Machinery and Civilization.

Mr. Charles C. Coffin has been giving a series of lectures in the Lowell (Mass.) Institute on our manufacturing industries and the relation of invention to civilization. From the Boston *Advertiser* we make the following extracts from one of these lectures:

The first need of men in this world is for something to eat; the second is for something to wear. The earliest historical allusion to the manufacture of textile fabrics is the simile in the oldest poem extant—the Book of Job—the comparison of the swiftness of time to the weaver's shuttle. The weaver's shuttle of the East and the loom of the Orient through all the centuries have not changed. Throughout Asia, and even in some sections of Italy and Spain, the spindle of to-day is like that which Penelope deftly twirled when preparing garments for her absent lord. The use of machinery in the manufacture of clothing has been a powerful agency in modern civilization. Out of the multitudinous machines of the present century I select those for spinning and weaving to represent the progress of mechanic art. It is noteworthy that the first movement in free intellectual thought in antagonism to the dogmatism of the Middle Ages and the first mechanism to relieve woman from unceasing toil were coincident. During those years in which Martin Luther, Melancbthon, and their compeers were awaking the world to a new intellectual and religious life, a German carpenter constructed the spinning wheel, which made its appearance about 1530. The knitting machine was the second invention—the device of a young curate of Nottingham, the Rev. William Lee; and during those months when the Mayflower was crossing the Atlantic, the first stockings knit by the machine were placed on the market.

The lecturer commented upon the fact that the century following Lee's invention rolled away without any invention. Men were giving their attention to other things. The spirit of the age was against invention. The learned were lost in abstractions, were regardless of human needs, utterly ignorant of the resources of nature to alleviate human woe or to lift men to a higher plane of life. Another reason why inventions did not come earlier was that all christendom, through the Middle Ages and down to the beginning of the present century, was engaged in war. The conditions were all adverse to scientific research. In 1781, just one hundred years ago, came Watt's first working engine, with a condenser and the steam applied to propel the piston in both directions.

Aside from the very few wind and water mills, the human race at the beginning of the present century was living by its own muscular energy, digging and delving, spinning and weaving, with rude instruments and mechanisms.

The world is more enlightened now, but there are still many people who cannot see how the introduction of a machine which will do the work of many men can be promotive of the well being of the community. Imagine yourselves as standing on the bank of the Merrimac in 1821, with Nathan Appleton, William Appleton, Patrick T. Jackson, Kirk Boott, John W. Boott, Paul Moody, and Nathaniel Bowditch. No sound breaks the stillness, save the rushing of the water over the rock. It is the energy of nature running to waste, and these gentlemen determined to set it to work for their individual welfare. They purchased the surrounding farms and the old canal which other men had constructed for the passage of rafts, set themselves to enlarging it, and in building a dam, not working with their own hands, but summoning the farmers, who came with their oxen to haul rocks. Stonemasons are wanted, and the blacksmith to sharpen their tools. Young men come down from Vermont and New Hampshire to dig the canal. The gentlemen who are pushing the enterprise need bricks. Another class of laborers is called for. Lumber is needed, and sawmills are set to humming. Masons, hodcarriers, mixers of mortar, lime burners, are set to work, with still more oxen, more teamsters and cartmen, besides coopers to make the casks for the lime. An architect plans the manufactory; the carpenters frame it, and a corps of joiners finish it. A millwright calculates the power, sets another corps of men at work constructing the great wheel. The manufacturers of the spinning and carding and weaving machines have regiments hammering and filing brass, steel, and iron. They in turn have set the founders, puddlers, and smelters to work. Furnaces send up their lurid flames; vessels are sailing on the ocean to fetch and carry the materials. The miners far down in the earth, the sailor climbing the shrouds in mid-ocean, the millwright lost in thought, as he calculates the power of nature's energy, the brickmaker moulding the plastic clay, the joiner plying his plane, the teamster urging his cattle; all have been called from former vocations to aid in building the mills. Why have they come? Because these gentlemen offer them more remunerative wages than they have been receiving.

Let us follow on. The mills are erected, the machines are in place, but human hands are still needed. The gentlemen summon the farmers' sons and daughters by the inducement of better wages. Have the gentlemen thrown any one out of employment? They have changed labor; they have made the spinning wheel and loom of the household useless lumber, not throwing the old-time spinners and weavers out of employment, but transferring them to one in which they can do more for themselves and their fellowmen. You ask, perhaps, what the masons joiners, and carpenters who built the mill are to do when the mill is completed? Are they not out of employment? The mill is only the beginning. Dwelling houses are needed, stores, shops for the grocer, butcher, baker, joiner, mason, blacksmith—the whole fraternity of trades and occupations. The first mill erected at Lowell was the beginning of a city to-day numbering between 50,000 and 60,000 inhabitants. It will be instructive in this connection to see what labor and capital together will accomplish through the use of the energy of nature, in giving value to raw materials.

