

# UNITED STATES PATENT OFFICE.

JACOB REESE, OF PITTSBURG, PENNSYLVANIA.

MANUFACTURE OF CAST-IRON HIGH IN CARBON AND LOW IN SILICON.

SPECIFICATION forming part of Letters Patent No. 281,729, dated July 24, 1883.

Application filed March 25, 1881. (No specimens.)

*To all whom it may concern:*

Be it known that I, JACOB REESE, a citizen of the United States, residing at Pittsburg, county of Allegheny, and State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Metal High in Carbon and Low in Silicon; and I do hereby declare the following to be a full, clear, and exact description thereof.

10 The object of my invention is to produce a metal for foundry purposes having a high tensile strength, and especially adapted for the production of chilled rolls, car-wheels, and malleable castings. This object I secure by running molten metal from the blast-furnace into an open-hearth furnace and treating it therein while in a state of rest until the greater portion of the silicon is eliminated, whereby the metal is produced high in carbon and low in silicon.

20 I have discovered that in the practice of the ordinary open-hearth process there are three distinct periods in which different chemical reactions take place. In the first or melting period about fifty per cent. of the carbon and silicon is eliminated. The second or desiliconizing period then commences, and the metal remains in a state of rest until the silicon is reduced down to the two one-hundredths of one per cent., at which point the carbon is attacked, and the third or boiling period commences, and the carbon is rapidly eliminated.

35 In the use of my new improvement it is designed to run the melted metal direct from the blast-furnace into the open hearth, and treat it there until the silicon is practically eliminated and the metal begins to boil, thus dispensing with the first and third periods, and retaining the carbon to impart a high tensile strength to the metal.

40 When a metal is desired high in carbon and low in silicon and phosphorus, I smelt iron ores low in phosphorus in a blast-furnace in the usual manner now practiced for the production of Bessemer pig metal. The metal is then run into an open-hearth furnace and treated until the appearance of the carbon flame, when it is run into pigs or castings. The desiliconization of the metal in the open hearth is preferably expedited by treating it with a bath of oxide of iron. The proportion of oxide used may vary from five to twenty-five per cent. of the weight of the metal; but the oxide of iron may

be dispensed with by subjecting the metal to an oxidizing flame, which will oxidize the surface of the metal, and the oxide will be absorbed by the metal and desiliconize it, and the silicic acid ( $\text{SiO}_2$ ) so formed will pass into the slag, and, uniting with a base, will remain in the slag as a silicate.

It is desirable in all cases wherein the metal is required to possess a high degree of fluidity that the metal should be taken direct from the blast-furnace into the open hearth, and that its treatment therein should be discontinued and the metal immediately run into pigs or castings at the moment when the elimination of the carbon commences. The fluidity of the metal after treatment will depend upon the amount of carbon it contains. The greater the amount of carbon the greater the fluidity. Therefore, as before stated, it is desirable in all such cases to retain the greatest possible amount of carbon in the metal. If it is inconvenient or impracticable to cast the metal at the moment the elimination of the carbon commences, a small quantity of silicious pig should be thrown into the furnace to raise the percentage of silicon in the metal, which will effectually prevent the elimination of the carbon until the silicon is again reduced down to the two one-hundredths of one per cent. Where a high degree of fluidity is not required, however, in the resultant product—as, for instance, where it is to be used for the manufacture of large castings—it may not be necessary, although preferable, to treat the metal directly as it comes from the blast-furnace, and pig metal may in such case be melted in the open hearth and treated as hereinbefore described.

I do not herein claim, broadly, a process which consists in blending together melted oxide of iron and melted cast-iron, maintaining the mixture at a temperature sufficiently low to prevent a too great reduction of the carbon while causing the transfer of the phosphorus from the metal to the oxide of iron as to destroy the fluidity of the metal and unfit it for casting, for the reason that the same forms the subject-matter of another invention, which I reserve the right to claim.

I am aware that it has been proposed to run molten metal and molten oxide of iron into a vessel and agitate the same by mechanical means, so that a rapid admixture may be se-



cured in order to dephosphorize the metal in from five to ten minutes, in which operation some of the silicon and carbon are eliminated. In that process a considerable amount of silicate of iron formed remains in the metal because intimately admixed therewith, while by my method herein set forth the operation is by surface action. There is no material ebullition of the molten metal, and no mechanical agitation thereof. Consequently the silicon is drawn to the surface and there oxidized, and the metal is not only freed from silicon, but also from the resulting silicic acid and silicate of iron.

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

1. The process herein described for producing desiliconized cast-iron high in carbon, which consists in running molten silicious cast-iron into a silicious-lined vessel, and then covering it with oxide of iron and subjecting it to a high temperature while maintained in a

state of rest, whereby the silicon is eliminated, the resulting silicic acid or silicate of iron embodied in the slag, and the metal freed from silicon, silicic acid, or silicate of iron without an appreciable reduction of the carbon, substantially as and for the purposes set forth.

2. The process herein described for desiliconizing metal without materially reducing its carbon, which consists in subjecting the molten metal to a high temperature and an oxidizing flame, and maintaining it at a state of rest in an open-hearth furnace until the elimination of the carbon commences, and then withdrawing and casting the molten desiliconized metal, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand this 23d day of March, 1881.

JACOB REESE.

Witnesses:

WALTER REESE,  
FRANK M. REESE.