. The garden plots have been surrounded by a neat rustic fence; trees have been planted in various portions of the grounds, and everything which was possible has been done to make the grounds correspond in beauty with the magnificent buildings which ornament them. Within the enclosure there are now, either finished or nearly completed, 190 buildings. These may be divided into several groups, as follows:

First—Exhibition Buildings proper, including the Main Building, Memorial Hall, Machinery Hall, Horticultural Hall, Agricultural Hall, the United States Government Building and the Women's Pavilion, with their annexes. Second—Subsidiary Exhibition Buildings.
Third—Buildings erected by foreign Governments, either as headquarters for their commissioners or for Exhibition purposes.
Fourth—Buildings erected by States, to be used as headquarters for State Boards, State authorities, etc.
Fifth—Buildings erected by States for Exhibition purposes.
Sixth—Buildings erected by individual exhibitors for exhibition purposes.
Seventh—Buildings erected for the display of special industries.

THE PRINCIPAL EXHIBITION BUILDINGS.

The principal exhibition buildings are: The Main Building, Memorial Hall, Machinery Hall, Horticultural Hall, Agricultural Hall, the United States Government building, and the Women's Pavilion. Owing to inadequacy of space in these structures, it was found necessary to erect a large number of annexes, some of which cover a very considerable area. The annexes to the Main building are—the structure north of the western section, in which an exhibition will be held of carriages and other vehicles, and the structure south of the building and fronting on Elm avenue, to be used for an exhibition of minerals from the various States. The annexes to Memorial Hall are—an extension on the north side, very nearly as large as
the Hall itself, and containing double the amount of wall space; and a building to be used for the exhibition of photographs, chromos, lithographs, etc. The annexes to Machinery Hall are—a building for the exhibition of shoes and leather, and the processes of their manufacture, and a number of boiler and engine houses. The annex to the Art Gallery is a very large flower tent; to the United States Government building, a model of the United States Field Hospital; and to the Women's Pavilion, the models of a school-house and of a kindergarten. The Main Exhibition building covers an area of nearly twenty-one and a half acres, and consists of a parallelogram running east and west, 1880 feet long, and 464 feet wide. The materials used in its construction are iron, glass, and wood. The larger portion of the structure is one story in height, and shows the main cornice upon the outside at a height of forty-five feet from the ground, the interior height being 70 feet. Upon the corners of the building there are four towers, 75 feet in height; and in order to obtain a central feature for the building as a whole, the roof over the central part, covering a space of 184 feet square has been raised above the surrounding portion, and four towers, 48 feet square, rising to 120 feet in height, have been erected at the corners of the roof. The total area covered is 21.47 acres. The building is divided into a central avenue or nave, 120 feet in width; two avenues each 100 feet in width; two aisles, each 48 feet wide; and two smaller aisles, each 24 feet wide.

In order to break the great length of the roof lines, three cross avenues united into one grand cross section, have been erected, from which the central towers rise. The total amount of iron used in the construction of the building was 8,300,000 pounds. The sides of the building, for the height of seven feet from the ground, are finished with brick work in panels between the columns, and above the seven feet with glazed sash. All the corners and angles of the building upon the exterior are accentuated by galvanized iron octagonal turrets, which extend the full height of the building from the ground level to above the roof. These turrets are surmounted with flagstaffs and the national eagle. The national standard, with appropriate emblems, is placed over the centre of each of the main entrances. The building stands nearly due east and west, and is lighted almost entirely by side-lights. The light is uniformly distributed throughout the building, so that there is comparatively little choice of location. Small balconies or galleries of observation have been provided in the four central towers of the building, at the heights of the different stories of the towers. The exterior of the building has been colored in yellow and brown tints, and in the interior the ceiling has been painted in very light blue. The upright iron columns, and the trusses supporting the roof, have been painted in gray, picked with scarlet, black, and yellow. The upper portion of the sash has been covered with oiled muslin, on which a variety of designs, representing different articles of industry, have been painted. This muslin is translucent, and the windows covered with it closely resemble stained glass. The cost of the building is about $1,600,000. The architect is Mr. Henry Pettit, and the contractor Mr. R. J. Dobbins. The structure was begun on the 8th of May, 1875, and the last girder was erected on the 18th of November, 1875. It was transferred by the contractor, completed, to the Centennial Commission, on the 14th day of February last.

The Main Building will contain the following groups of exhibits:

1. Materials and Manufactures used for Food or in the Arts, the result of Extractive or Combining Processes.
2. Textile and Felted Fabrics; Apparel, Costumes and Ornaments for the person.
3. Furniture and Manufactures of general use in construction and in dwellings.
5. Engineering, Public Works, Architecture, etc.
MEMORIAL HALL.