The Southern farmer plows his lands, casts in the cotton seed. He sells his crop at 12 cents per pound, obtaining a livelihood by agricultural labor. The operative in Lowell, by manufacturing it into muslin, may make it worth 80 cents, by more delicate manipulation into lace worth $1. But before the process could be undertaken by the machinist, the iron manufacturers were called upon to construct the machinery. The ore which the miner dug from the ground, and which he sold for 75 cents, the iron smelter sold for $5. The machinist makes it worth $100. If instead of putting it into spindles and wheels, it had been sold to the manufacturer of fine needles, he would have made it worth $6,800. The manufacturer of watch springs would have made it worth $250,000; or if he were to use it for pallet arbors it would be worth $2,577,595. Past earnings and present labor together give this increased value to the 75 cents' worth of ore.

Invention renders old things obsolete and so is destructive; but there is a force more destructive than invention, a force that not only drives men from occupation, but upon the instant consigns their costly machines to destruction—a force wielded almost wholly by the female sex—the force of fashion, a power stronger than the combined strength of inventors, manufacturers, and operatives. Not long ago every woman in this audience quite likely regarded a hoop-skirt as necessary to make her wardrobe complete. Probably not less than 25,000,000 were manufactured per annum, requiring an outlay of many millions of dollars for complicated machinery, furnaces, and rolling mills for the foundation of steel, manufactures for the weaving of tape, employing many thousand operatives; but suddenly the idea gained possession of the female mind that dress would be more graceful and pleasing to the eye without them, and they were upon the instant discarded, bringing about quick destruction to the manufactures and loss of occupation to the operatives.

Invention is an educator. It begins with thought. The more thought put into his machine by the inventor the higher the intelligence to operate it. Mechanics has become a distinct profession, requiring high mathematics, physics, and the power of abstract thought. Trade and commerce recognize the new profession by offering it their highest pecuniary rewards. It is the master mechanic, receiving his salary of $15,000 per annum, who is the cheapest employe of some corporations in this country. Fifty years ago, in 1830, the spindles of the world were as follows: United States, 1,000,000; Europe, 2,000,000; Great Britain, 8,000,000. To-day the United States has 11,000,000; Europe, 20,000,000; Great Britain, 40,000,000. In cotton manufacture it is estimated that one man to day is able to do the work of 1,000 hand laborers, and that the cotton, silk, and woolen industries of to-day would require the labor of every human being if prepared by hand labor.

One hundred years ago, when thread numbered 150 by the standard set up by spinners was considered the utmost degree of fineness possible by English spinners, a pound of cotton spun to such fineness would give a thread 74 miles in length, sufficient to reach from Boston to Concord, N. H. The machinery of to-day spins for useful purposes thread numbered 600—from one pound a thread 196 miles in length. And machinery has been constructed so delicate that a pound of cotton has given a thread reaching 1,061 miles—farther than from Boston to Chicago! The weaver of my boyhood could throw the shuttle perhaps twenty-five times a minute, but not at that rate through the day. Human muscle would break down under such rapid action. In 1850 Compton's loom threw the shuttle fifty times a minute, whereas so great has been the advance of invention, that the loom of to day is considered a slow moving mechanism if the shuttle does not fly 240 times a minute! "No man can afford to take as a gift to-day a cotton manufactory equipped with the machinery of 1860," was the remark of the late superintendent of the Amoskeag Mills. "We are breaking up the machinery of those days for old iron."

In some departments of cotton manufacture a man with the present machines will do eight times the amount of work which he could accomplish in 1860. In the manufacture of coarse cloth an operative with ten machines does twice the work which he could accomplish with thirteen machines before the war. There never was a period so fruitful in discovery, so fertile in invention as the present, and the reason is manifest. The first discoverers and inventors groped in the dark. They were ignorant of nature's laws. They did not know what force was. They had a limited comprehension of what the simple mechanical powers were. There was little accumulated wealth of research.

In contrast, the mechanic of to-day has all the discoveries, the experiments, the ascertained facts, mathematics of machinery, the laws of force at his command. He inherits the scientific wealth of all the past and makes it his capital. Instead of gazing, as it were, upon old mines worked out, he beholds mountain ranges filled with golden ore, and engages in his work with the stimulus of the needs of the human race, and the ever increasing wants of an advancing civilization.

Repairing Steamers Out of Dry Dock.

