W. SLEICHER, Jr.

Melting and Treating Iron.

No. 168,293. Patented Sept. 28, 1875.

FIG. I.

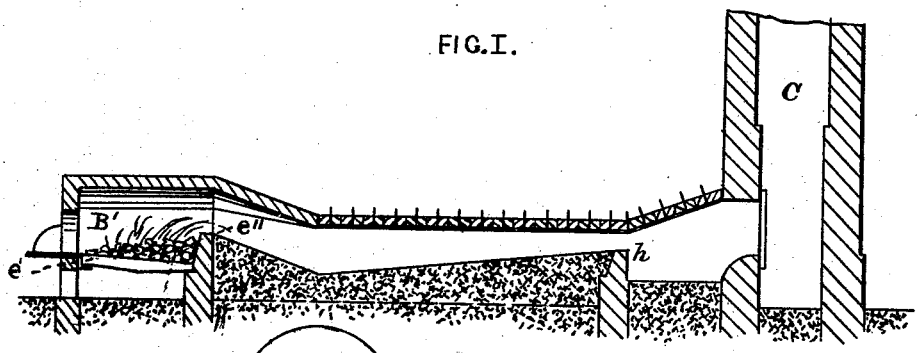



FIG. II.

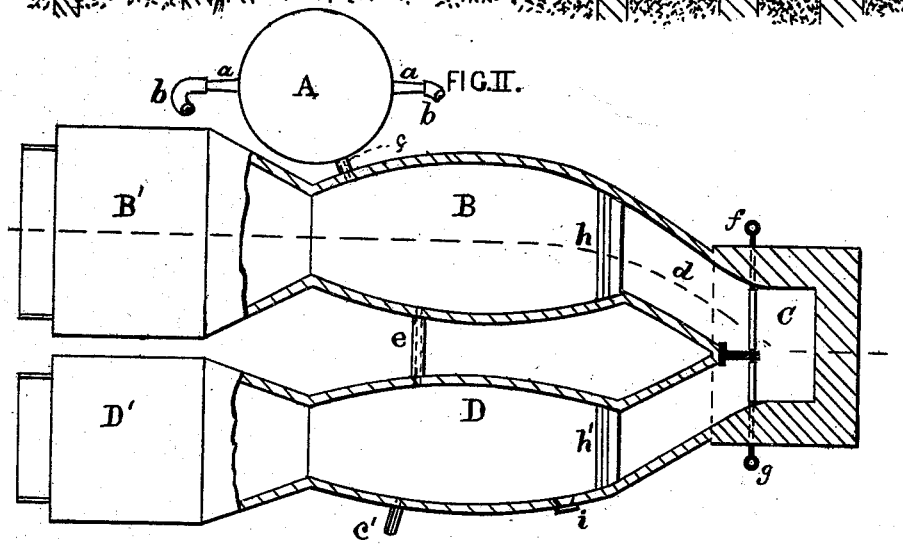
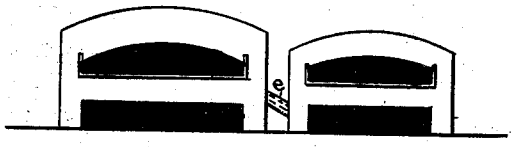



FIG. III.

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# UNITED STATES PATENT OFFICE.

WILLIAM SLEICHER, JR., OF TROY, NEW YORK.

## IMPROVEMENT IN MELTING AND TREATING IRON.

Specification forming part of Letters Patent No. **168,293**, dated September 28, 1875; application filed April 2, 1875.

*To all whom it may concern:*

Be it known that I, WILLIAM SLEICHER, Jr., of the city of Troy, in the county of Rensselaer and State of New York, have invented a certain Process of Melting and Refining Iron, for purposes hereinafter named, together with the means for carrying such process into effect, of which invention the following is a specification; and I do hereby declare that the same is a full, clear, and exact description of the said invention, reference being had to the accompanying drawing, and to the letters of reference marked thereon.

My invention is designed to be applied to general foundry purposes, but may be applied to the treatment of iron and other metals for other purposes.

By means of this invention an iron is readily produced well adapted for malleable castings, which iron, it is known, must be of a high grade and crystallized, or freed in a great degree from carbon. The labor of preparing the furnace for the purpose of melting is materially lessened, the process of refining facilitated, and less skillful and expensive help required to produce a larger percentage in result.

The part of my invention capable of illustration is shown in the annexed drawing forming a part of this specification.

Figure 1 is a longitudinal section of the apparatus. Fig. 2 is a plan, and Fig. 3 a front view of the same.

Similar letters of reference indicate similar parts of the invention in all the views.