Memorial Hall is situated north of and parallel with the Main Exhibition building. It is intended to serve the double purpose of a permanent memorial of the exhibition, and a gallery for the exhibition of the graphic and plastic arts. It is paid for by an appropriation from the State of Pennsylvania, and its cost is about $1,500,000. It stands on the most commanding portion of the Lansdowne plateau, and looks southward over the city. The structure is in the modern Renaissance style of architecture, and the materials are granite, glass and iron. No wood is used in the construction, and the only wood-work in the building consists of the doors, lining of the walls for hanging pictures, and partitions, erected to give a greater amount of wall space. The building is 365 feet in length, 210 feet in width and 59 feet in height, over a spacious basement 12 feet in height, and surmounted by a dome. It covers a total area of about one acre and a half. The main front is divided into three sections: first, a main entrance, consisting of three colossal arched doorways; second, a pavilion at each end; and third, two arcades, connecting the pavilions with the centre. Between the doorways are clusters of columns, terminating at the top in richly carved capitals. The main cornice is surmounted by a balustrade, and at either end is an allegorical figure representing Science and Art. The dome rises from the centre of the structure to the height of 150 feet from the ground. It is of glass and iron, terminating in a colossal bell, from which rises the figure of Columbia. Four large groups typifying Art, Commerce, Manufactures and Agriculture, occupy the four corners of the base of the dome. Each pavilion is ornamented with eagles at its four corners. The arcades, copied from those seen in old Roman villas, are intended to screen the bare walls of the main gallery. They enclose garden plots 90 feet long and 36 feet deep. The rear or north front is of the same general character as the main front, with the exception that the feature of the arcades is omitted from it. Between the pavilions is the grand balcony, 275 feet long and 45 feet wide. The structure comprises two large halls extending through the central portion, and respectively 82 by 60 feet, and 83 feet square. East and west of these are the galleries, each 98 feet by 84 feet. In these galleries temporary divisions have been erected, on which to exhibit pictures. The central hall and galleries may be thrown into one grand hall, capable of accommodating eight thousand persons. There are also two smaller galleries, each 89 by 28 feet, two side galleries each 210 feet long and a corridor 14 feet wide extending along the north line of the building, and opening into a series of private rooms, thirteen in number, designed for studios and smaller exhibition rooms. All the galleries and central hall are lighted from above, and the studios and pavilions from the sides. In this building the exhibits comprise sculptures, paintings in oils and water color and engravings. The architect is Mr. H. J. Schwarzman, and the contractor, Mr. R. J. Dobbins.

MACHINERY HALL.

Machinery Hall is situated 550 feet west of the Main Exhibition building, with its north front upon the same line. It consists of a main hall, 1402 feet long and 360 feet wide, with an annex on the southern side 208 by 210 feet. The principal part of the structure is one story in height, the interior height to the top of the ventilators in the avenues being 70 feet, and in the aisles 40 feet. The main entrance is finished with façades 78 feet in height, and the long lines upon the exterior have been broken up with projections. The ground plan shows two main avenues 90 feet wide by 1360 feet long, with a central aisle between and an aisle on either side, each of the latter being 60 feet in width. At the centre of the building is a transept 90
feet wide, which on the south front is extended into the annex above mentioned, where there is a tank for the exhibition of pumping machinery. The transept, beginning 36 feet from the main hall (with which it is connected) and extending 208 feet, is flanked on either side by aisles of 60 feet in width. The foundations of this building are of masonry. The superstructure is of timber columns, supporting roof trusses constructed of straight wooden principals and wrought iron ties and struts. The outer walls are of masonry to the height of five feet, and above that are of glazed sash placed between the columns. The tank for the exhibition of hydraulic machinery is 60 by 160 feet; depth of water 10 feet. At the south end will be a waterfall 35 feet high by 40 feet wide.

On the south side of the hall is a boiler house, to supply power to the Corliss engine which is to run all the machinery. The main hall and annex cover about fourteen acres. The ornamentation of both interior and exterior is very simple. Turned columns and scroll work picked in with colors make up the exterior ornamentation, and the sky line is well broken up for such a long building. The interior is painted in plain colors, the ceiling in very light blue, the roof, trusses, girders, etc., in a light, rich salmon color. The columns are painted light yellow brown, relieved with red. The architects of the main building are Henry Pettit and Joseph M. Wilson; contractor, Philip Quigley. The contract price was $543,300.

The articles to be exhibited here are: Machines, tools, and apparatus of mining, metallurgy, chemistry, and the extractive arts; machines and tools for working metal, wood and stone; machines and implements of spinning, weaving, felting and paper making; machines, apparatus and implements used in sewing and making clothing and ornamental objects; machines and apparatus for type setting, printing, stamping, embossing, and for making books and paper working; mortars and apparatus for the generation and transmission of power: hydraulic and pneumatic apparatus, pumping, hoisting and lifting; railway, plant, rolling stock and apparatus; transportation by water, on suspended cables, aerial and pneumatic transportation; water transportation and appliances; machinery and apparatus especially adapted to the requirements of the Exhibition.