Some weeks ago the steamship Queen, of the National Line, had her bow stove in by collision on the bay. To save the heavy cost of occupying the dry dock while the plates were being made for repairing the breach, the Queen was towed to the Erie Basin, where the manager of the line, Mr. Hurst, had the work done by means of a cofferdam, which was built on the dock. The dam was about 25 feet square, and was simply a huge box without a cover. In one side of this box an aperture was cut into which the bow of the vessel exactly fitted. Then the box was sunk beneath the steamship and raised under her bow so that it fitted snugly to her hull and the edges were calked. After the water had been pumped out the workmen descended into the box or cofferdam and rebuilt her bow. This method of repairing, which is an old but much neglected one, saved the company, Mr. Hurst is reported to say, just $26,000.

More recently the method has been applied to the iron steamship Holland, of the same line. Mr. Hurst says: "In the November gales she was all torn to pieces about the stern. She is 450 feet long and is registered at 4,000 tons burden. No dry dock in America could lift her. She is at our dock at Houston street, North River. I had a coffer dam built in Jersey City and towed to the Holland. The dam is 36 feet long, 26 feet wide, and 22 feet deep. I sent a carpenter into the hold of the Holland, and he took measurements every 2 feet from keel to deck. He then went on the dock and built a flat pattern the exact shape of the vessel about 10 feet from her stern. The shape of the pattern was cut from one side of the coffer dam. Then the coffer dam was towed to the vessel, heavy chains were thrown into her until she sank, the chains were then withdrawn, and the dam rose to the hull of the steamship. The stern fitted perfectly into the aperture, and all was made snug." The repairs will take till February 15. By that time the charge for dockage would have amounted to over $30,000, which is saved by the use of the coffer dam.

A Large Iron Steamboat.

The Fall River Steamboat Company announce that a contract has been signed with John Roach & Son for the construction for them of an iron steamboat, to be the largest ever built for the Long Island Sound trade, between New York and Fall River. Her length over all, on deck, will be 395 feet; length of hull, 380 feet; extreme breadth of beam across the guards, 87 feet; breadth of beam of hull, 50 feet, and 17 feet depth of hold. She will be built upon the cellular system, that is, with two hulls—the most recent type of shipbuilding insuring safety—the cellular spaces at the sides being two feet deep, and along the bottom three feet deep, between the hulls. The spaces between the two hulls will be divided into ninety-six watertight compartments, and, in addition, there will be six water-tight bulkheads from the inner hull to the main deck. The new boat will be provided with a steam steering apparatus, and an independent or safety-steering quadrant aft, in case of accident to the steam gear. The means for extinguishing fire, for closing one compartment from another, and other provisions for safety, will be on the latest improved methods. The engine will be on the "walking beam" principle, with 110 inches diameter of cylinder and fourteen feet stroke. There will be four main boilers, their construction being such as to warrant carrying a pressure of steam fifty pounds to the square inch, although the working pressure will be about twenty-five pounds to the square inch. The paddle shaft will be twenty-six inches in diameter, and with the piston rod, connecting rods, and rock shafts, will be made of the best wrought iron. The machinery will be inclosed in a compartment of longitudinal and athwartship bulkheads, carried up to the hurricane deck. The passengen accommodations are intended to be superior to those of any steamboat now afloat. The boat is to be completed by May, 1882.

AGRICULTURAL INVENTIONS.

Messrs. Anthony W. Byers and James C. Dorser, of Sherman, Texas, have patented a cotton planter so constructed that it can be adjusted to plant less or more seed, as required. There is an ingenious arrangement of spikes or prongs attached to the rim of the feed wheel, which take hold of the cotton seeds and draw them out between curved steel springs fixed in the slot in the bottom of the feed board or bottom of hopper, and at the sides and forward end of this slot are attached springs which are curved downward and outward in such a manner that their bends may meet, or nearly meet, within the slot, so as to prevent the seeds from passing out except when pushed out by the prongs of the feed wheel and thus prevent the seeds from being dropped in bunches. The outward curve of the ends of the springs allows the seeds to drop from them freely, and allows the prongs of the feed wheel to pass up between the springs should the said feed wheel be turned backward.

Mr. Julius Holekamp, of Comfort, Texas, has patented a seed planter whereby corn, sorghum, beans, rice, cotton, etc., may be planted in hills or drills, and so constructed that the seed may be planted in any desired quantity, and at any desired distance apart, and with the rows at any distance apart.

Mr. Christian E. Gardner, of Orangeburg, S C., has patented a seed planter and fertilizer-distributer, which has two hoppers and dropping devices whereby different materials may be carried and distributed by the same machine and at the same time. Adjustments are provided whereby the machine may be used either as a single or double planter.