

now ready for the charge of scrap iron, which will amount to about 47,000 to 50,000 pounds, and consist of old rails, crop ends from the mills, Bessemer waste, tin plate scrap, nails, broken or worn out machinery, in fact any iron low in carbon and valueless for any other purpose will be gladly received.

When the furnace is charged the operation of melting begins, with a high temperature, the flame being so regulated as to secure complete combustion over the centre of the bath; the limit to which the temperature may be raised depends on the fusibility of the brick and the general correctness of the lines of the furnace. As stated above, the ports have more to do with the direction of the flame than any other factor, and as they wear away, and the checker work of the regenerators becomes clogged and the passages obstructed the efficiency of the system is considerably impaired, until the furnace has to be let out for repairs.

During melting the impurities are gradually oxidized, starting with silicon, which combines with iron and oxygen, forming a light foamy slag. A slight ebullition around the side of the hearth at this point is caused by oxidization of carbon. The end of this stage is marked by the lime coming to the surface, it having been held down by the superimposed weight of unmelted charge, it is generally well burned by this time, although dark pieces of undecomposed limestone occasionally show themselves bobbing to the surface, and floating around in such a manner as to receive the designation of black ducks, which is another example of the resourceful imagination of the iron smelter in connection with the barn yard. The liberated CO_2 from the limestone, although absorbing some heat, acts as an oxidizer, giving up the whole or part of its oxygen to the impurities of the charge.

The third stage begins with this boiling on the lime, the partially formed slag and molten metal being thrown violently upward for a foot to two feet, facilitating rapid oxidization. The melter prepares to get his "slag in shape" as soon as this boiling subsides, showing that the lime is all up. This is an operation involving great skill and experience, it simply means getting the slag of the right consistency and composition to retain the phosphorus, and aid in the oxidization of other impurities.

The charge now is engaged in a quiet boil due to oxidization of carbon and the escape of the products of this reaction. A test is taken, *i.e.*, a small quantity of metal is removed in a hand ladle, poured into a mould and broken, by the peculiar grain of the fracture