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SOME THINGS A MECHANIC SHOULD KNOW.

Subdivision of labor insures skilled work, but the confinement of the mechanic's knowledge to one single manipulation detracts from his usefulness. This apparent paradox is easily explainable. Take the pattern maker as an example. The department that prepares his work is that of the draftsman; that which perfects or ultimates it is that of the molder. Now, although it may be true that the "Jack at all trades is good at none," yet he who understands, at least in a measure, the design or intention of the workman who is his predecessor in the chain of industry, and the duties and needs of him who follows his work, is more capable than the workman who can only mechanically use the tools of his craft. He will not only do his work intelligently, making a perfect job, but will be able to ascertain imperfections and detect omissions in the work of those who preceeded him, and suggest, at least, by his own work, the proper method for those who succeed him.

Confining ourselves to the pattern maker, let us see the difference between the workman who knows merely how to get out his stock, prepare the pieces, and put them together in a workmanlike manner, and the workman who conceives and understands the design of the draftsman as imaged on the sheet before him, whether shown in perspective, plan, or section, and knows something of the manipulations of the molder's art. In the one case, the workman must be overlooked, instructed, and guided in every move, by some one who has an educated intellect and understands the object of the work in hand. In the other case, the intelligent pattern maker goes coolly, steadily, and quietly to work, correcting defects, and possibly suggesting improvements. His work is always perfect, and he can be always be depended upon in emergencies. Give him a drawing and he knows the object and intention of the draftsman, perhaps taking time to ascertain them; but when he does understand, he needs no oversight, and when his work is finished it is correct.

There are comparatively few machinists who can work from a drawing. In one shop, with which we were formerly practically acquainted, the workmen at the forge and at the lathe were furnished with a model or pattern of their work, as much as the molders in the foundery. If these workmen had informed themselves, never so slightly, of the principles and practice of mechanical drafting they could have wrought intelligently from drawings. Yet the theoretical and practical knowledge so useful is seldom possessed, when it may be obtained by the devotion of a few hours of attention in the leisure every mechanic has.

Beside this partial knowledge of cognate branches of his business, which every mechanic could and should possess, some knowledge of a technical character, easily obtainable from ordinary school text-books, should also be added. A decent smattering of chemical nomenclature; a knowledge, however limited, of chemical combinations; some ideas of natural philosophy as applied to mechanics; a good acquaintance with arithmetic, including algebra, and a familiarity with the principles of geometry, the science of sciences and the foundation of all that is useful in the arts, should be possessed by the mechanic.

All these may be easily obtained. The way is open, the road easy, and the goal within the reach of all. Success attends endeavor, and success is possible to all. Skilled labor guided by educated brain—discretion, good judgment, common sense, and intelligence—is always a marketable commodity, bringing its full value to its fortunate owner, who may reasonably consider himself the possessor of present independence and prospective competence, and as such the peer of the most favored in the land.

PROGRESS OF SUBMARINE TELEGRAPHY.

Very few not directly interested in marine telegraphy are aware of the immense progress in this art, or of the solid basis upon which success is predicated, not only of the cables already laid, but of others which are projected. No less than eleven cables are laid between the several islands of the British group connecting that country with Holland, Belgium, Denmark, and the different islands with each other. To these must be added the two cables between Ireland and America, which, in conjunction with the cables connecting Ireland to England and the continent, unite the two hemispheres.

The Islands of Zealand and Funen have been connected to the continent by Denmark. In the Mediterranean Sea there are several cables laid, and working perfectly. France is joined to England by three cables; Asia is in communication with Europe through two cables, while America has united all her possessions in the Atlantic and Pacific by these slender yet powerful bands. In the Indian Seas two cables are working, having stood the test of several years' service.