HORTICULTURAL HALL.

Horticultural Hall is situated on Lansdowne Terrace, a short distance north of the Art Gallery. The principal materials used in its construction are glass and iron. The building is one of the handsomest structures ever designed for the purpose to which it is adapted. It will remain as a permanent ornament to Fairmount Park, and will, it is expected, form the nucleus of a much-needed botanic garden. The building is north of the Art Galleries, and the view from this point of the deep ravine with its thick foliage, the half-hidden bridges which span it, the wooded banks, and the city beyond, is picturesque and beautiful in the extreme. The structure is designed in the Saracen or Moreseque architecture.

Entering through the principal archway, the effect is very rich. The inside is covered with beautiful arabesque work in brick and fresco, and adorned with Mosaic pavements, refreshing fountains and flowers. In the centre of the building is the principal fountain.

The hall covers an area of one acre and a half and contains a grand central conservatory, around which runs a gallery at the height of 20 feet from the floor. There are four forcing houses, divided by handsome vestibules, and flanked by similar vestibules, restaurants, reception rooms, etc. The galleries are approached by ornamental stairways.

The Science of Horticulture is represented in the Hall in the following order and classification: Ornamental trees, shrubs and flowers; hot-houses, conservatories, graperies and their management; garden tools and accessories of gardening; landscape-gardening, designing, construction and management.
BUILDINGS FOR THE CENTENNIAL EXHIBITION.

The grounds surrounding the building have been tastefully laid out and planted with trees, tulips, hyacinths, geraniums, etc., and rustic arches, seats and arbors enhance the surroundings. The cost is $251,937. The architect is Mr. H. J. Schwarzman, and the contractor Mr. John Rice.

AGRICULTURAL HALL.

Agricultural Hall is situated north of Horticultural Hall, and on the eastern side of Belmont avenue. Its materials are wood and glass. It consists of a long nave crossed by three transepts, both nave and transepts being composed of Howe truss arches of a Gothic form. The nave is 826 feet in length by 100 feet in width, each end projecting 100 feet beyond the square of the building, with a height of 75 feet from the floor to the point of the arch. The four spaces at the corners of the buildings have been roofed in, thus making of the ground-plan a parallelogram 465 by 530 feet, covering a space of about ten acres. The exterior has been painted dark brown, the roof green, and the interior with a light color wash. The architect is Mr. James H. Windrim, the contractor is Mr. Philip Quigley. The cost was about $197,000. There will be exhibited in Agricultural Hall objects illustrative of horticulture and forest products, pomology, agricultural products, land animals, marine animals, fish culture and apparatus, animal and vegetable products, textile substances of vegetable or animal origin, machines, implements and processes of manufacture, agricultural engineering and administration, tillage and general management.

THE GOVERNMENT BUILDING.

The United States Government building is situated on Belmont avenue, north of Fountain avenue and west of the Women's pavilion. The building consists of a central nave, and aisles, 100 feet in width by 400 feet in depth, with a cross transept 100 feet wide by 300 feet deep. With the attached aisles, office sections, etc., the total area covered is 83,640 square feet. Where the nave and transept cross a cupola is raised above the rest of the building to a height of 50 feet, constructed of wood, with pilasters on the outside. The building cost $60,000, was designed by Mr. James H. Windrim, and constructed by Mr. Aaron Duane. It is intended for the exhibits of the Army, Navy, and Treasury Departments, Patent Office and Smithsonian Institution. It is colored in light brown and yellow tints.

WOMEN'S PAVILION.

The Women's Pavilion stands east of Belmont avenue, opposite the Government building. It covers an area of 30,000 square feet, and is formed by two naves intersecting. The corners formed by the two naves are filled out by four pavilions. The structure is in modern wood architecture, roofed over by segmental trusses. The centre of the structure is raised twenty-five feet higher than the rest of the building, and is surmounted by a lantern with a cupola on the top. The interior has only four supporting columns, all the rest of the building being trussed over from the outside walls. The architect is Mr. H. J. Schwarzman, and the contractors Messrs. Peters & Burger. The building is designed for an exhibition of women's work in all its branches, and for the illustration of those educational systems in which women have bore a prominent part. Women are, however, also allowed to exhibit in the Main building, and are not excluded by the establishment of a separate women's department. The exterior is colored in brown and yellow, and the interior in blue and white.
SUBSIDIARY BUILDINGS.

In addition to the principal Exhibition Buildings are the following annexes: To the Main building, the Carriage building and the Mineral annexes.

The Carriage Exhibition building is situated north of the west end of Main Exhibition building. It is covered with corrugated iron, painted in light colors, and its extreme dimensions are 360 by 24 feet. It is intended for the exhibition of carriages, vehicles and their accessories.

