## THE MODERN BASIC OPEN HEARTH PROCESS.

the melter estimates the contents in carbon and phosphorus. It is now five or six hours since charging commenced, the phosphorus is usually still too high, although fifty to seventy per cent. has been removed.

If the carbon is still high a few thousand pounds of hæmatite iron ore of pure quality is added, it gives up its oxygen to the carbon, and other impurities which are removed, causing a rapid boil and flickering blue flames to play over the surface due to the burning of CO. Tests are taken at intervals and the reduction regulated, when the carbon is down to 0.18% the addition of ore is stopped and the charge allowed to slowly bring itself down to .08 to .10% C, when it is ready for tapping. While ore is being added the gas is partially turned off, as a good deal of heat is generated by the oxidation going on.

If, however, on taking the first test the carbon is low and the phosphorous high, the heat is said to melt low, pig metal is added to supply the bath with carbon, thus preventing the oxidization of iron while the excess of phosphorus is being reduced. The phosphorus has been found as high as .090% after melting, when the carbon was as low as .07%.\*

If the carbon is now down to .08% and the phosphorus below .030%, the heat is ready for tapping, providing the slag is of the proper consistency to run easily from the furnace and the heat at the proper temperature, which is usually estimated by the eye or by the rate of solution of an iron rod placed in the bath.

A thin slag can be thickened by an addition of burnt dolomite or limestone, also if the slag be too thick an addition of fluorspar will confer fluidity.

The sulphur is not removed to more than forty per cent. of that originally present ordinarily, but if the heat can be held in the furnace for two or three hours, the sulphur can be reduced to a very low point by treatment with calcium chloride and calcium fluoride.

The removal of phosphorus is controlled primarily by the amount of  $SiO_2$  in the slag, and secondly by the per cent. of CaO present. The  $SiO_2$  may vary considerably from 14 to 20% perhaps, but the lime usually runs about 45 to 50%; only 1.25 to 1.50% silicon can be per-

bout the out ther

gins, cure hich rick ated ame ork ted ace vith my t is ked the ned on-` in is is

lly a

ter

he

ng

ng

st-

is e,

of

re

13

<sup>\*</sup> The increasing demand for very soft low carbon steel (0.1% and less) involves an element of danger if carried to an extreme, as when the bath gets so low in carbon there is a considerable risk of the iron itself being burned and the steel containing more oxygen than is desirable or safe. Sufficient ductility can be secured by reducing the other foreign elements to a minimum and allowing an extra point or two of carbon to protect the iron.