In the Mediterranean a cable is about to be laid connecting Nice *via* Corsica with Algeria; while appearances indicate that a new cable will shortly be laid between France and America. This cable will be laid in two sections; the first from Brest to St. Pierre, Miquelon, a distance of 2,688 miles, and from thence to New York, a distance of 950 miles. The time fixed for the completion of this great work is August 15, 1869. An English exchange in speaking of this cable says:

"The grounds upon which the projectors have found favor with the French and New York State Governments have been, chiefly, that the proposed cable will obviate the circuity and delay incident to the present line; and will also lessen the existing liability to casualties. By the only route we now have not less than four submarine cables have to be employed, while the electric fluid has to perform four land journeys also before a message can be sent from the Continent of Europe to New York. There intervene—1, the North Sea, or the English Channel; 2, the Irish Sea; 3, the Atlantic; 4, the sea between Newfoundland and the American continent; while the wires have also to be carried across England, Ireland, Newfoundland, and, lastly, from the coast of British America southwards to New York. It is, perhaps, surprising that with this circuity, messages are sent from Europe to the United States as quickly as they are; but there is no doubt that communication will be very much accelerated if, as is said, a merchant or banker at Paris will be able literally to speak into New York. It may possibly be a sanguine calculation that messages between those cities may then be sent and answered in half an hour, and that messages may be sent from Berlin or Frankfort to New York and answered within an hour; but the difference of time must obviously be very great. It is thought also that the directness and simplicity of this route will very much diminish the chances of communication with America being from time to time put out of gear. Ocean telegraphy has now been carried to such perfection that there is more fear of mishap by land than by sea; and, in point of fact, during the last two winters, when we have several times been alarmed by a stoppage of messages, the explanation has in each case been that storms had blown down the land telegraphs, sometimes in Newfoundland, sometimes on the American mainland. From this danger, whatever it may amount to, the new line will be exempt. As the capital it will represent will, it is stated, be only £1,000,000, and as the working expenses, with only two stations (at Brest and at New York), ought to be very small, it is probable that this project will bring the luxury of telegraphing across the Atlantic within the reach of persons of very moderate means. A cable laid across the English Channel, from Falmouth to Brest, would also give us the benefit of it. It is understood that the new Atlantic cable will be ready for laying next June."

Improvements are being made, not only in the cables and apparatus used for telegraphy, but in the mode of transmitting messages. A newly invented system of telegraphing by code is announced in England. Numbers are used instead of letters, each number indicating a word or a phrase, the translation of the message into the numbers, and *vice versa* being done by clerks. A large saving of time and greater accuracy is claimed for this invention.

Nothing illustrates the general progress of the age so much as the rapidity with which the art of marine telegraphy has spread its lines through the deeps, thus annihilating distance and uniting the nations of the earth into a closer brotherhood.

MINING AND TUNNELING BY MACHINERY.

During the protracted siege of Sebastopol, Capt. Penrice, of the Royal Engineers, devised a very ingenious machine for tunneling, but the siege was cut short before the merits of the invention could be thoroughly tested. Enough, however, was done to satisfy the inventor that he had contrived a really valuable thing, and since that time, in the face of much doubt and opposition, he has pushed forward the invention to a point where it promises success.

In April last Capt. Penrice called upon us in Paris, and, by the aid of drawings, fully explained his invention, at the same time he invited us to examine a working machine under construction at one of the large machine shops near the city.

The machine resembles a horizontal steam hammer, so modified that the head can rotate as well as strike. The piston is cast in gun-metal in a single piece with the head; the diameter in the 5-foot machine is 28 inches, and the stroke, which varies according to the nature of the rock being operated upon, averages 2 inches, and can increase to 4 inches. The diameter of the head is 5 feet, and this diameter corresponds with the diameter of the level to be driven. The head is a disk, with so much removed as shall leave a Maltese cross, occupying about two-thirds of the area, the remaining third, being open, serves for the passage of the debris to the back of the machine. The entire field of these segments is covered with cutters, in the form of double chisels, and arranged concentrically from the center to the circumference. The piston moves in a cylinder of cast iron, with a flat bottom, and is furnished with a stuffing box in fron , the steam being admitted from a secondary regulating cylinder. As to the rotation of the head, there is a transverse horizontal shaft, which, by means of two intermediary shafts, gives a slow motion to another shaft, inclined upon the piston perpendicular to its axis by a screw pinion gearing, with a helicoidal wheel fixed upon the piston by a couple of keys. The debris is drawn to the back of the machine, so soon as broken down, by a series of hoes attached to an endless chain, worked by wheels and pinions, and ample arrangements have been made for providing sufficient space on one side of the machine to enable the face to be reached when the renewal of the chisels or other circumstances require it.

