the cylinder again in passing through the second valve arranged for the purpose.

A hydraulic gauge, placed at the side of the cylinder, permits of regulating the pressure by acting upon the spring of the exhaust valve. The compression is effected within three distinct periods: in the first, the upper compressor acts alone; in the second, the lower one rises until the pressure is equal upon both surfaces; in the third, when the limit of pressure is reached, the piston continues its motion in the hydraulic cylinder until the dead center of the crank is passed.

The moulds are emptied upon a tilting table or endless belt, or even directly upon the floor in cases where carts can be driven into the works.

The table carries from 12 to 14 moulds, which are so arranged as to give the bricks a form such that their height and breadth are half their length. They can then be piled up crosswise, so that four of them form a perfect cube and waste no space. There are four styles of double compression presses that yield bricks of 1, 2, 5, and 10 kilogrammes, and manufacture, respectively, 18, 50, 90, and 150 tons of bricks per day.

This system of double compression presents numerous advantages, the most important of which is the greater degree of homogeneousness, and consequently greater solidity, obtained. In the old machines, the density of the bricks, as a consequence of the friction of the coal against the moulds, continued to diminish from the surface in contact with the compressing cylinder to the one most distant from it. With double compression, the least dense part is found in the center; the edges are entire and sharp, and waste is, through this fact, notably diminished.

The paste for manufacturing the bricks was formerly prepared by means of a steam pug mill; but this is now replaced by a special furnace that heats directly and has a revolving sole. The apparatus may be seen in the center of Fig. 2. The paste consists of a mixture of coal and pitch, that must be as intimate as possible in order that its agglomeration may be afterward effected in the press.

The furnace is circular in shape, and consists of a revolving cast iron platform whose motion is dependent upon that of the agglomerating machine. This platform is surrounded with masonry, which is inclosed within an iron plate jacket, and which supports a spherical dome that is traversed in its center by a cylinder that carries an axle provided with paddles. It is into this cylinder that is emptied the mixture to be prepared. A lateral fireplace, with two opposite doors, permits of obtaining the heat necessary for the elimination of the water, for heating the coal, and for melting the pitch. The flames, after licking the upper surface of the mixture, heat the dome (which reflects them), pass beneath the sole, opposite the fireplace, and from thence, through a flue, to the chimney. In the circumference of the furnace jacket there are six apertures. The first four of these serve for the introduction of scrapers that turn over the material, and mix it up, so as to permit it to become heated uniformly and to present all its parts to the flames and the sole. Opposite the fifth aperture there are two bars, one fixed and the other movable, which, through the aid of hinged partitions that may be inclined more or less, gradually carry the material from the center to the circumference, while at the same time turning it over and stirring it up just as the scrapers do. Another object of this arrangement is to regulate the thickness of the layer, and, consequently, the time during which the mixture remains upon the sole.

Another scraper, maneuvered by means of a rod exterior to the furnace, acts upon the material in the center, moves it to the zone of action of the preceding ones, and regulates the delivery. The sixth aperture serves for the exit of the properly heated paste.

The furnace, as a whole, is built upon masonry that contains an opening for the passage of the shaft and for the gearings that actuate the sole.

The revolving sole furnace operates continuously, as does the agglomerating press. The coal is well dried therein, an essential condition for obtaining a good product; and the temperature to which it is submitted softens it a little and increases its agglutinative properties, this being followed by a considerable saving in pitch.

The engraving that gives a general view permits one to obtain an exact idea of the mode of manufacture. The refuse and pitch, coming in on the right, pass through the breaking and proportioning apparatus, and the coal is then carried by chain and buckets to the sole of the furnace, to be dried, and the pitch to an endless screw, where it mixes with the dry and heated coal. The mixture thus begun in the endless screw becomes more intimate in the pug mill stationed above the press. The bricks, upon coming from the latter, are piled up, or are loaded on carts and carried away.—*La Nature.*

IN small blasts, 1 pound of powder will loosen about 4½ tons; in large blasts, 1 pound of powder will loosen about 2¾ tons. One man can bore, with a bit 1 inch in diameter, from 50 inches to 100 inches per day of 10 hours in granite, or 300 inches to 400 inches per day in limestone.

