

slightly warm them before a grate containing a coke fire. But in massive works these precautions are less required, and the facing of common brick-dust, which is incombustible and more binding, succeeds better.

The founder therefore fills the moulds having the slightest works first, and gradually proceeds to the heaviest, if needful he will wait a little to cool the metal, or will effect the same purpose by stirring it with one of the ridges or waste runners, which thereby becomes partially melted. He judges of the temperature of the melted brass principally by the eye, as when out of the furnace the very hot surface emits a brilliant bluish white flame, and gives off clouds of the white oxide of zinc, a considerable portion of which floats in the air like snow, the light decreases with the temperature, and but little zinc is then fumed away.

Gun-metal and pot metal do not flare away in the manner of brass, tin and lead being far less volatile than zinc, neither should they be poured so hot or fluid as yellow brass, or they will become sand-burnt in a greater degree, or rather tin and lead will strike to the surface. Gun-metal and the much-used alloys of copper, tin, and zinc, are sometimes mixed at the time of pouring; the alloy of lead and copper is never so treated, but always contains old metal, and copper is seldom cast alone, but a trifling portion of zinc is added to it, otherwise the work becomes nearly full of little air bubbles throughout its surface.

When the founder is in doubt as to the quality of the metal, from its containing old metal of unknown character, or that he desires to be very exact, he will either pour a sample from the pot into an ingot mould, or extract a little with a long rod terminating in a spoon heated to redness. The lump is cooled and tried with a file, saw, hammer or drill, to learn its quality. The engraved cylinders for calico printing are required to be of pure copper, and their unsoundness, when cast in the usual way, was found to be so serious an evil that it gave rise to casting the metal under pressure.

Some persons judge of the heat proper for pouring by applying the skimmer to the surface of the metal; which, when very hot, has a motion like that of boiling water; this dies away and becomes more languid as the metals cool. Many works are spoiled from being poured too hot, and the management of the heat is much more difficult when the quantity of metal is small. In pouring the metal care should be taken to keep back the dross from the lip of the melting-pot. A crucible containing the general quantity of 40 lb. or 50 lb. of metal can be very conveniently managed by one individual, but for larger quantities, sometimes amounting to one hundredweight, an assistant aids in supporting the crucible, by catching hold of the shoulder of the tongs with a grunter, an iron rod bent like a hook.

Whilst the mould is being filled, there is a rushing or hissing sound from the flow of the metal and the escape of the air; the effect is less violent where there are two or more passages, as in heavy pieces, and then the jet can be kept entirely full, which is desirable. Immediately after the mould is filled, there are generally small but harmless explosions of the gases, which escape through the seams of the mould; they ignite from the runners, and burn quietly; but when the metal blows, from the after escape of any confined air, it makes a gurgling, bubbling noise, like the boiling of water, but much louder, and it will sometimes throw the fluid metal out of the runner in three or four separate spurts; this effect, which mostly spoils the castings, is much the most likely to occur with cored works, and with such as are rammed in less judiciously hard, without being, like the moulds for fine castings, subsequently well dried. The moulds are generally opened before the castings are cold, and the founder's duty is ended when he has sawn off the ingates or ridges, and filed away the ragged edges where the metal has entered the seams of the mould, small works are additionally cleaned in a rumble, or revolving cask, where they soon scrub each other clean. Nearly all small brass works are poured vertically, and the runners must be proportioned to the size of the castings, that they may serve to fill the mould quickly, and supply at the top a mass of still fluid metal, to serve as a head of pressure for compressing that which is beneath, to increase the density and soundness of the casting. Most large works in brass, and the greater part of those in iron, are moulded and poured horizontally.

The casting of figures is the most complex and difficult branch of the founder's art. An example of this is found in the moulding of their ornaments in relief. The ornament, whatever it may be—a monumental bas-relief, for instance—is first

modelled in relief, in clay or wax, upon a flat surface. A sand-flask is then placed upon the board over the model and well rammed with sand, which thus takes the impress of the model on its lower surface. A second flask is now laid on the sunken impression, and also filled with sand, in order to take the relief impression from it. This is generally termed the cope, or back mould. The thickness of the intended cast is then determined by placing an edging of clay around the lower flask, upon which edging the upper one rests, thus keeping the two surfaces at the precise distance from each other that it is intended the thickness of the casting shall be. In this process the metal is economised to the greatest possible extent, as the interior surface, or back of the casting, is an exact representation of the relief of the subject, and the whole is thus made as thin in every part as the strength of the metal permits. Several modifications of the process just described are also made use of, to suit the particular circumstances of the case. What we have said however, is a detail of the principle pursued in all matters of a similar nature. In conclusion, we will give a composition for cores that may be required for difficult jobs, where it would be extremely expensive to make a core-box for the same:—

Make a pattern (of any material that will stand moulding from) like unto the core required. Take a mould from the same in the sand, in the ordinary way, place strengthening wires from point to point, centrally; gate and close your flask. Then make a composition of two parts brick-dust, and one part plaster of Paris, mix with water and cast. Take it out when set, dry it, and place it in your mould warm, so that there may be no cold air in it.

NOVA SCOTIA'S COAL PRODUCTION.

The returns received of the trade in coal during the nine months of this year ending September 30th, though exhibiting, as was fully expected, a certain decrease in the sales, do not show so great a falling off as would have been warranted by the dulness of trade. In the same period of time last year—January to September—the trade in coal amounted to 641,057 tons, this year it has amounted to 571,889 tons, being a decrease of 69,168 tons. The quantity of coal raised in the first nine months of 1873 was 703,523 tons, as against 750,746 tons this year, showing a decrease for 1874 of 12,777 tons. It must be remembered, however, in comparing these figures, that there are yet three months to run, and that the prospects of an improvement in the trade being very slight, it is likely that the decrease in the total returns for the year will be proportionately greater than it shows at present. The following statement exhibits the comparative trade for the period of nine months, by counties:—

	1874.	1873.
Cumberland.....	35,151 tons.	16,835 tons.
Pictou	280,758 "	242,900 "
Cape Breton	252,812 "	381,226 "
Other counties	5,162 "	6 "
	571,889 "	641,057 "

The causes of this state of things are not far to seek. The United States, in ordinary times liberal customers, have imported this year 80,000 tons less than in 1873, and are not likely to import very much during this remaining quarter. Then the stock of coal has been large, and the consumption, reduced by the stagnation of trade, has been but small, leaving an unusually large quantity on the hands of owners. For the same reason the demand in Montreal and Quebec has been much lessened, and besides, the competition has been much closer in the little trade there was. Coal in England having gone down in price almost as quickly as it went up during the panic—misnamed famine—vessels sailing from the St. Lawrence ports to England, laden with timber, found it profitable to take return cargoes of coal, on which, carrying it even as ballast, they made a profit.—*Halifax Chronicle*, Nov 10.

The locomotive trade of the United States is in a bad condition. Work at the Grant Locomotive Works was, for the present, almost entirely suspended, October 17, about 700 men out of 850 employed having been discharged. Of the Russian order, twenty-two engines have been finished and shipped, and one of the reasons assigned for the suspension is that owing to the closing by ice of the port to which they are shipped, no more could be delivered until spring.