The Mineral annexes of the Main Exhibition building, for the exhibition of mineral products, consist of two buildings situated south of the Main building, one of which is 532 by 40 feet, and the other 312 by 35 feet. The display of minerals promises to be a very large and fine one.

The annexes to Memorial Hall comprise the extension to the Hall and the Photographic building.

The extension to Memorial Hall [Art Gallery] is about 100 feet north of the latter, and covers about an acre of ground. It is 356 by 185 feet; it is built of brick, rough cast and painted in imitation of granite, to correspond with Memorial Hall. In the wall are alcoves for the reception of statues, the same as in Memorial Hall. It contains double the amount of wall space of the latter, which is secured by dividing the space into a larger number of rooms, each lighted by a square skylight. In some of these rooms a further subdivision is effected by introducing two screens intersecting each other and placed in the centre of the room. The walls are painted maroon color, to give a proper relief to the pictures.

Photographic Hall, a building for the exhibition of photographs, is a large building situated southeast of Memorial Hall. It is 86 by 143 feet, and contains a hall 85 by 26 feet, in which the photographs are displayed. It contains also three studios, with a total length of 100 feet and a width of 20 feet, and a printing room 80 by 20 feet.

The annex to Horticultural Hall is a flower tent, 50 by 150 feet, and is situated north of the Hall, and designed for the exhibition of rhododendrons and cut flowers.

The annexes to the Machinery building include the Shoe and Leather building and ten smaller structures, used for boiler houses, machine shops, etc.

The Shoe and Leather building is a large wooden structure, 160 by 300 feet, situated between the east end of Machinery Hall and Elm avenue. In this every description of shoe machinery, boots and shoes, leather of all grades, from every quarter, home and foreign, will be on exhibition. The process of machine manufacture will be illustrated by the machinery in motion, with all the details of this important industry.

The annexes to Agricultural Hall comprise a building for the exhibition of wagons, a building for the exhibition of fruits, a model cheese and butter factory, and thirty-five acres of sheds to be used for the exhibition of live stock. The annex wagon building is located north of Agricultural Hall building, and is 250 by 145 feet. The sides are of corrugated iron. It has three sections, at the middle and at each end, which are two stories high.

The Brewers' building is a large structure situated northeast of the Agricultural building, designed to exhibit the progress of the manufacture in this country. In one section will be exhibited a brewery of fifty years ago, and in another section the process at the present day. The Pomological building, in which will be a special display of fruits, adjoins Agricultural Hall on the east. A model butter and cheese factory stands east of Agricultural Hall, near the Pomological building.

The annex to the Government building is the model of a field hospital used in the army.
during the war. It is a small frame structure, painted in drab, and is divided into wards with all the improved appliances for nursing.

The annexes to the Women’s building are a model of a school-house and a model of a Kindergarten.

FOREIGN BUILDINGS.

A number of the foreign Governments and individuals from foreign countries have erected separate buildings, some for exhibition purposes, some to be used as headquarters for the Commissions, and others for purposes of traffic or to make special exhibits. These buildings may be classified as follows: Great Britain, 4; Germany, 1; Brazil, 1; Sweden, 1; Japan, 3; Spain, 3; Canada, 1; Turkey (individual exhibit), 1; Morocco, 1; Tunis, 1; Chili, 1; France, 4; Austria (individual exhibit), 1; Natives of Jerusalem (individual exhibit), 1.

St. George’s House, the headquarters of the British Commissioners, is much admired, and it is proposed that it shall remain after the Exhibition closes, if the Park Commissioners conclude to use it for their offices. It is of the Elizabethan style of architecture, two stories high, surmounted by red tiles and a multitude of large chimneys. Mr. J. H. Cundell, engineer of the British Commission, superintended its erection, and Mr. Cooper, of London, the furnishing. The furniture and fixtures are all from famous English establishments.

It covers a space 90 by 25 feet, with projections in front, and a veranda and balcony back. The interior decorations and arrangement of rooms, hallways, etc., are designed to reproduce the time of Queen Elizabeth as nearly as it can now be done. The window panes are small; the rooms have fire-places, high mantels, and broad window seats. On the first floor, a suite of three apartments finely finished in oak, and opening into each other by sliding doors, are the “show rooms” of the house. They aggregate 56 feet in length by 16 feet wide. There are about twenty apartments on the two stories, opening into passage-ways running lengthwise through the centre of the house. Apartments in this building will be provided for the use of the various British Colonial Commissioners, from the Dominion of Canada, Victoria, New South Wales, Queensland, South Australia, Tasmania, New Zealand, Cape of Good Hope, Jamaica, Bermuda, and the Bahamas. In the two adjoining houses there are accommodations for thirty-eight persons who are attached to the Commission.

