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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 469,

For the Week ending December 27, 1884.

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HOW IS BUSINESS?

Somewhat extended presentations of this question to manufacturers over a considerable district of New England elicit a hopeful if not a satisfied reply. The gloom of a despondent winter is partially relieved by the hope of a better future—by the signs, even now, of improved conditions. Establishments which had shortened hours last October have resumed the usual time; others, that had shut down entirely before November 1, have started up, perhaps on diminished time; others, which had discharged men in the latter part of the fall, are encouraging their men to remain with them to meet new orders just received. This is not the picture of the entire territory, but it is that of the larger portion of it; and it comprehends the manufactures of cotton, wool, iron, brass, and wood—in fact, it covers an example of almost every prominent New England manufacture. The general feeling is one of hopefulness; this begets confidence, encourages capital, and inspires purchasers.

During the first ten days of December, 1884, one of the largest dealers in iron and coke made larger sales than during the same term the year before, the facilities for supplying demands being ample in both instances. He reported that in Boston, Mass., and Providence, R. I., at that time, the condition of business had improved, and that the prospect in the territory dominated by these trade centers was encouraging.

Of course, different men give different reasons or suggestions to account for the alarming depression in business—overproduction, lack of adequate markets, the system in some sections of the country of giving long credits, and the disturbance of business by the excitements and unreasonable alarms attending a political national campaign. Whatever the causes, they seem to be gradually in process of removal by the settlement of the political caldron.

IMPROVED WORKMANSHIP.

Said an old and long experienced machinist the other day, one of a firm of well known manufacturers: "I should be ashamed now to father some of the nice jobs I prided myself upon thirty years ago. I was a first class machinist, and got first class pay; but I have men in my shop, not yet out of their four years' apprenticeship, who can do a better job than I could then. And it is not all owing to improved machine tools; it is because better work is exacted, and better instruction is given to apprentices."

The reduplication of parts and of entire machines in modern practice is one reason for this improvement in individual skill. In addition to the necessary hand work in making templates, jigs, gauges, and other appliances for reduplication, there is much more exactness in fitting than formerly, requiring individual judgment, patience of work, and skill of hand. The modes of doing work have been greatly changed; patterns for the moulder are made to such modifications of the old fashioned rule of "one-eighth of an inch to the foot for shrinkage" as would astonish a Rip Van Winkle of a machinist or pattern maker. Some patterns require very intricate calculations and very exact proportions before they finally leave the pattern shop for the foundry. Castings now come from the pickling room requiring only a superficial dressing to fit.

So, the forger must work to the line. Thirty years ago, if the forger's product resembled the object intended as closely as Hamlet's cloud did a whale or a camel, it was as near as could be expected; but now there are jobs coming from the forging shop that it seems a shame to submit to the tearing planer and the rasping milling machine. Thirty years ago a machine tool new from the shop was expected gradually to work itself into usable shape; the carriage and foot stock of a lathe were to gradually adapt themselves to the ways of the lathe, and the crosshead of the new planer had to be gibbed up again and again, and perhaps ground with flour of emery and oil, before it fitted the uprights; and it was a common practice to run the platen of the new planer back and forth, for a day or so, with the Vs loaded with emery and oil.

To-day the new tool works as perfectly when first started as when months old; a result to be attributed more to the patience and skill of the workman than to the improvements in the tools he uses; the scraping to fit of the modern machine shops demands as much judgment and hand skill as it does of patience.

The Washington Aqueduct.

