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AMERICAN PROGRESS—I.—FROM 1776 TO 1820.

There are few darker pages in history than those which recount the condition of the thirteen colonies of North America during the months just previous to the adoption of the Declaration of Independence. A year had elapsed since arms had been taken up against the mother country; and although the colonists had resisted successfully, the very fact carried fresh terror to the doubting, for it augured invasion, not by a few battalions sent to quell a rebellious mob, but by the grand armies of England, victors in a century of wars. If not extirpation, then reduction beneath a tyranny, more grinding than that against which they had revolted, now menaced the rebels. Congress sat doubting, distrustful, divided in thought, seeing no glimmer of light in the prevailing darkness, thinking, as John Adams moved on the 10th of May, 1776, that the colonies should themselves establish separate governments, "adequate to the exigencies." But the stirring eloquence of Thomas Paine was ringing through the land, replete with the suggestion of a hope which none had dared to cherish. The war against England's blind and headlong oppression was fast becoming, through popular sentiment alone, a war against England herself; and it needed but the formal declaration of Congress to elevate the conflict from a mere rebellion to that grandest of wars, which finds its parallel in all animate nature, the struggle for national existence.

To turn from the political to the industrial condition of the colonies is but to bring to view fresh evidences to show the fragility of the foundation on which the fabric of our country was reared. Iron and steel works there were none, nor woolen nor flax manufactories: all were suppressed by England. Iron founderies had been started, and in New England hats had been made; but Parliament declared America factories "a nuisance," and crushed them ruthlessly. It allowed the production of pig iron; but the colonist was forced to have the material manufactured in England, and pay an enormous profit to the English founder. Agriculture, hunting, fishing, and cutting lumber, England could not check; hence these furnished occupations to those who were not engaged in such few trades as were carried on. Probably the most extensive factory in the country was Baron Stiegel's glass house, in Mannheim, near Lancaster, Pa. Operations were conducted in a curious manner, for the owner's ideas were of the feudal ages. He built castles and mounted cannon wherewith to salute himself on arriving and departing; and when a guest was received, the workmen were summoned from furnace and foundery to attend the new comer with music and rejoicing. The war cut off the Baron's funds from Europe, and the works were soon after discontinued.

Shipbuilding existed in New England, and brick-making in nearly all the colonies. There were but two steam engines in the territory; one built in 1772, for use in a distillery in Philadelphia; the other had been imported in 1736, for the Schuyler copper mines, at Passaic, N. J. Both were of the Newcomen type. No agricultural machines were known, except, perhaps, the grain drill, no cotton mills existed, and the green seed or staple cotton alone was cultivated. Not a printing press existed west of the Alleghanies; and there were only forty, all hand machines of the crudest type, in the colonies. Thirty-seven newspapers sufficed to spread intelligence. From Boston to New York was a week's journey by coach, sloops plied between New York and Albany; and in winter, colonists in Virginia were practically isolated from those in Massachusetts. Certainly no nation ever embarked in so gigantic a struggle worse prepared; for of the material prosperity whence the sinews of war are drawn, the colonies were destitute. Canada, refusing to join them, furnished vantage ground for the invader.

The Spaniards along the Mississippi looked with no favor on the rebellion, and the English in Florida were actively hostile. Thus on the 10th day of May, 1776, just one hundred years before the opening day of the Centennial, the few but resolute inhabitants of the thirteen colonies found themselves hemmed around with foes, bankrupt in money and in industries wherewith to gain it, menaced by an uprising among the Indians on the border wildernesses, disunited in thought and feeling among themselves; and to crown all, a British army was preparing to attack New York, while all the seaboard cities seemed doomed to certain and swift destruction. Yet, in the face of these terrible odds, Independence was proclaimed, and the nation was born.

It is our purpose to present here some brief account of what Americans have accomplished in Science and invention since the bell in Philadelphia pealed forth "liberty throughout the land." Much must necessarily be omitted; of nothing can we take more than a passing glance, so vast and varied are the achievements which, beyond all else, have combined to create a great and powerful nation in the shortest period known to history. To the same ancestry that asserted their rights as freeborn men, an ancestry gathered from the skillful workers of all countries, are due the frugal and industrious habits, the facility of adopting means to ends, and the indomitable perseverance and energy which characterize the American people; and it is well to remember that in the very restrictions placed upon their efforts toward progress were found the impelling causes of the war of independence.

The industries of the country being practically ruined when the war began, the record of invention and scientific progress up to the close of the conflict is meager in the extreme. The discoveries of Franklin, the first great contributions of the New World to Science, had all been made; it was in 1752 that he demonstrated the identity of lightning with the electric spark, and drew electricity from the clouds. Early in 1775 he left England, where he had been honored and courted, and returned to bide his fortunes with his native country; but even the engrossing labors imposed upon him as a member of the Continental Congress and a framer of the Declaration were not sufficient to distract his attention from Science; and when sent as Commissioner to Paris, he took advantage of the voyage to make observations of the Gulf Stream and to plot a chart of that great current, which still forms the basis of our maps.