The Japanese country house, located on the eastern slope of George’s Hill, has attracted more attention than any other building on the grounds, not only from the peculiarity of its architecture, but, perhaps, from the opportunity which its construction afforded to witness the methods of the Japanese workmen, and the workings of their funny little tools. The building is a low structure, two stories high, covered with heavy tiles of a very ornamental shape. The sides of the building are made of movable panels; over the entrances are curiously carved timbers, and the floors are covered with costly carpets of unique design. The walls are hung with finely woven curtains of vegetable fibre, which, while it shuts out the sun’s rays, does not exclude the air. It is used as quarters for Japanese exhibitors.

The new Japanese bazaar, or chop house, as they term it, is a long, low, cedar wood structure, standing northeast of the Judges’ Pavilion, and due north of the Public Comfort building. The bazaar measures 100 feet long by 20 wide, and has a wing extending from each end 45 feet long. In the rear of the building, toward the Public Comfort building, is a neat-looking shed for stores. The frame of the bazaar is of hard wood, but the lattice work, etc., is of red cedar. It has a double-tiled roof, and a porch extending around the front. The little knoll on which the building stands has been prettily arranged as a garden, and small trees, shrubs, and rocks, brought expressly from Japan, add much to this interesting picture.
The Brazilian Commissioners' Pavilion stands on a wooded knoll on Agricultural avenue, east of the German Government building. It is built of wood, octagonal in form, about 75 feet each way. A spacious piazza extends nearly the whole width of the structure, and the roof forms a balcony. A turret-like room is built over the main structure, and at every point are staves for flags, while the Brazilian coat-of-arms is seen over the entrance porch. The whole is painted a light ochre, picked out with red and black, and has the general appearance of being a sea-side residence. The interior is also nicely arranged; the doors open into a large hall extending right through, and two rooms diverge on each side; one of these has a bay window and the other opens to the rear of the building. The stairway leads from each side of the farther end of the hall into the turret room and balcony above. The house is very plainly furnished, but is well lighted and ventilated. The parterres around it have been nicely laid out and planted with Brazilian trees and shrubs.

The Portuguese Commissioners' building stands on the western slope of Lansdowne valley, corner of Agricultural avenue, and north of the Swedish School House. It consists of a main structure for the Commissioners, and an annex covering 2,000 square feet, for the purpose of exhibiting the goods for which they had not room in the space allotted to Portugal in the Main building, etc. The structure is nearly square in form, and has a piazza extending around it.

The interior displays a main hall 27 feet square, and there are retiring rooms on each side. The roof forms a promenade and the inner walls of the building extend above the roof and form a small turret. When finished it will be painted in appropriate colors, and the coat-of-arms of Portugal will be placed over the entrance.

The German Commissioners' building is an attractive structure, in the Renaissance style of architecture, situated on the northern slope of Lansdowne ravine and eastward of Belmont avenue. It is built of brick overcast with cement, and measures 82 feet by 42. A spacious portico leads into the main hall, which is well finished in stucco work, and the walls and ceiling are highly frescoed. On one side of the hall are the offices, and on the other ladies' and gentlemen's reception room.

The Spanish Government buildings, of which there are three, are situated west of the T. A. B. fountain. The eastern building is octagonal in shape, and 50 feet in diameter, and is occupied by the Spanish Engineer corps. Next west is a long shed-like structure, used for a dining-room, at the end of which are a kitchen and wash-room. Beyond this is the building for the use of the Spanish Commissioners, 80 by 100 feet.

The French Public Works' building is 53 by 103 feet, and is located east of the extension to the Art Gallery, near Lansdowne drive. It is intended for the exhibition of models and drawings of the public works of France. The French stained glass pavilion, which is near it, is 20 by 53 feet, and is the headquarters of the French Commission. The French zinc pavilion is an octagonal structure with a long rectangular wing; the octagon is 24 feet in diameter, and the wing is 27 feet long. It is constructed entirely of zinc, and is intended for the exhibition of articles made of that metal.

The French ceramic pavilion is located near the Moorish villa, south of the German pavilion. It is built of iron and tiles, and will be used for the exhibition of bronzes, rustic furniture, pottery, etc.

The Canadian log house stands near the British headquarters and north of the Catholic fountain.

The Swedish school-house is a prettily-designed structure, standing westward of the carriage building, and designed to be a model of a Swedish school. The structure was brought over from Sweden in sections.

The Tunisian Coffee-House is a structure having a projecting platform, situated at the
corner of Fountain avenue and the walk leading to the upper lakes. It occupies an area 40 by 26 feet. It is designed for the sale of Tunisian coffee, tobacco, etc.

The Vienna Bakery is a structure standing east of Memorial Hall, and measures 150 by 125 feet. It will be sold Vienna bread and coffee.

Colonel Lienard's relief plans of Paris, etc., have been constructed on the north side of Fountain avenue.

STATE HEADQUARTERS.

A number of States have erected buildings to be used as places of rendezvous for their Commissions, State authorities and visitors from the States to the Exhibition.

