M. LANE.

TREATING METALS.

No. 33,090 Patented Aug. 20, 1861.

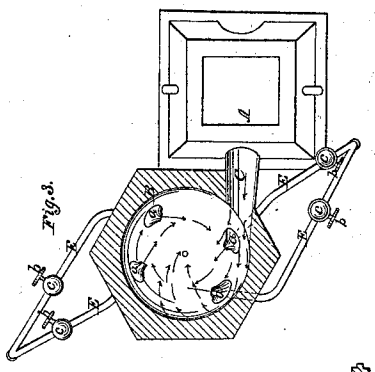

Fig. 3.

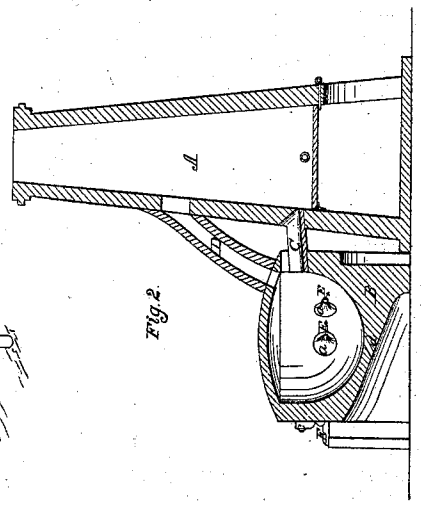

Fig. 2.

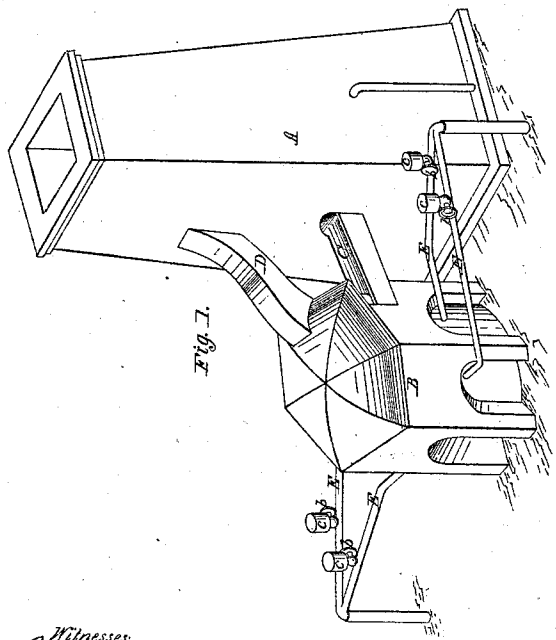

Fig. 1.

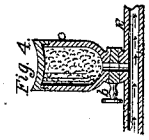

Fig. 4.

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UNITED STATES PATENT OFFICE.

MARCUS LANE, OF WASHINGTON, DISTRICT OF COLUMBIA.

IMPROVEMENT IN TREATING METALS.

Specification forming part of Letters Patent No. **33,090**, dated August 20, 1861.

To all whom it may concern:

Be it known that I, MARCUS LANE, of the city and county of Washington, District of Columbia, have invented a new and useful mode of carbonizing, decarbonizing, and otherwise refining or changing the nature of metals; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a perspective view of a furnace adapted for performing my invention; Fig. 2, a vertical section, and Fig. 3 a plan and partial section of the same. Fig. 4 is a section of a charcoal-vessel and blast-pipe.

Similar letters of reference in each of the several figures indicate corresponding parts.

The invention which I have developed is designed particularly for use in connection with furnaces or the side hearths thereof, which have tuyere-pipes set tangentially to their interior circumference or surface, and which produce a rotary or spiral motion in the mass of molten metal.

The nature of my improvement consists, first, in the combination of the spherical bottom of the chamber B, which contains the molten metal, with the tangentially-arranged gutter or induction-pipe C between the stock-furnace, so that the metal shall have a circular motion imparted to it the moment it enters the hearth or chamber B without the aid of the blast; second, supplying carbon with the air at a point below the surface of the molten mass of metal by means of blast-pipes set tangentially, and valved chambers or vessels, said chambers containing and supplying the carbon, and the said pipes conducting it into the molten metal, and the blast of air through the pipes forcing it throughout the same.

