

UNITED STATES PATENT OFFICE.

JACOB REESE, OF PITTSBURG, PENNSYLVANIA.

BASIC BESSEMER PROCESS.

SPECIFICATION forming part of Letters Patent No. 278,363, dated May 29, 1883.

Application filed January 3, 1882. (No specimens.)

To all whom it may concern :

Be it known that I, JACOB REESE, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in the Basic Bessemer Process; and I do hereby declare the following to be a full, clear, and exact description thereof.

The object of my invention is to secure the thorough dephosphorization of the metal and prevent the undue oxidation of the iron and final basic additions. This object I attain by ascertaining the number of cubic feet of air injected into the converter during the overblow in the treatment of a standard phosphorectic metal, and treating successive charges to the determined amount of air required for the dephosphorization of the metal.

In the practice of the acid Bessemer process the duration of the blow is determined by the disappearance of the carbon flame; but in the basic Bessemer process the blow must be continued after decarburization in order to eliminate the phosphorus from the metal. Now, one of the greatest difficulties in the practice of the basic process is to determine the proper duration of the overblow, for the appearance of the flame may give little or no evidence, as it is often obscured by brown smoke. If the blow is discontinued too soon, the metal will not be thoroughly dephosphorized, and if it continued too long it causes great waste of iron by undue oxidation, requires a larger addition of ferro-manganese or spiegeleisen to remove the oxide, and also causes the earlier destruction of the converter-lining, and is especially destructive on the bottom.

In the practice of the basic process it is found desirable to use a metal low in silicon, and, as two or three per cent. of phosphorus may be removed as readily as the one-tenth of one per cent., phosphorus may be substituted for silicon as a heat-producing agent in the metal; but as the metal made in the United States varies largely in its content of phosphorus it will be readily understood that the duration of the overblow must necessarily vary largely in operating on different qualities and charges of metal, so that, as before stated, great difficulty exists in determining the proper duration of the overblow, and consequently either an imperfect steel or loss of iron and a

destructive waste of the bottom and lining results.

In the practice of my invention I propose to take any quality of metal, but preferably metal low in silicon, and admix it with a sufficient quantity of ferro-phosphorus or pig metal high in phosphorus to phosphorize the mixture up to a sufficiently high and uniform degree to develop the proper temperature in the converter and give a uniform termination to the overblow when different charges of the metal are operated upon.

When it is desired to use a single brand of metal with phosphorus above the required degree, I prefer to admix it with a sufficient amount of scrap-steel low in phosphorus to bring the average percentage of phosphorus down to the required standard, as by this method the duration of the overblow will be the same for the different charges, and the scrap, rail, and bloom ends may be used to greater advantage; or different brands of metal may be mixed together in such proportions as to bring the percentage of phosphorus up to the degree required. The standard amount of phosphorus, or the amount which it is desirable to have present in the mixture in order to give a definite duration to the overblow, will vary with the amount of silicon present in the charge, and also with the amount of carbon, being higher when the silicon and carbon are low in order to supply additional caloric to compensate for that lost by the absence of the ordinary amount of these substances, and when the Bessemer metal contains the ordinary amount of these substances the mixture should, preferably, not contain more than one per cent. of phosphorus, as that amount is sufficient to produce the amount of caloric required under such circumstances, and it is desirable to avoid an increase of the basic additions and continuance of the blow as much as possible. The time of the duration of the overblow will vary according to the difference in the shape of the converters, the number of cubic feet of air blown in per minute, and the manner of the distribution of the air into the molten metal, and it will also vary with the percentage of phosphorus present in different mixtures, it being preferable, as before stated, to regulate the amount of phosphorus in each mixture with reference to the percentage of

carbon, and especially the percentage of silicon present in each mixture. In practice, however, I have found that when the metal contained three (3) per cent. of carbon and one-half ($\frac{1}{2}$) per cent. of silicon, two (2) per cent. of phosphorus in the mixture gave the best results.

In the Bessemer basic practice by the use of any certain plant when the standard amount of phosphorus required to develop the amount of caloric under those conditions of practice is determined, then samples of the metal treated should be taken at different intervals during a test overblow, and a careful record made of the number of cubic feet of air blown into the metal during each interval between the taking of samples, and thus the amount of oxygen determined which is necessary to be blown in for the oxidation of any given standard weight of phosphorus under those conditions—viz., the character of the plant, the character of the blow, and the distribution of air through the molten metal. When the relative amount of oxygen to the amount of phosphorus has been thus determined, then by the use of successive charges containing the standard weight of phosphorus, and treating the successive charges to a uniform amount of oxygen under like conditions, the duration of the overblow may be definitely measured and the phosphorus eliminated without undue loss of iron.

I do not claim any particular method for

producing phosphoretic metal, the essential conditions of my process being to secure a series of charges of metal containing the same amount of phosphorus and treating each of them in a like manner and under the same conditions after decarburization has been effected; nor do I herein claim, broadly, the basic Bessemer process or the overblow therein for the elimination of phosphorus. In the use of my invention the amount of air blown in will remain the same with all charges of the standard metal in the converter; but a variation of the percentage of phosphorus in the metal will necessitate a change in the quantity of air supplied proportionately to the change in the percentage of phosphorus in the metal.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

In the basic Bessemer operation where followed by the overblow, the process herein described of preventing undue oxidation of metal and excessive basic additions during the elimination of the phosphorus, which consists in providing a bath of metal containing a known amount of phosphorus, decarburizing the same, and subsequently supplying the exact quantity of air required for the overblow, substantially as and for the purpose specified.

JACOB REESE.

Witnesses:

JAMES H. PORTE,
WALTER REESE.