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IMPROVED METHODS.

So wedded are workmen, generally, to familiar methods that even a demonstration of a better way of doing a job is not always convincing. A sub-contractor in a machine shop took certain parts of the work on machine tools to do by the job. He was a stickler for old methods, and did not "take stock" in the kindly meant suggestions of the superintendent, who was disposed to aid him. At last, however, he yielded so far as to allow the superintendent to "fit up" for one job, with the understanding that if the output did not promise to pay, the contractor should bear no expense. The job was the finishing of "ball nuts," so called, nuts to be turned up by hand, and consisting of a central boss for the thread and two short arms ending in balls. The contractor's method was to center each end, drill centers, and turn and finish each ball in the lathe. Then the nut was chucked, and the central cylindrical portion was drilled and tapped. A threaded arbor was then fitted and mounted on centers, and properly dogged on the table of a crank planer or pillar shaper; and so the two sides of the nut and the arms were dressed by the reciprocating motion of the cutter. The arbor was then swung in a lathe, and the ends of the cylindrical threaded portion and the edges of the arms squared up. It will be seen that this was a roundabout way to complete a simple job; indeed, the machine work on the crank planer was slower than hand filing would have been.

The superintendent improved on these methods very sensibly. He chucked the piece, drilled the center hole, and tapped it. Before removing it from the chuck he finished, by turning, the face of the central portion and the edges of the arms. Then he screwed in a threaded arbor, reversed ends, either in the same lathe or another, and repeated the turning for the other face. While still on the arbor, it was placed on centers on a milling machine, and passed under a gang of milling tools adapted to the profile of the cylindrical portion and the arms; the work was half revolved on the centers, and the job repeated. Nothing now was left to be done but finishing the balls. This was done in a peculiar way. On the two ends of a polishing spindle were mounted hollowed out emery wheels with rests in front. The piece was held, first one end or ball, and then the other, inside the concavity, and slowly turned. The ball was cleaned, scoured, and shaped in the wheel of coarse emery on one end of the spindle, and then was finished and polished in the finer wheel at the other end. In all this work there has been no centering, no lathe turning, no slow planing on the pillar shaper, and the amount of handling was greatly reduced from the old method. But the crucial test was the economic result: a saving of two-thirds of the time, and even more, for five completed pieces were turned out within the time required by the old method to complete three pieces. The contractor was convinced, and bought the plant.

This single specimen of improvement in methods might be supplemented by instances in the recollection, if not in the practice, of many mechanics. It pays to use wit and judgment, as well as skill and handy manipulation, in the conduct of work.

DROPPING AND STRIKING UP.

There has been great improvement on the old style machines for cutting and heading tacks and nails and forming rivets; the heading machine has been adapted to forging purposes with great advantage. But the limit of the machine is not great; a requisite to accurate work, unless with the result of great strain to the machine, and its final disabling, is that the amount of material fed in for working should be accurately measured. All the blows of the heading machine are absolute as to force and exact as to distance; they are made by means of a crank or an eccentric acting directly on the hammer, or by similar means acting on a knuckle or "toggle" joint; in either case there is no provision for yielding in the event of a superabundance of material to work upon; the material must give, or "get," or the machine must stop or break. So it is necessary that the feed of the heading machine shall be exact as well as accurate; it must not "bite off more than it can chew."

But the drop has plenty of leeway, limited only by the accommodation of the dies, and they are made so as to allow plenty of room for sprues, or overplus of metal. The force of the blow of the drop is graduated by the weight of the hammer and the distance through which it falls, the latter element being changed at will. The limit of the blow is simply the resistance of the material to be worked to the impact of the falling weight. This force varies in effect by the condition of the material; if soft and plastic, at nearly a white heat, it yields as readily as soft putty; if only dull red, it resists impact, and works hard. So, also, the quality of the material adapts itself to the blow of the drop.

From the above it is easy to see that the drop has a much larger range of useful work before it than the heading machine; the latter may work faster and be more exact in its first results; but the drop can be adapted to a much more varied list of articles. At all events, the heading machine can never usurp its place.