The Pennsylvania State building is situated east of Fountain avenue and north of Machinery Hall, near the lake. It is a wooden Gothic building, 100 by 50 feet. It is surrounded by a tasteful piazza, six feet wide, and is ornamented with a central tower, flanked on each side by two smaller octagonal towers. The height to the eaves is 23 feet and to the peak of the roof 39 feet, and to the top of the central tower 155 feet. The roof is covered with slate. The main hall is 30 by 30 feet, on the right of which are two rooms each 20 feet square, intended for ladies' and gentlemen's parlors; they will be beautifully fitted up, and have dressing-rooms and other conveniences attached. On the left of the hall are two committee-rooms 20 by 27 feet. The building will be the headquarters of the Pennsylvania State Commission, and the State appropriated $15,000 for its erection.

The Indiana Commissioners' building stands east of that of New Hampshire, and occupies a space of ground 60 by 40 feet.

The Arkansas Commission building stands near the Catholic fountain and east of the Virginia building. It is octagonal in form, about 80 feet in diameter, and of very neat appearance.

The Massachusetts building occupies an area of 85 by 70 feet, north-east of the New York State building.

The New Hampshire State building, measuring 50 feet square, is situated to the east of the Connecticut building.

The New York State building is a large, highly ornamented structure, 80 by 35 feet, standing north of the British buildings. It is erected as a headquarters of the State Board.

The Vermont building measures 35 by 40 feet, and stands at the north-west corner of Machinery Hall, on a garden-plot, near the Turkish Coffee-house.

The Mississippi building is the most completely rustic of any on the grounds. It is 30 by 44 feet, with a framework of boards covered with bark, taken whole from large trees, making it resemble a log-house. From the cornices hang masses of the long moss which depends from the limbs of the forest trees in the low lands of that State.

The Missouri building, for the headquarters of the Commissioners, is a building 40 by 60 feet, at the south of the old Belmont drive and near the reservoir. Adjoining this is the Iowa headquarters, 35 by 40 feet. The Rhode Island building, 24 by 35 feet, is opposite the Mississippi building, and on the slope of George's Hill. It is in the form of a Greek cross.

The Ohio State building has a wooden annex 60 feet long, intended for exhibiting articles from that State. The stone State building will be for the use of the State Commissioners and citizens of Ohio. The Maryland State building is 70 by 85 feet, and will be used for exhibition purposes.

The Virginia State building, used as headquarters for the Commissioners, is east of the Kansas building, and near the Women's Pavilion. It is quite a large structure.

The Connecticut State building is situated on State avenue, north-west of the English
buildings. It is a representation of a New England country house, one and a half stories high, with small window panes. The grounds are decorated with ornamental plants, representing the United States and State Coats of Arms. The States of Wisconsin, Illinois, Michigan and Delaware have also erected pavilions to be used as headquarters for the State Boards. They are all situated east of the old Belmont drive in the north-western section of the grounds.

The New Jersey State building is situated on the east side of Belmont avenue, just north of the Women's Pavilion. It is unique in architecture, and of a very imposing appearance. The roof and a wedge-shaped tower are covered with heavy, light colored tiles, which makes it very conspicuous. It contains a large amount of accommodation for the Commissioners and residents of the State.

STATE EXHIBITION BUILDINGS.

A number of States have also erected buildings in which to make special exhibits of their industries and resources.

The Ohio State building, located west of Belmont avenue, and near the old Belmont drive, is built of stone furnished by twenty-one quarry owners of that State. All the other materials used in its construction were also furnished by dealers in the various articles. It will be used as headquarters for the Ohio Commissioners and contributors. It is 40 feet square inside, and has a full story and attic. Extending north of it is a frame annex, in which an exhibit of the resources of the State will be made.

The Kansas State building is a large ornamental wooden structure, 132 by 132 feet. It contains a large circular hall, approached by very broad passage-ways from north and south. It stands east of Belmont avenue, and north of the Women's Pavilion. It will be used for a special exhibit from the State of Kansas, and the offices of the Commissioners from that State.

California has a large building for exhibition purposes, 55 by 115 feet. It stands just north of the Japanese country house.

The West Virginia building is situated to the south and west of the British buildings. In front is an octagonal building for the use of the Commissioners, which is connected by a corridor, with a large hall for exhibition purposes, 50 by 140 feet.

The building erected by the Educational Department of Pennsylvania stands due north of the Carriage building. It is octagonal in shape, about 100 feet in diameter, and has two annexes at the front and back, each 40 by 20 feet.

The Pennsylvania Bible Society have erected a building, 29 by 20 feet, south of Horticultural Hall.

MISCELLANEOUS BUILDINGS.

Under this head are included buildings erected by individual exhibitors, buildings erected for purposes of traffic, ornamental structures, and minor structures.

