

United States Patent Office.

CHARLES MOTIER NES, OF YORK, PENNSYLVANIA.

Letters Patent No. 102,146, dated April 19, 1870.

IMPROVEMENT IN THE MANUFACTURE OF STEEL.

The Schedule referred to in these Letters Patent and making part of the same.

To 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 certain new and useful Improvements in the Manufacture of Steel, of which the following is a specification.

My invention is based upon the application of electricity, in combination with the carbonizing process for the conversion into steel of pig-metal mingled with iron obtained from ore mixed and melted with the pig.

By the process I produce a superior quality of steel, with much economy of time and labor. In making steel in accordance with my invention, I take pig-iron, such, for instance, as made by the process for which Letters Patent were granted me on the 16th November, 1869, or any other suitable pig-iron, and melt it in a cupola or other suitable furnace, with twenty per cent. (more or less) of iron ore.

The composition of the ore I prefer to use is as follows:

Silica, 40.80.

Metallic iron, 36.07.

Alumina, 8.65.

Magnesia, a trace.

Phosphorus, 0.22.

But other ores may be employed for the purpose.

I place both the pig-metal and the ore into the cupola, together with coal sufficient to melt the same, and then turn on the blast.

Steel bars, connected with a galvanic battery of suitable power, say, a Grove's battery of from six to ten cells, are inserted into the hearth of the cupola, so as to be brought in contact with the melting iron, through which a current of electricity is thus caused to continuously pass.

The object of putting the ore and pig together into the cupola is to obtain the decarbonizing effect of the ore upon the pig-metal, which is most marked, and to this the electricity adds its action, which produces a disposition in the metal to crystalize, purify, and take a steely nature.

The metal is left in the cupola until sufficiently decarbonized, which is ascertained by tapping out a small quantity. If not sufficiently decarbonized, more ore is put in.

When the metal is decarbonized or brought to nature, or nearly so, it is ready for the final treatment, whereby it is converted into steel, which is as follows:

After tapping off the cinder, which is done as in ordinary blast-furnaces, I tap out the melted iron, and run it into a fire-brick chest or receptacle, closed, so as to be practically air-tight, and in this chest the metal is recarbonized by introducing carburetted hydrogen, or other carbonizing gases, in the usual way, or, instead of this, I can effect the car-

bonization of the metal by throwing into the chest from five to ten per cent. of the pig-iron, made by the process for which Letters Patent were granted me, as above stated.

Wires from the galvanic battery are inserted into the metal in the chest, so as to subject it to the action of a continuous electrical current, the effect of which I have above mentioned, and it is my object, in all the manipulations of the metal from the beginning to close of the process, to maintain the connection between the battery and the melted metal.

When the metal has been brought to proper condition, which can be ascertained in the usual way, I run it from the converting apparatus or chest into cast-iron or other suitable molds.

Both the cupola or other furnace in which the pig and ore are preliminarily melted, and the chest or receptacle, into which the melted metal is run for the purpose of carbonization, should be insulated by means of glass or other insulating substance.

I am thus enabled to produce steel direct from ore mingled with the pig-iron in about the proportion above stated.

The use of electricity shortens the process, purifies the iron, and gives a greatly improved quality of steel.

If it be desired to produce a high steel, I place in a retort communicating with the chest, in which the melted metal is run, a carbonizing mixture, composed of, say, equal parts of marble-dust, charcoal, and pyroligneous acid.

I employ, for the purpose of driving into the chest the gases arising from the above compound, a tweek, one end of which is inserted at the top of the boiler of the steam-engine, usually found at iron-works, and the other end into the retort.

The gases evolved by the action of the acid upon the charcoal and marble are thus blown, by the power of dry steam, into the metal and percolate every portion of the melted mass, so that in thirty minutes I can produce from one to five tons of very fine steel.

It will be understood that the construction of the apparatus employed may be greatly varied without departure from the principle of my invention, and that the carbonizing materials may be of any nature suitable for the purpose, and may be applied in any of the modes now in use.

What I claim, and desire to secure by Letters Patent, is—

The process of producing steel from cast-iron and ore, substantially in the manner and for the purposes set forth.

In testimony whereof, I have signed my name to this specification before two subscribing witnesses.

CHARLES MOTIER NES.

Witnesses:

DANIEL H. LAWMASTER,
GEO. A. HECKERT.