THE BIOGRAPHY OF A BRICK

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The soil of the earth is the origin of almost every machine or contraption invented by man. A brick is no exception. Many people do not realize it, but the bricks from which our streets and our walks are made come from the soils of the earth.

There are three processes by which the clay may be taken from the ground. The first, and probably most used, is the steam shovel. The second method is by means of drag buckets. The last method is that of the shale planer. This planer acts just as a wood planer and shaves off the clay in the same way. Before these three devices are used, the clay is loosened by means of dynamite.

Once we have the clay won from the earth we are ready to start in the process of making a brick. From the cars, the clay is transferred to an apparatus called the dry pan. The dry pan crusher is employed to a greater extent than any other grinding machine for shale and any other hard, lumpy clays. It has a wide range of usefulness because of its ability to pulverize any hard material, from worn-out firebrick, for use as grog, and hard limestone in the cement industry, to the less refractory classes of raw clays. The mechanism usually consists of two heavy end frames between which is placed the revolving pan and which are also used to carry the gears, driving mechanism and accessory parts. Dry pans are usually made with pan diameters of five, seven, eight, nine, and ten feet. The capacity of the pan is largely controlled by the nature and condition of the material and the degree to which it must be ground.

Ordinarily, clays are dried out for the purpose of fine grinding to eliminate the larger bits of stone which would cause considerable irregularity in the finished product. Contained in the dry pan is a plate, finely perforated. In order to give the clay a fine texture it is passed through this plate.

Clays that are ground in a dry pan need not necessarily be bone dry. Some moisture in the clay is desirable to avoid excessive dust. Clays which by themselves would be too moist to grind in a dry pan are very often mixed with dryer clays from other portions of the clay pit or from storage in order to make dry grinding possible. It has been observed that an increase in the moisture content of most clays will decrease the grinding capacity of this type of equipment.

From the dry pan, the clay must be shoveled or spouted into the pug mill. This apparatus consists of a hollow metal trough, placed either horizontally or vertically, with a shaft running through its center from end to end equipped with blades or "knives" arranged like the thread of a screw. The action is such that the revolving blades cut, masticate, and wedge the clay into a perfectly homogeneous mass, and deliver it, through the warm pushout. In most brick plants the various types have capacities ranging from 3,500 to 15,000 bricks per hour, and in some cases more.

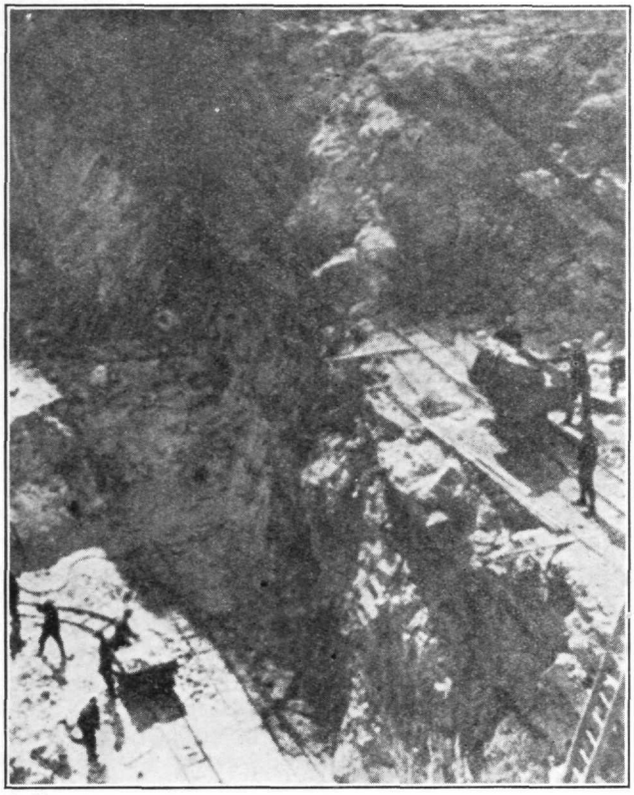
With the increased demand for brick, a machine called the auger was invented. This machine has a straight barrel, generally a continuous screw auger, the pitch of which is constant and increases toward the front. The pug mill is connected to this instrument and acts as a feeder. This machine does not compress the clay in any way except in front of the auger, the latter merely solidifying it and expressing to the die opening, giving at the same time, the greatest speed with the least possible consumption of power. Almost all auger brick machines are lubricated, as few clays will run out of a die without pulling back on the corners and consequently weakening the brick. The lubricating medium is oil, water, or steam. As mentioned above, from the auger machine, the clay is compressed through the die which acts as a mould and gives us the cross section of the brick. This long block of clay is advanced on down the chute, where it is cut at regular intervals, making blocks the exact size of the brick desired. The cutters are wires varying in length, size, and tensile strength according to the type of clay used.

