

UNITED STATES PATENT OFFICE.

CHARLES M. NES, OF YORK, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF STEEL.

Specification forming part of Letters Patent No. 108,287, dated October 11, 1870.

To all whom it may concern:

Be it known that I, CHARLES MOTIER NES, of York, in the county of York and State of Pennsylvania, have invented a new and useful Improvement in the Manufacture of Steel; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an improved mode of producing steel in a converting-furnace or in an open forge-fire.

To better explain the nature of my invention, as regards the production of steel in the converter, I will, in the first place, give a general description of what is now known as the Bessemer process, and then point out the difference between that and the process employed by me.

In the Bessemer process the pig must, in order to produce any good results, be the best quality of charcoal-iron. Iron made with anthracite coal, or any other pig containing an appreciable proportion of phosphorus, is not fitted for the purpose, and cannot successfully be used. This pig is first melted, then run into the converter, where the blast is turned on until the metal is thoroughly decarbonized, and then spiegeleisen or Franklinitite is thrown in, in definite and well-ascertained proportions, to recarbonize the mass to the proper degree to make steel.

The process I employ is different from the above in many essential features, and is as follows: I take the pig—which may be ordinary iron, with as much as one per cent. of phosphorus, instead of the fine charcoal-iron required in the Bessemer process—and melt it in a suitable furnace, and, by preference, melt with it at the same time from fifteen to twenty per cent. of an ore known as the Strickhauser or Leader Hill ore, mined in York county, Pennsylvania, and having the following analysis: Metallic iron, 36.18; oxygen with the iron, 15.30; silica, 42.30; sulphur, practically none; phosphoric acid, .36; alumina, 1.70; lime, .12; magnesia, .04; protoxide of manganese, .26; water, 2.02; alkalies and loss, 1.72=100.00; or any other ore, the analysis of which is about the same as the above, may be used.

The melted pig and ore are run into the converter, and the blast is then turned on. The melted silica of the ore forms a coating on the

top, which keeps in sufficient of the carbon, under all circumstances, to make steel. If the blast be continued, for instance, a great length of time, a portion of the metal will burn out, but that which remains will be steel. The silicious coating seems, also, to take a great portion of the phosphorus from the pig, leaving practically none in the made steel. After the blast has continued for sufficient length of time, which is determined in the usual way by the appearance of the flame, the metal is then run off, the product being a very fine cast-steel. The ore may be thrown into the converter, but I prefer to melt it with the iron before running the mass into the converter.

The differences between my process and what is known as the Bessemer are marked and important. In the first place, I can use ordinary anthracite pig, instead of the charcoal-iron, which is a great saving; secondly, the ore I employ is an oxide, and is not a carbonizing agent, like the spiegeleisen or Franklinitite; thirdly, the ore can be melted with the pig before being run into the converter; and, fourthly, the metal does not need recarbonization, like that made by the Bessemer process. I do not burn out the carbon and then reintroduce it, but the combined action of the blast and the ore which is mixed with the pig is sufficient to steelify the mass.

The silicious coating which the ore forms over the metal is an important agent also, as an analysis of it has proven that much, if not all, of the phosphorus in the pig is taken up and contained in the said coating; and it serves the further purpose of keeping in sufficient carbon to make steel.

Another mode I have employed of making steel is by the use of the ordinary forge-fire. The pig is melted, with from fifteen to twenty per cent. of the ore above mentioned, in the fire, and is then run out upon a heated hearth, where it is worked or balled up in the usual way. So far as I am aware no one has heretofore succeeded in making steel in a forge-fire; but, after continued experiment, I find that, without the use of the more costly apparatus, such as reverberatory furnaces, cupolas, &c., a fine quality of steel may be produced by melting in a forge-fire the pig and ore in about the proportions stated, the metal be-

ing manipulated, in order to make steel, in the manner heretofore employed under like circumstances to make iron.

In connection with both the forge-fire and converter, I propose, at times, to use electricity to improve the quality of the steel, as described in my former patents for the manufacture of iron and steel. The poles of the battery communicate with the molten metal by means of wires, and the furnaces should be insulated by means of glass or other insulating material. The electricity employed can be generated by any suitable apparatus.

Another part of this invention consists in a fettling or fix, which I have found well adapted for use in puddling-furnaces, for puddling iron or steel. This is composed of mill-cinder, hammer-slag, and scrap-iron, taken in equal parts, burnt in any suitable manner together, and then used as a fettle.

Having described my invention, and the manner in which the same is or may be car-

ried into effect, what I claim, and desire to secure by Letters Patent, is—

1. The manufacture of cast-steel, in a converting-furnace, from pig-iron and the ore herein specified, substantially in the manner set forth, with or without the use of electricity, as described.

2. The manufacture of steel from pig-iron and the ore herein specified, in a forge-fire, substantially in the manner set forth, with or without the use of electricity, as described.

3. A fettling or fix for puddling-furnaces, composed of equal parts of mill-cinder, hammer-slag, and scrap-iron, substantially as described.

To the above specification of my invention I have signed my name this 22d day of August, A. D. 1870.

CHAS. MOTIER NES.

Witnesses:

SOLOMON C. KEMON,

THOS. D. D. OURAND.