One other name, that of David Rittenhouse, of Philadelphia, may be noted beside that of Franklin, whom he succeeded as President of the American Philosophical Society. Rittenhouse was a clockmaker, and carried the perfection of his art into the manufacture of orreries, which still exist, and which show the movements of the heavenly bodies for a period of 5,000 years, and their positions for each year, month, day, and hour, with marvelous accuracy. He made a successful observation of the transit of Venus in 1769, and on account of his great mathematical attainments was elected a Fellow of the British Royal Society.

After peace had been declared, the country found itself exhausted in resources and in men as well, and saddled with a debt of forty million dollars, with no system of public revenue wherewith to provide for it. Financial disaster followed, and private confidence fell in the wreck of public faith. It was no time to await the slow development of events, and the people recognized the fact. It seemed as if every one worked with a will. The whir of the spinning wheel and creak of the loom were heard all over the land. Every family became a manufacturing society. In 1784 New Jersey alone had forty-one fulling mills for woolen fabrics, and not a woolen factory in the State. In two counties in Virginia, 315,000 yards of flaxen cloth, 45,000 yards of woolen, 30,000 yards of cotton, and 45,000 of linsey woolsey were made in one year by household labor. One family completed 1,355 pair of shoes in a year. The inventor's skill was quickly called into action.

In 1785 Oliver Evans, of Philadelphia, first applied steam machinery to the grinding of plaster and sawing of stone, and to flour mills. Then he invented the elevator or bucket chain to raise grain, the conveyer to take it from place to place, the hopper boy to spread it, the drill to carry it by rakes instead of buckets, and the kiln dryer. In 1799 he attempted to build a steam carriage, and in so doing invented and constructed the first high pressure steam engine. In 1785 John Fitch built the first steamboat, and ran it on the Delaware river. It had reciprocating paddles, and steamed at the rate of eighty miles per day. During the succeeding year James Rumsey propelled a boat on the Potomac by a stream of water driven out through the stern by a steam engine. In 1790 Jacob Perkins, of Massachusetts, invented a machine for cutting and heading nails, which produced those useful articles at the unprecedented rate of 200,000 a day. On the 31st of July, 1790, the first United States patent was issued, the patent and copyright laws being both first enacted in that year; and thereafter a marked increase in the number of inventions becomes visible.

At this period, the growing cotton industry of the country seemed to have encountered an obstacle, which bid fair to be a serious one. Hand-cleaning of cotton was slow and costly; and unless mechanical means could be devised, the new staple could never become a source of wealth. It so happened that there then came to the house of Mrs. General Greene a poor student, from Yale College, named Eli Whitney, who, in various ways, showed himself possessed of considerable mechanical skill. While some officers, her guests, where one day regretting the absence of the machine above noted, Mrs. Green laughingly suggested that Whitney should invent one. The young man overheard the words and remembered them. He had never seen cotton in his life; but making his way to Savannah, he obtained a small quantity and, shutting himself up in a room, went to work. It is said that the saw gin was suggested to him by the accidental use of a toothpick to try the tenacity of the seed. Within ten days after he began experimenting, he made a model which was capable of cleaning 50 lbs. of green seed cotton daily. Thus was completed one of the greatest inventions of modern times, and one which the inventor lived to see result in increasing the cotton production from 5,000,000 to 215,000,000 lbs.

In 1796 the great scientific discovery of the non-materiality of heat was made by an American, Benjamin Thompson, Count Rumford, then residing in Munich. He had deserted his country during the war, and accepted service under a foreign prince. This discovery lies at the foundation of the mechanical theory of heat, and directly led to the grandest doctrines of modern Science, the correlation of forces and the conservation of energy.

We may note the establishment of broom-making as a new industry, and the invention of broom-making machinery in 1797, by the Shakers located along the Mohawk river. In the same year Amos Whittemore, of Massachusetts, devised the first machine for the manufacture of wool and cotton cards; this device punctured the leather and set the wires. This proved of great value to the industry, and highly remunerative to the inventor. During the following year Robert McKean patented the first steam sawmill.

At the opening of the nineteenth century the signs of remarkable progress were everywhere discernible. In ten years the population had increased by nearly two millions. The exports for 1799 were $78,665,522 against $79,069,148 imports, and during the previous decade 306 patents had been granted.

In 1801, the oxyhydrogen blowpipe was invented by Dr. Robert Hare, of Philadelphia, one of the greatest as well as the earliest of American scientists. It occurred to him that a flame produced by the combustion of oxygen and hydrogen gases ought to be attended with a higher heat than that gen