The next step in brick manufacture is the drying process. There are three different kinds generally used. The humidity system of drying can be applied to any type of dryer, as the term humidity drying represents a process rather than a form of structural design. Humidity drying may be divided into three stages: (1) the heating stage, during which the clay is gradually heated up in an atmosphere of relatively high humidity; this prevents excessive cracking or distorting on the face of the brick; (2) the drying period, in which the air is heated to a maximum temperature for the clay being dried; the humidity is gradually decreased to allow the clay to dry uniformly all the way through; (3) the cooling stage, in which the temperature is gradually decreased to uniformity.

The steam racks system of drying consists of a series of racks of pipes through which steam is passed. The clay blocks are placed on these racks and dried in this way.

In making our brick, we shall consider the rectangular kiln as the one being used. The setting of a rectangular kiln is very simple. The brick setting in the down-draft kilns varies from twenty-four courses high to thirty-two courses, and the height of the kiln should not exceed thirteen feet in the center. For setting about twenty-eight courses high, the crown space in the center is about three feet high before the bricks are burned and on either side the bricks are about twelve inches from the crown. If the setting is lower than this, the kiln should be correspondingly lower and vice versa. The blocks of clay are usually conveyed to the kilns by little cars pulled by a steam engine or some similar device. They are stacked in courses, as mentioned above, and then the real brick manufacturing begins.

The clay is not fully dried when placed in the kiln. Hygroscopic water is not driven off at ordinary temperatures or even at the boiling point of water; in fact, the temperature ofttimes rises



A TYPICAL PIT

quite a bit above the boiling point before the water is completely evolved. The watersmoking is accomplished b oylw fires in the kiln furnaces. Wood is frequently used for this purpose, to avoid sooting. In the watersmoking period it is desired to heat up the brick, evaporate and remove the moisture, and to accomplish this successfully, it is very necessary that the draft be strong. The period of watersmoking is the most critical point in the life of the brick. The process must be carried on very slowly as the water in coming out of the clay may crack the surface.

As soon as the watersmoking is completed, the temperature is advanced to that required in oxidation. Oxidation begins in the later stages of watersmoking and continues into the period of vitrification, but the greater part occurs between the temperatures of 800°F. and 1300°F. At this stage most of the impurities are given off and the metals constituting the clay are changed to their respective oxides. The highest temperature reached at this point is usually near 2000°F.

From the oxidation of the brick, we come to its vitrification. There is no change in the burning process but the heat is merely advanced to the vitrifying point and held there until all the particles of the brick are thoroughly fused.

Cooling is not a stage in the burning, but in many ways it should be classed as such. When the firing ceases, the mass is in a stage of semi-fusion, and the rate of cooling has material effect on the physical structure. The fire is lessened very gradually so as not to give too great a variation of temperature. The kilns are closed very tightly at this time. On coming near the kiln, one can hear the bricks snapping and cracking in the process of cooling.

The bricks are now ready to remove from the

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kiln. They are removed by the same method as setting the kiln, on the opposite side of the kiln. The bricks are now ready for the market and are distributed to all parts of the world.

Bricks have been found to be some of the most useful things in life. We meet them at every turn. Without pausing to think of the process of manufacture connected with them, we hurry over the fast walk of life but the little brick lives on down through the ages as it was first created.