The project of supplying the capital with water by forming a tunnel through several miles of rock, from the distributing reservoir above Georgetown to a much larger one in the vicinity of Howard University, is now rapidly advancing at all points. The great subterranean cylinder, when finished, will be eleven feet wide, seven and a half feet high, and nearly 22,000 feet long, and will be able to furnish a liberal supply for many years in the future. Along the course of the new aqueduct, at convenient distances, five large shafts have been sunk to the average depth of nearly one hundred feet. The shafts are sunk about ten feet deeper than the floor of the tunnel, forming wells to receive the springs that flow through the interstices of the rock. Compressed air is the motive power employed for all the pumping, drilling, hoisting, and ventilating. A substantial edifice has been built at a central point upon the Chesapeake & Ohio Canal, where fuel is delivered at least cost. This building contains six 100 horse power boilers, arranged in one battery, and these are worked incessantly, night and day, except Sundays, for the compression of air. Four 150 horse power compressors receive the air, which, during the process of compression, is cooled by a spray of water injected into the air cylinder, and in this condition passes into the air receiver. A complicated and singular process then forces the compressed air through a 12 inch pipe into a body of water, which experience has shown to be the easiest way of extracting the moisture that would cause it to freeze in the machine using it. The concentration of the power at one point necessitates the use of five miles of 12 and 6 inch pipes to convey and distribute the compressed air. There are in operation in the several shafts twenty-eight rock drills, which work under a pressure of sixty pounds to the square inch, and enable the contractors to proceed with the tunnel about fifty feet per day. Twice in twenty-four hours there is a temporary cessation of the boring apparatus. After detaching and protecting the machinery, the blasts are set, and all the workmen ascend the shaft. The blasts are discharged simultaneously by a battery, the foul air and smoke are driven out by turning on the air, another gang of workmen descends, and boring again begins. Nearly 300 men are employed at the different shafts, in addition to a Lidgerwood hoisting engine and a Knowles pump stationed at each shaft. Appliances are at hand for graduating the pressure, and a stop valve can instantly separate any one shaft from the rest of the works. The debris produced by blasting is removed on cars, propelled on rails to the shaft, where it is hoisted, emptied, and the car returned, there being a double track of rails in the tunnel. The broken rock is conveyed to the site of the new reservoir, where it is utilized by more than 350 men, who are at work on the construction of that immense tank. The whole enterprise was to be finished before the middle of next year; but it is now conceded that at least another year must be added to the time.—*New York Tribune.*

Novel Lightning Protector.

The Washington (D. C.) Monument, which is to be about 500 feet high, is approaching completion. To protect it from lightning the following novel expedient is employed. The apex of the monument is to consist of a conical block of aluminum of considerable size; to its bottom part will be attached a heavy copper bolt or cord, which will at once be divided into four parts, one of these being carried to either of the four heavy columns supporting the elevator. These in turn will be connected with the well near the base of the monument, thus making a complete and ample connection between its summit and the earth. A similar connection between the temporary top of the column and the earth has always been maintained, thus protecting the workmen as well as the structure itself from the effects of any electrical disturbances.

Value of Labor.

A school reading-book of the last generation had an article on the mechanic arts in which was a remarkable statement of the immense increase of value imparted to a pound of iron when manipulated and manufactured into watch springs. The illustration was misleading, because it left out all the expense of conversion from crude iron to spring steel, and took no account of the inevitable enormous waste of material; the idea conveyed was that the conversion of a single pound of iron into a pound of watch springs was possible.

But the increased value of a product of manufacture by labor can be illustrated by an example that is open to no objection of overstatement. A piece of steel bar, square, three-eighths of an inch diameter and two inches long, worth perhaps half a cent, can be increased to more than forty times its initial value by labor. A single blow of a drop hammer on the heated steel punches the central portion against the sides, and forms the steel into a hollowed parallelogram; another blow forms the outside, so that the squared ends become rounded or shaped like the bows of a boat; a final blow completes the shape into that of a sewing machine shuttle. The forging is then placed in a die under a powerful press to compact its substance, is finished on a buff wheel, is drilled, fitted with a tension spring, and is ready for sale, bringing at wholesale from twenty to thirty cents.

A Chance for Our Makers of Dredges.

By reference to another column, it will be seen that American manufacturers of dredging apparatus have an opportunity of filling still another foreign order, this time for the Spanish government, for use at the port of San Juan, Porto Rico. A dragboat is called for, with screw propeller of 100 horse power, five iron barges, and two towboats. Three months are allowed for sending in proposals, and eight months thereafter for building the apparatus. On the Panama Canal, American dredges have been proved superior to the several patterns of dredges of European make also in use there, and our makers of such apparatus are not likely to neglect this opportunity of competing with foreign manufacturers in the same line.

Saw Tempering by Natural Gas Heat.

Messrs. Emerson, Smith & Co., Limited, of Beaver Falls, Pa., are, we believe, the first to use natural gas in heating furnaces for hardening and tempering saws. It is claimed that, natural gas being composed so largely of "hydrogen" and entirely free from sulphur or other base substances, and giving a steady, regular heat, steel is stronger and rendered less brittle and less liable to crumble than when heated by coal or coal gas.