MUNICIPAL DEPARTMENT

CAST IRON WATER PIPE.*

(Concluded.)

Then the spigot-ends are examined the same way. They, too, must be truly round, of correct diameter inside and out, to enter sockets, and the metal should be of the same thickness within the allowed variation. It is necessary to repeat all the measurements at each end, as a pipe may be truly round at one end and oval in shape at the other, and a core may be truly centred at one end and oval at the other. The beads must not overrun prescribed diameters, and if they do in places, must be trimmed to correct size. Spigot-ends require generally a freer use of the hammer than the bell, and a closer watch for blow holes, because, as a rule, this end is uppermost in the flask, and is apt to contain slag, cinder pockets and scoria. If the metal is inferior at the spigot end, it will often break under the blow of a two-pound hammer. If, however, the metal is good and sound, it is not considered necessary that the beads should be as clear in outline as the bells. As long as there is a distinct bead and it is trimmed clean to enter any socket freely, it should be accepted.

So much for the ends of pipes. The inside and outside surfaces have next to be looked over carefully. There are a number of defects to which pipes are subject. These may be enumerated as follows: Scabs: Lumps or patches of superfluous metal, due to defects in core or mould. Cold Shuts Places where part of the metal has chilled before the adjacent metal has flowed over it; this makes a seam or weld in the casting. Sand holes: Pockets of sand. Checking Shrinkage cracks, found usually in the top of the casting, and due to cold shortness. Blow Holes Spongy Metal, due to froth and scoria in the iron. Gate shrinks. Hollows leading from the gate into the body of the pipe. Core Cut, Mould Cut or Socket Cut: These are places where the mould has been cut away by the flow of melted iron. This is most objectionable in the socket, which is spoilt by it. It is bad anywhere if there is much of it, because the sand is in the body of the pipe. Cracked Cores. Places where the core has cracked in long lines, leaving sometimes ridges, sometimes seams along the body of the pipe. Crushed or Swelled Cores or Moulds: These produce ridges or rings on the pipes, and are due to failure of cores or moulds to retain their shapes. Facing Washed Places where the lamp-black facing has either cut the sand or covered it in lumps on the surface of mould or core.

All these defects in the castings a skillful inspector must be on the watch for, and so skillful do the best men become that it is rare indeed that a defective pipe escapes their attention. The rejection of pipes for these causes is often made regardless of their ability to stand the hydrostatic pressure in the proving press. This is done, of course, because defects such as those noted above seriously affect the life or endurance of pipes.

When an inspector has finished his morning's work in the cleaning shed on the lines indicated above, his next duty is to go to the proving press and test the pipes which he has previously examined, and which have, in the meantime, received a coating of tar. In the proving press all pipes are tested under hydrostatic pressure, generally 200 lbs. per square inch. The process is as follows: Each pipe is run, in turn, into position between the two heads of the press, and one of these heads, which is really the piston of a hydraulic ram, moves forward and secures the pipe firmly at the ends against gaskets of hemp. The pipe is then filled with low pressure water and, when quite full, the 300-pound pressure from the accumulator is turned on, thus requiring a comparatively small flow of water at high pressure.

When the pipe is being fitted in place between the gaskets and until it has filled, and the pressure has reached the figures required, it is always desirable to stand out of harm's way. If the pipe bursts, water, and sometimes iron, fly freely. After the pressure is on, however, the inspector must walk the length of the pipe, strike it several sharp blows with a hammer, and look it over carefully to see that it does not leak through blow holes, either slowly or in jets, and must be rejected for this cause. Plugging can not be allowed. The last step in the process of inspection now follows in weighing the pipes. The weight of a casting has always been regarded as an important indication of the soundness or unsoundness of its internal structure, and in all the specifications for water pipe the standard weight for each size is specified and the allowed variation carefully stated. The inspector, therefore, always witnesses the weighing of the pipes to see that they are within the standard requirements. The correct weight is then marked on the pipe and the inspector checks the weight, pipe number and size of all pipe accepted or rejected, in his note book, and those accepted are then ready for shipment by the manufacturer.

This statement presumes, however, that the physical tests required have proven satisfactory and as these physical tests are ordinarily made on the afternoon of the day before the pipes are proved in the press the work is generally completed at the scales. Of physical tests it is usual to require two kinds in specifications. The first of these is a direct tension test, in which the iron is required to show a tensile strength differing in different specifications from 14,000 to 18,000 lbs. per sq. inch, the second is a transverse test which has been adopted by the American Water Works Association. This test requires that a specimen bar, 2 inches by 1 inch in section, laid flat on points of support two feet apart, shall carry a centre load of 1,900 lbs. and deflect 5-16 inch before breaking. The tensile test proves the strength of the iron, and the transverse test proves its toughness and resilience. As iron may be strong without being tough, or may be tough without being strong, the two tests supplement each other very well and can be used together with advantage.

The test pieces are generally cast in the presence of the inspector. It is usual to have the moulds for the test castings set up alongside the cupola, and at some time during the day the inspector in charge of the work steps into the foundry and asks the foreman to cast his test pieces. They are then immediately poured and the selection is thus made entirely at random.

The percentage of rejections under skillful inspection, for both tests and surface inspection together, varies very much from day to day. In a foundry the unexpected is always happening. Sometimes the mixture of iron is not right. At other times the sand is not quite satisfactory. The condition of the sand varies somewhat with the weather, and requires different handling, depending upon the condition of the weather. There are occasions when an entire day's work will be spoiled in this way by some accident in the regimen of the foundry. On other days, and sometimes for days at a time, the pipes will nearly all be of a high standard. On an average, however, it is believed that something like one-third of the pipes cast in the pit will be condemned as unsalable for water mains for one cause or another by an inspector representing the purchaser. Quite a percentage of these can still be disposed of by the foundry for use as railroad and highway culverts.

To every large pipe foundry there are attached two subsidiary foundries for making special castings, such as tees, branches, reducers, bends, crosses and valves. These foundries are known respectively as the green sand foundry and the loam foundry.

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