The Judges' Hall or Jury Pavilion is situated north of the Main building and east of Belmont avenue. It is a handsome wooden structure, 152 by 113 feet, in the centre of which is a large hall, 60 by 80 feet, with a gallery extending round it to the walls. Surrounding this central hall is a corridor upon which open fourteen committee rooms, one of which is a room 60 by 20 feet, and is used by the United States Centennial Commission for their meetings.

The Centennial Photographic Company's building is situated east of Belmont avenue, and west of the Judges' Pavilion. It is occupied by a company which has the privilege of taking photographs and selling them within the enclosure.
BUILDINGS FOR THE CENTENNIAL EXHIBITION.

The Medical building is situated in Lansdowne ravine, just north of Judges’ Hall. It is to be used as a medical headquarters or hospital. A physician will be on duty at all times. The building contains two small wards, one for males, and one for females, with beds, medical supplies, and everything in readiness for any emergency. There will be many cases requiring immediate attention in such a multitude as will throng the grounds during the progress of the Exhibition. No patients will be kept over night, but severe cases will be removed to the hospitals or to their homes. There are large and commodious offices, in which Dr. Pepper and his assistants will receive such physicians as see fit to pay them a visit.

The Catholic Centennial Fountain, erected by the Catholic Total Abstinence Union of the United States, is one of the most prominent ornaments of the grounds, and a most beautiful and appropriate memorial. It will remain a permanent feature of Fairmount Park. It stands at the intersection of Fountain avenue and the Avenue of the Republic, and near the foot of the slope of George’s Hill. The idea was originated by Dr. Michael O’Hara, of this city, and was adopted by the National Union in New York, in October, 1873.

A large circular basin, 40 feet in diameter, has in its centre a mass of rockwork, upon the top of which stands a colossal statue of Moses. He points towards Heaven as the source of the great miracle which the gushing waters attest. Stretching from the basin are four arms, in the form of a Maltese cross, each terminating in a circular platform, upon which stands a drinking fountain 12 feet high, surmounted by a colossal statue 6 feet high. The four statues represent Commodore John Barry, the “Father of the American Navy;” Archbishop John Carroll, the patriot priest of the Revolution; Charles Carroll of Carrollton, the Catholic signer of the Declaration of Independence, and Father Mathew, the Apostle of Temperance. The statues were executed in Tyrol, Austria, by the sculptor Kirn. The coping of the basin is of American marble, from the Cockeysville (Md.) quarries.

The granite steps leading up to the fountain are of Maine granite. The basin wall is divided into eight sections, in the centre of each of which is a circular space with a medallion head, each one being of a Catholic patriot. The whole cost of this work was $50,000.

The Grand Division of the Sons of Temperance have erected a pavilion at the intersection of Belmont and Fountain avenues, under which is a fountain, with twenty-six self-acting spigots, which dispenses ice water freely to all comers. The pavilion is thirteen-sided, representing a Greek temple; it is 25 feet in diameter and 36 feet high. The tank holds from four to five thousand gallons of water, and is fed directly from Belmont reservoir.

The Witherspoon Monument is situated near the Lansdowne drive, just east of Memorial Hall. The Monument is of bronze, cast by Robert Wood & Co., and is 12 feet high, upon a pedestal of Quincy granite 12 feet high. The monument was erected by the members of the Presbyterian denomination, in honor of the patriot, statesman and divine, and the signer of the Declaration of Independence, and President of Princeton College.

Lauber’s German Restaurant is situated northeast of Horticultural Hall, on the top of the hill, south of Belmont valley. It consists of a large dining hall with a lofty dome, and three wings enclosing an open space, in which tables are also set. About a thousand people can sit down to the tables at one time.

The American Restaurant is situated on the northern side of Belmont valley, south of Agricultural building. It is 273 by 188 feet, inclosing on three sides a space 125 by 116 feet, in which are fountains, plants and statuary. About 500 people can be seated in the main banqueting hall, and the total capacity is equal to the accommodation of 4,000 guests.

The Restaurant of the South is situated east of Belmont avenue and north of the Women’s Pavilion. It is a building 150 feet long, built with projections from each end and from the centre. It will accommodate about 1,000 guests.
The Restaurant of the Trois Frères Provenceaux occupies the triangle formed by Fountain and Belmont avenues and the north shore of the adjacent lake.

A Hebrew Restaurant, or Hungarian wine pavilion is situated south of George's Hill. It is a plain shed-like structure with a pointed roof, and measures 20 by 26 feet. Mr. Schwarzman is the architect.

George's Hill Restaurant is a structure 85 by 70 feet, which stands in the rear of the British buildings.

The Department of Public Comfort. The building forming the headquarters of this department stands directly eastward of the Jury Pavilion. It is 100 feet square, and one end of the structure is occupied by the Centennial Commission, and the other by the Telegraph Department. In the building are cloak and umbrella rooms, writing rooms, lavatories, a refreshment buffet, a news stand, etc. Stations in connection with the Department of Public Comfort have been established in various parts of the grounds, for the convenience of visitors.