A company has been organized to work the invention, and it is stated in the London *Mining Journal* that they are prepared to guarantee an average progress of twelve feet in granite, and eighteen feet in sandstone rock in 24 hours' work. With regard to the continuity of the working, the sole interruption will be that resulting from the removal of the blunted chisels and the fixing of fresh ones. The changing of the chisels will not, according to Capt. Penrice, occupy more than two hours. All that is necessary is to draw back the machine a few feet, so as to allow a couple of workmen to pass in front of the head through the openings to remove the worn chisels and replace them with new ones, two other workmen behind the head unscrewing and re-tightening the nuts.

A Commission appointed by the French Government have quite recently made a full examination of a six-foot machine now in operation in a quarry at Vaugirard, Paris, and have also seen it in operation there; and, although their official report has not yet been presented, the Commissioners have individually expressed their entire belief in the general utility and extraordinary capabilities contained in the invention. The machine has been at work nearly every day for the last seven or eight weeks, and up to the present time but one set of chisels has been used, and these have not even once been sharpened.

It is worthy of remark, in this connection, that the Emperor Napoleon, with an enlightened regard for the material prosperity of France, took a warm personal interest in this invention, as he has done in many other instances; an example worthy to be imitated by other rulers.

THE AMERICAN SCIENCE ASSOCIATION.

THIS distinguished body has again held its annual session, and performed its usual amount of service to the world at large by the elaborate discussion of such subjects as the "Nature of Thought," "The Statics of the Four Types of Modern Chemistry, with Special Regard to the Water Type $\left.\begin{matrix}H\\H\end{matrix}\right\}O$," "The Chemico-Geological Relations of the Metals," "The Stratigraphical Relations of the Fossil Horse in the United States," etc. No doubt the savants have a pleasant time in cracking these hard nuts. Their meats are, however, too indigestible for the mental stomachs of the generality of readers.

It is but just to add, however, that some time has been devoted to more practical subjects, among which we notice "The Effect of Atmospheric Changes on the Eruptions of the Great Geyser of Iceland," by P. A. Chadbourne. The eruptions of the Great Geyser are known to take place more frequently in fair weather, and it has long perplexed travelers to find a solution for this singular phenomenon. Mr. Chadbourne stated that the Great Geyser is a tube ten feet in diameter by seventy in depth, surmounted by a saucer-shaped basin seventy feet broad and four feet deep. When an explosion takes place, the water in the basin, and two-thirds of that in the pipe, is projected into the air. The explosion is caused by the gradual heating of the water far above the boiling point. The water which replaces that blown out by the explosion, has a temperature of 212°. An explosion will again occur when the water at the bottom of the tube becomes heated to 266° The reason why the explosions are less frequent in January than in August, is that cold water trickling through crevices mixes with the water at the bottom, and prevents the rapid rise of temperature which takes place at the latter period, when the surface is dry.

Prof. Whitney read a valuable paper upon "The Progress and Present Condition of the Geological Survey of California." He dwelt upon the importance of the work, and stated that a great deal of the coast survey work was a fraud on the Government. He also exhibited some fine maps of different parts of California.

An excellent paper was also read by John L. Hayes on "The Recent Contributions of Science to the Arts of Dyeing and Printing Woolen Tissues," which we can not do more than allude to. These latter papers are of the class demanded by the age and the public, and we trust that in the future proceedings of this and similar associations this fact will be borne in mind. People are getting to care less and less for abstract speculation; they want practical knowledge, and will be content with nothing else in this material age.

GRANITE, notwithstanding its exceeding hardness, splits as straight and clean as a chestnut stick. At one of the granite quarries of Maine recently, a block was split out which measured 100 feet long, 8½ feet wide, and 5 feet thick. It weighed over 300 tuns.