UNITED STATES PATENT OFFICE.

ANTHONY L. FLEURY, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN THE MANUFACTURE OF IRON.

Specification forming part of Letters Patent No. **32,826**, dated July 16, 1861.

To all whom it may concern:

Be it known that I, ANTHONY L. FLEURY, of the city of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in the Manufacture of Wrought or Malleable Iron; and I do hereby declare the following is a full, clear, and exact description of the same.

The invention may be performed in a puddling-furnace of ordinary construction, such furnace being arranged in suitable proximity and relation to a galvanic battery, a magneto-electric machine, or other apparatus for producing or inducing a current or currents of electricity, and the terminal poles of such apparatus being so connected with the furnace that the electric current may be completed through the metal under treatment in the furnace, and the conducting-wire or other electrical conductor belonging to such apparatus being fitted with a key similar to what is used in telegraphing for opening and closing the circuit. The currents employed should be of high intensity, and I propose generally to use a current produced by one or more of Bunsen's batteries, broken and induced by a Ruhmkorff's or Ritche's coil; but as I do not here intend to claim any apparatus or to confine myself to the use of any particular apparatus, and the apparatus I employ is all well known, I have not thought it necessary to represent it by drawings.

The process is conducted in the following manner: The charge of pig or cast iron or ore (ore having been previously deoxidized) is introduced to the furnace without the usual addition of cinder, and subjected to the action of heat in the usual manner. The electric circuit is allowed to remain open till the metal or ore has fused and commenced to boil, when it is closed by the key and the current is caused to pass through the boiling mass; and simultaneously with the application of the electricity, or as nearly so as convenient, I introduce the nitrogenized hydrogen or nitrogen-containing salt or substance. The nitrogenized hydrogen may be prepared by passing hydrogen over or through a nitrogen-containing substance—as guano, leather, or woolen scraps—and may be introduced in jets among the boiling mass by tuyeres or by perforated tubes made of or coated with fire-clay or other refractory material. The nitrogen-containing salts which may be employed are nitrate of ammonia, chloride of ammonia, sulphate of ammonia, carbonate of ammonia. The quantities of such salts used may be from one (1) to two (2) per cent., by weight, of the quantity of iron or ore. Instead of these salts, guano may be used in quantity from two (2) to five (5) per cent., by weight, of the quantity of iron or ore. These substances may be introduced by a working-tool of suitable construction and stirred in among the boiling mass. In connection with the use of these nitrogenous salts or other nitrogenous substances, I generally introduce among the mass a jet or jets of steam, or, instead of steam, I introduce water in small quantities by means of a hollow working-tool. The electricity introduced among the iron or ore while the latter is in the boiling condition destroys the chemical affinity by which the impurities are bound to the iron and causes them to be thrown to the surface, and this action is so much assisted by the nitrogenized hydrogen or nitrogen combining with the impurities as soon as they are liberated that the iron "comes to nature" almost immediately, and when this takes place I open the electric circuit and discontinue the application of electricity. The time required for the application of electricity seldom exceeds ten minutes.

I am aware that various applications of electricity have been made in the manufacture of iron and steel, in some of which the current has been passed through the charge only during the cooling of the iron, and in others at an earlier stage of the process; also, that various chemical substances have been made use of in connection with a current of electricity in the manufacture of iron, and I therefore disclaim all applications of electricity and of chemical substances not in accordance with the foregoing specification; and

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

The method herein described of treating iron, consisting substantially in destroying the chemical affinity by which the impurities are bound to the iron by submitting the latter, while in a boiling state, to the simultaneous action of nitrogenous substances and electricity, in the manner herein set forth.

ANTHONY L. FLEURY.

Witnesses:
M. M. LIVINGSTON,
L. W. BENDRÉ.