A is an ordinary cupola, the tuyeres of which are represented by *a*, and the pipes leading therefrom by *b*. B is a reverberatory or intermediate receptacle for the iron placed contiguously to and fed by the cupola through the trough *c*. The furnace B has a construction substantially as shown, the channel *d* of which leads to the chimney C. D is another reverberatory furnace, having a connection with the furnace or receptacle B by means of the trough *e*, and from which the metal is ultimately poured at *c'*. The hearth of the furnace B is about one foot higher than that of the furnace D, enabling the molten metal to flow by its own gravity into the latter. The size of the furnace B is about one-third larger than that of the furnace D. The plans of the furnaces are shaped about as shown, which shape I prefer, as it enables the iron to be spread over the greatest practical area at a small depth, which distributes the reacting or reverberatory operation of the heat from the arched roofs to the best advantage. The cupola, furnace, and chimney are made wholly of or lined with fire-brick. The furnaces proper, or fire-chambers, marked, respectively, B' and D', are placed at the fronts of the furnaces B and D. The grate-bars are represented by *e'*, which fall to the bridge-wall *e''*. The roofs of the furnaces B and D rise to the crowns of the fire-chambers B' and D', as shown, the fire and heat being thereby deflected upon the iron resting upon the respective hearths of the furnaces B and D. The stoke-holes of the fire-chambers, as seen in Fig. 3, extend nearly across the fronts of the fire-chambers, enabling the fireman to bank the fuel well up into the same. The exterior sides of the fire-chambers are braced with wall-plates and tied with bolts, as shown. The roofs of the furnaces B and D are formed of layers of fire-brick resting upon removable T-shaped supports reversed, as shown, and which can be removed singly by means of hooks or other appliances. That portion of each furnace leading to and entering the chimney is made to rise, as shown, the reverberating character of the furnaces being thus seen. Each furnace is supplied with a suitable damper or shut-off, represented, respectively, by *f* and *g*, by means of which either furnace can be used singly, or the entire combination of both furnaces, cupola, and chimney employed.

This feature of my invention is very useful in emergencies where the engine furnishing the blast becomes disarranged or incapable of use. In such an emergency, by shutting off the connection between the furnaces D and B the natural draft through the single furnace, superinduced by the height of the chimney, would cause sufficient draft for temporary uses. It is, of course, understood that these dampers would be necessarily fire-proof. The same result could be reached by stopping up the communication by means of fire-brick.

Each furnace is provided in that part thereof approaching the chimney with a bridge-wall, *h h'*. A skimming-door, *i*, is shown in the side

of the furnace D, which, when opened, is used by the furnaceman to skim, with a suitable implement, the surface of the iron.

In cases where the cupola would not at all times be employed, and the artificial draft produced by the altitude of the chimney would not be ample, a blast from a centrifugal or other blower could be used by means of a single pipe branching to each furnace. Slag-holes are provided, by means of which the chimney is cleared.

The foregoing sets forth the preferred manner in which I use my invention, but substantially the results obtained thereby are accomplished by placing the cupola centrally of the two air-furnaces, as herein described, the cupola to have two spouts, and this arrangement I consider the equivalent of the arrangement first described.

As a part of the process of melting, refining, and treating iron by means of the apparatus herein described, the fuel which I employ in the cupola is composed of about two-thirds coke and one-third charcoal, more or less. I find that this mixture of the two substances as a fuel is highly beneficial to the iron when treated in the manner hereinbefore described. Charcoal, it is known, has the property of centralizing or absorbing gases from the iron, while coal impregnates it with its sulphurous properties. Especially do I find the charcoal and coke in the above proportions purify the iron from slag for malleable purposes.

The iron heating rapidly in the cupola, it is necessary to tap it about every ten minutes, else the iron would run through the tuyeres. It is also necessary to run the iron quickly to the first furnace in order that the character given to the iron by the charcoal may not be lost. It is here subjected to the action of the furnace consequent upon its reverberatory construction; but it is again necessary to run the iron into the second furnace, which is of smaller size, that the character of the iron may not deteriorate by contact with that constantly drawn from the cupola, which is not refined. It is therefore seen that the second furnace, when used in this connection, and with a charcoal fuel, admits of the iron remaining a short time—say, ten minutes—in the first furnace for refining purposes, which refining has been in part accomplished, first, by the charcoal fuel, and next by the action of the first furnace. Experience has shown me that about ten minutes' use of the first furnace is sufficient to refine the iron, so that the refining is completed in the second furnace, and the sizes of the two furnaces, as herein given, one being considerably larger than the other, enables me to continually have a sufficient supply of iron in D for malleable casting of a proper grade and character for the purpose. The furnace B retains the iron, or holds it back, while a smaller quantity is more perfectly refined for the purposes intended. Thus the process of melting and refining proceeds without interruption, experience having shown me that the capacities of the cupola and respective furnaces are such as to permit the continuance of the operation without stoppage.

The arrangement of air-furnaces and cupola, and the process hereinbefore described, produces also the following advantageous results: Eight tons of iron can be taken out of furnaces of one ton capacity in five hours, instead of in eighteen hours, where the two air-furnaces are used, without the union therewith of the cupola. The iron is always hot and better graded, anneals more readily, and is purer and tougher. One-third less in the quantity of fuel and fire-brick is required by my process.

Where it is desired to run off the first heat to the furnace D, the trough for the cupola is made long enough to reach thereto.

Having described my invention, what I claim as new, and wish to secure by Letters Patent of the United States, is—

1. The process of melting and refining iron by adding in the cupola a fuel of about two-thirds coke and about one-third charcoal, and running the molten metal from the cupola to a reverberatory furnace, and also from said furnace to a second independent reverberatory furnace, from which the metal is ultimately tapped for foundry uses, substantially as herein specified.

2. The cupola A, first and second independent reverberatory furnaces B and D, and chimney C, combined substantially as and for the purposes set forth.

In testimony whereof I have hereto subscribed my name this 8th day of March, A. D. 1875.

WILLIAM SLEICHER, JR.

Witnesses:

JOHN F. SLEICHER,

C. R. DE FREEST.