The Casting of a Locomotive Frame.

The advent of the cast steel locomotive frame into general use in the last decade, bringing with it the use of cast steel parts throughout the locomotive construction, has resulted in a wonderful expansion in the steel industry from a railway standpoint. The former method of building up a wrought iron frame by forging is familiar to all locomotive men; but very few have more than a passing knowledge of the initial stages through which a cast steel frame proceeds before it reaches the machine shop, the place where the majority make their first acquaintance with the cast steel frame. In consequence, it is believed that a brief description of the stages through which the frame passes before reaching the machine shop will not only be appreciated but will also be of value in leading to a proper understanding of the care and attention required before the production of the frame is possible. The information contained in this article was obtained at the Canadian Steel Foundries' new plant at Longue Pointe, Montreal, from Wm. Cox, Foundry Superintendent.

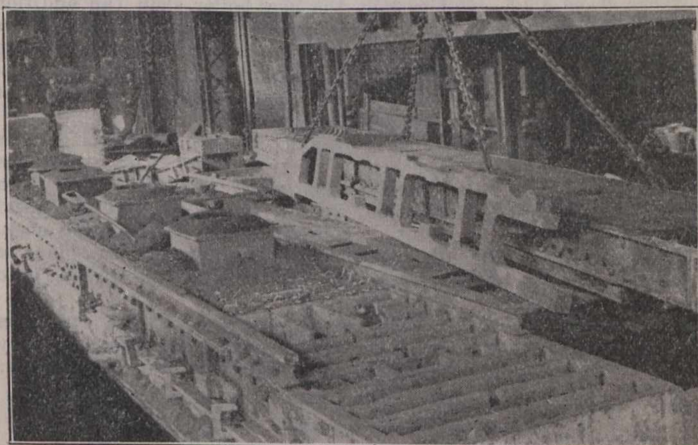

Fig. 1.—Cope and Flask with Drawn Pattern, and Mould ready to Pour.

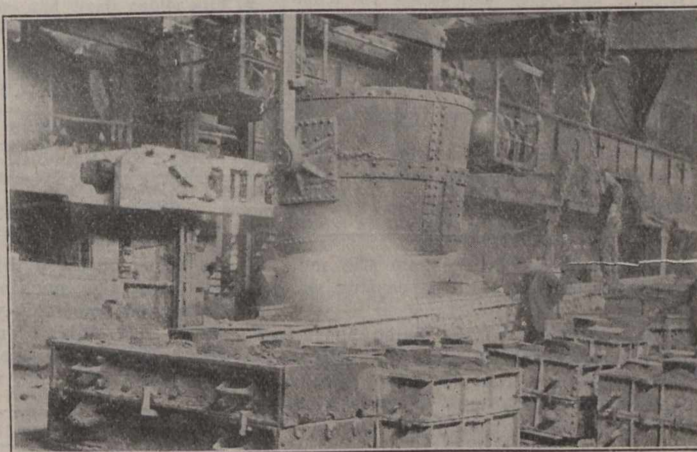

Fig. 2.—Pouring a Cast Steel Locomotive Frame.

Fig. 3.—Frame Immediately after being Cast.

Fig. 4.—Section of Frame, Showing Test Bar.

The point that impresses the writer most forcibly is the striking difference in weights between the casting as it comes from the mould, and the same casting as it is finally ready to be built into the locomotive; the latter is less than half the original weight. Consideration of the various steps in the production of the frame will explain the reasons for the big difference. As a typical example, the frame for a small six wheel switching engine has been selected for descriptive purposes, it being the intention to follow this frame through from the pattern state to the time when it is ready for delivery to the machine shop.

There is nothing unusual about the pattern, other than the fact that the axle box opening has a cross brace at the bottom to prevent the top rail from warping the frame out of shape while cooling. The shrinkage is thus equalized top and bottom. The pattern shown in fig. 1, standing against the cope, has just been drawn from the sand of the mould. The mould is entirely contained in the flask, the cope presenting a smooth surface. A special grade of sand is used, and while being introduced into the mould is thoroughly rammed—to a greater degree than is necessary for cast iron. When the flask is filled, and rammed full to the level of the top of the flask, the surface is treated with a layer of separating sand, and the cope placed on top and similarly rammed full of sand. At the outer end of the slabbed portion of the frame, the pouring gate is located, with four risers or sprue holes at intervals along the length of the frame.

The construction of the cope and flasks that hold the moulds is in itself rather interesting, being of an exceptionally good design. The handling of moulds for long thin castings, is a more or less difficult task unless both cope and flask are particularly solid, for on account of the great length the whole sags in the centre. This precludes the use of wooden mould boxes. The moulds used are built up of cast steel sections, three lengths being joined along each side to form supporting beams. These side pieces are cast in channel beam sections, with outwardly projecting flanges. The shape is shown in fig. 1, but the method of joining up may best be seen in fig. 2, the pouring operation. Sagging is undesirable, as it tends to break the sand of the mould in addition to warping the resultant casting.

The flask, with contained mould, is lifted by a crane and carried across to an oven car, on which it is subjected to a surface treatment before it is baked. The surface treatment consists in filling the surface of the mould with long wire nails, closely spaced, especially along the edges of the mould where the sand is liable to break down from the rolling action of the molten metal traversing the mould. The nailed surface of the mould is next treated with a heavy saturation of molasses and water. Following this treatment of the flask, the cope is carried across and placed on top of the flask and treated in a like manner. The two are then placed in the oven for a thorough baking. The resultant mould must be much harder and more solid than for cast iron moulds. Following the baking of the moulds, the halves are secured together as shown to the left in fig. 1. Gates, as indicated, are built up around the pouring hole and risers.

Next in order comes the pouring of the mould, illustrated in fig. 2. One of the foundry cranes carries a 10 ton, bottom pouring ladle over to the pouring gate. The ladle gate being drawn, the mould is slowly filled from one end. As the molten steel finally creeps up the last riser, a signal is given for the pouring to stop, the ladle then proceeding along the mould to fill up each of the risers in order that a uniform liquid pressure may be presented through the full length of the casting, absorbing the liquid contraction while setting.

In from 10 to 15 minutes, the casting will have set sufficiently to permit of loosening the clamps which hold the cope and flask