MUNICIPAL DEPARTMENT

CAST IRON WATER PIPE.*

(Continued.)

The cupolas for melting the iron differ little from those used in other foundries. The ladle containing the molten metal is handled by the pit crane, and the pouring of the iron must be done rapidly and at a high temperature. In what appears to be a very short time after casting, and while the pipes are still at a cherry red heat, the core spindles are drawn, generally stripping free of sand and of hay rope as they come out. The pipes are taken out while still red hot, and as soon as they are cold enough, are placed in line on the cleaning skids. The flasks are then knocked apart and cleaned up, and the process of moulding for cores and flasks is again begun. Thus, in continuous round, the work of the foundry proceeds, and the output of single pits is often as much as 75 tons, and sometimes more than 100 tons per day of 10 hours.

When the cast iron pipe has been drawn from the mould, it is, in the best modern foundries placed on a long line of skids which is at right angles to the length of the foundry, and the pipes proceed on these skids, one after another, through a course as follows: 1st. Through the cleaning shed; 2nd. To an oven, where they are heated to a temperature of about 500° F. prior to dipping; 3rd. To the dipping tank, where they receive a tar coating; 4th. To the hydraulic proving press; 5th. To the scales, and 6th. To the loading skid, or to the yard if not required for immediate shipment.

When a water pipe is laid in the bed of a street, it must not only conduct water without leaking, but must resist large stresses on the material. There is, first, the static head or pressure of the water, which varies in different systems from a few pounds to over 200 pounds per square inch. Then, there is an added pressure when the flow of the water is suddenly stopped or checked, which is known as water ram, and which is commonly assumed to be about 100 pounds per square inch, in large pipes, and somewhat more in smaller ones. These pressures are from within. In addition to this the pipe has to resist the outside pressure of the earth around it, tending to crush it. This latter force is generally opposed to the other forces which tend to burst the pipe, but must be considered and in some cases specially provided for in designing castings.

A first-class water pipe must not only resist these pressures, internally and externally, at the time it is made, but must continue to do so for a long term of years. The consequences of bursting a large water main in the business district of a city are most disastrous. In a recent instance the damage to the street and loss of merchandise through the flooding of cellars was estimated at over $10,000 during the hour or so which it took to close the valve in the main leading to the break. It is for these reasons that it has been the custom for 20 years or more past to have all water pipes for the larger cities inspected and proved under hydraulic pressure, and to require, besides, that the pipe shall be cast from iron, of such quality as to withstand specified tensile and transverse stresses. The work of an inspector charged with such duties is, in many respects, more interesting and makes greater demands on good judgment and experience than any other work which inspectors of material are called upon to perform.

A casting of any kind must be examined with greater care than is necessary for a piece of rolled or wrought metal, because it is not only necessary to examine the surface, but to form a satisfactory opinion of its internal structure. A pipe casting, by reason of its great length and and superficial area, is a specially difficult casting to inspect, as it is a difficult casting to make. The comparatively thin shell may be defective at almost any point and from a dozen or more distinctively different causes.

An inspector in charge of such work always begins his daily task in the cleaning shed, where each pipe, in turn, is examined inside and out, is gauged with calipers to determine the thickness of the shell at each end, and to prove also that the core and mould have been set concentrically. Then each socket must be carefully examined to see that it is free from obstructions or scabs, and that it is round and has the proper clearance for the spigot-end of another pipe to enter. This has to be determined by the use of an inside circular gauge which must pass freely to the bottom of the socket.

At the spigot-end an outside circular gauge is used, which must pass freely over the bead without striking at any point, so as to insure that it will freely enter the socket of any other pipe. A sharp-pointed steel hammer is used freely on any part of pipes where blow holes, or sand holes or cinder pockets are suspected. It may be well imagined that it is no easy or pleasant task to thus examine 30 or 40 great pipes in the course of a morning in the midst of the dirt and dust of the cleaning shed, and in contact with the rough and dirty surface of the iron; but it must be done and thoroughly done.

Let us then start with an inspector at the bell end of a row of pipes and observe how his work is done. First, the bells must be clean and sound. Usually they are cast bell downward, so that they will be sound, but each pipe must be thoroughly examined and tested with a hammer. Second, the inside of the bells must be of correct diameter, truly round, and free from scabs and obstructions, so as to allow all accepted spigots to enter freely and have the required lead room all around. This is determined with a circular gauge referred to above. Very little latitude can be allowed in the inside diameter of the sockets. The outer diameters of the beads on the spigot-ends of pipes are usually but 1/8 inch less than the inside diameters of the sockets, and as the beads are apt to be large, sockets must measure the full required diameter at all points, but may overrun 1/8 inch without objection. The lead space back of the bead varies from 1/4 inch on small pipes to 1/2 inch or more on large ones, and must be clear. This is especially true of the recess or so-called lead ring inside of the socket, which is intended to wedge the lead in place, and to prevent it from being forced out under pressure.

Third, cores and moulds must be set concentrically, that is the bells and the pipe barrels adjacent to them should caliper the same thickness all around. It is customary to gauge the thickness at four points, 90 degrees apart, around the circumference. A variation of 1-10 inch plus or minus from the required gauge may be allowed in the thickness of the pipe-shell, provided the weight of the pipe is correct, that is, the eccentricity of the core may be 1-10 inch as a maximum allowance. It would seem as though this were not a difficult requirement to meet, yet a great many pipes are rejected because of uneven gauge, due to the fact that the core has not been properly centred.

Fourth, the depth in the sockets in the bells must be right. The allowed variation is usually 1/4 inch short to 1/2 inch long. It is important to note also that when the sockets are long they are not so long as to make the metal thin at the bottom by extending into the fillet joining the bell with the body of the pipe. In this way each bell is examined in turn by the inspector, keeping tally of good and bad pipes by the numbers cast on them.

(To be Continued.)

*From an article by Frederick H. Lewis in Cassier's Magazine.