It is proper that I should here state the advantage of the rotary motion in fused metals, although it, broadly considered, does not constitute my invention. By the rotary motion the metal is caused to sink at the center and rise at the sides of the refining-chamber or hearth, and therefore any agent introduced at the outside of the furnace for the purpose of refining or changing the nature of metals will by this motion be caused to permeate the whole mass, provided the form of the interior of the chamber is adapted to facilitate the rotary motion, and the manner of applying the refining or other agent is practical. Now, the semi-spherical form of the bottom of the refining-chamber will not permit any portion of the fused metal to be in a state of rest, as said form tends to aid the metal in moving in horizontal and vertical circles when the action of the blow-pipe is brought to bear upon it; and as the metal is thus thoroughly put in circulation the introduction of the carbonizing agent from the tuyere-pipes E into the mass of fused metal is thorough and equal, and the whole mass will be carbonized and changed into steel. The carbon in excess is supplied from the vessels *c c* and carried by the air with such force into the mass of metal as to speedily produce the desired result. It is apparent that the vessels *c c* may have a branch pipe leading into their top from the tuyere-pipes E for the purpose of insuring a supply of carbon; but this arrangement would require a more powerful blast, and as I believe the carbon will descend from the vessels by its own gravity and be carried forward with great force, I do not deem the branch-pipes necessary or desirable.

To enable others skilled in the art to perform with my invention, I will proceed to describe an apparatus which I believe is adapted therefor.

In the drawings, A represents a cupola-furnace for smelting iron or its ores. The construction of this furnace is nearly in all respects similar to those now in use.

B is a refining, decarbonizing, or carbonizing chamber arranged on one side of the furnace A. This chamber communicates at two points with the furnace A, as shown at C and D. The form of the interior of the chamber B is semi-spherical, and the position of the induction-pipe C is tangential to its circumference, as represented.

E E are a series of branch-pipes of a blower or other forcing apparatus. These pipes enter the sides of the chamber B at different elevations, and also stand or run tangentially to the interior circumference of the chamber, their ends being protected from the intense heat in the chamber by soapstone coverings *a a*, as shown.

On each of the branches, at points intermediate between the chamber B and the forcing apparatus, a vessel, *c*, for containing pulverized

charcoal or other agent used in the treatment of the metals is placed, said vessel having a communication with the branch pipe by means of a turning valve, *b*, as represented.

From the foregoing description the construction will be readily understood, and it only remains to be stated that the metal after being smelted in the furnace A, is run off into the chamber B through the passage C, and in its fall strikes the spherical surface of the chamber and therefrom receives a partial rotary motion, which motion is kept up by means of the blast of air, steam, or other agent introduced by force through the tangential pipes E E, the black arrows indicating the course of the metal at its first entrance into the chamber, and the red arrows its continued course. The rotary motion thus produced in the metal causes it to sink at the center and rise at the sides of the chamber, and thus the particles of which the molten mass is composed are continually changing their position and presenting new portions to the agent, which is introduced along with the air for the purpose of changing the nature of the metal. If the object is to decarbonize cast-iron, air or steam is introduced from the pipes E E; but if it is desired to carbonize bar iron, charcoal or other suitable agent is introduced along with the air from the vessels *c c*. Said substance, being of a carbonaceous nature and in a powdered condition, is drawn from the vessels *c c* by the action of the blast of air through the branch-pipes, and then forced by the air throughout the circulating mass of metal in so thorough a manner that the iron will at once, as I believe, be converted into steel or first-quality bar-iron accordingly as desired.

As the operation of treating the metal in the chamber B proceeds, the gases thrown off escape through the flue D into the smelting-stack, and when the treatment of the metal is finished the metal is run off through the passage *d* in the bottom of the chamber.

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

1. Imparting a partially-circular motion to the molten metal by means of the semi-spherical form of the chamber B and the tangentially-arranged pipe or gutter C, substantially as and for the purposes set forth.

2. Continuing the circular motion in the metal by combining the semi-spherical form of chamber B, tangentially-set gutter C, and tangential blow-pipes E E, substantially in the manner herein described.

3. Supplying carbon with the air at a point below the surface of the metal to a circulating mass of metal by means substantially such as herein described, for the purpose set forth.

4. In the combination of the refining-chamber with the stack of the furnace by means of a flue, D, so that the escaping gases from the mass of metal may pass off directly through the stock-furnace, and by their heat aid in heating said furnace.

MARCUS LANE.

Witnesses:

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