The Centennial National Bank is a frame building 70 by 40 feet, fronting on Belmont avenue, south of the Main building; Messrs. Cook, Son & Jenkins' excursion ticket pavilion stands on the southern shore of the lake, near the eastern extremity of Machinery Hall.

The Dairy buildings are situated on the north side of Lansdowne ravine, east of Belmont avenue. The principal structure is of a rustic pattern; it stands upon the slope, the second floor being at a level of the drive above. The upper story is open at the sides, and will be used as a lunch-room, where ice cream, milk, cheese, butter, etc., will be sold. The lower story will be used to store dairy products. The additional building is a frame structure adjoining, increasing the room for seating guests.

The Empire Transportation Company's building is situated south of the Vienna Bakery or north-east of the Main Exhibition building. The structure measures 82 by 60 feet.

The Bankers' Exhibit building, measuring 75 by 40 feet, stands to the north-east of Photographic Hall.

The Newspaper pavilion, erected by Messrs. George P. Rowell & Co., of New York, is a frame structure, measuring 70 by 46 feet, standing west of the restaurant of the Trois Frères Provenceaux.

The Singer Sewing Machine Company's pavilion stands north-west of the extension to the Art Gallery, and measures 80 by 45 feet.

The Burial Casket Company's building stands north-east of that of the Singer Sewing Machine Co., and occupies a space measuring 35 by 20 feet.

The Bohemian Glass building has been erected by Klautsch, Thomas & Stewart, south of the German pavilion and near the lake. The structure measures 40 feet square, and it is intended therein to illustrate the process of manufacturing Bohemian glass. Messrs. Kittredge & Co.'s building stands near the Bohemian glass building. It is 40 by 27 feet, and is for the exhibition of cornice and ornamental work.

Among the industrial buildings quite recently erected are the following: west of Machinery Hall and south of the T. A. B. fountain, is Campbell's building, 90 by 115 feet, for the exhibition of printing machinery. Klautsch's glass factory is located north of the judges' pavilion. The American Fusee Company, north-east of the judges' pavilion. The Giddon Guano building, for exhibiting guano, crude and prepared, east of the Women's pavilion. The bee hive, an exhibition of bees in patent hives, east of the Agricultural building. Eleven different wind-mills, erected by different parties, north-east of the Agricultural building. Dietrich's hay packing building for exhibiting hay presses, south-east of the Agricultural building. West of Machinery Hall are the Liberty Store Works; Fuller, Warren & Co.'s stove-works; saw-mill; Gillender & Son's glass-works; E. Ross's saw-mill; automatic railway; the Tiffany gas-works; the Chili Amalgamating machinery building; south of Machinery Hall, are Wei-
mer's patent furnace, State of Nevada quartz-mill, Yale Lock Company's works, and J. N. Boles' drilling machines.

Several newspapers have separate buildings on the grounds, mostly small and unpretentious in architecture. Among them are the following: The Practical Farmer, Philadelphia, south-east of the Agricultural building; Frank Leslie's building, north of Machinery Hall, on the borders of the lake; The Philadelphia Times, north side of Fountain avenue, east of the T. A. B. fountain; New York Tribune, west of Belmont avenue, near the lake.

RECAPITULATION.


In the northeast section are the following buildings: Agricultural building, Annex Wagon building, Pomological building, Brewers' building, Model Butter and Cheese Factory, Tea and Coffee house, American restaurant, Kansas State building, Restaurant of the South, New Jersey State building, Horticultural Hall, Women's Pavilion, Gidden Guarino Company's building, New England Log House, Bee-hive, Women's School-house, Lauber's German Restaurant, Virginia State building, Boiler House, Eleven Windmills, Hay Packing building, Practical Farmer's Office, Police barracks, two Public Comfort stations, one Police station, one Pop-corn stand, two Cigar stands, and one Soda Water fountain.

mon State building, Chilian Machinery building, statue of Elias Howe, Police station, two Pop-corn stands, and one Soda Water fountain.

In the northwest section are the following buildings: United States Government building, United States Hospital, Laboratory, United States tents, United States Signal Service, Bishop Allen's monument, Canadian Log house, Arkansas State building, Spanish Government building, Spanish Engineers' headquarters, Spanish Exhibition building, West Virginia State building, Japanese country house, Mississippi State building, George's Hill Jewish restaurant, California State building, New York State building, two English houses, English house, English headquarters, Tunisian Coffee house and tents, Centennial Fire Patrol, Ohio State building, Indiana State building, Illinois State building, Wisconsin State building, Michigan State building, New Hampshire State building, Connecticut State building, Massachusetts State building, Delaware State building, Maryland State building, Tennessee State building, Iowa State building, Missouri State building, United States Block house, Rhode Island State building, two Cigar stands, one Soda Water stand, and one Public Comfort station. Making a grand total of 190 buildings within the boundaries of the Exhibition enclosure.
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