(No Model.)

C. G. P. DE LAVAL.

METHOD OF MELTING IRON BY MEANS OF ELECTRICITY.

No. 585,040. Patented June 22, 1897.

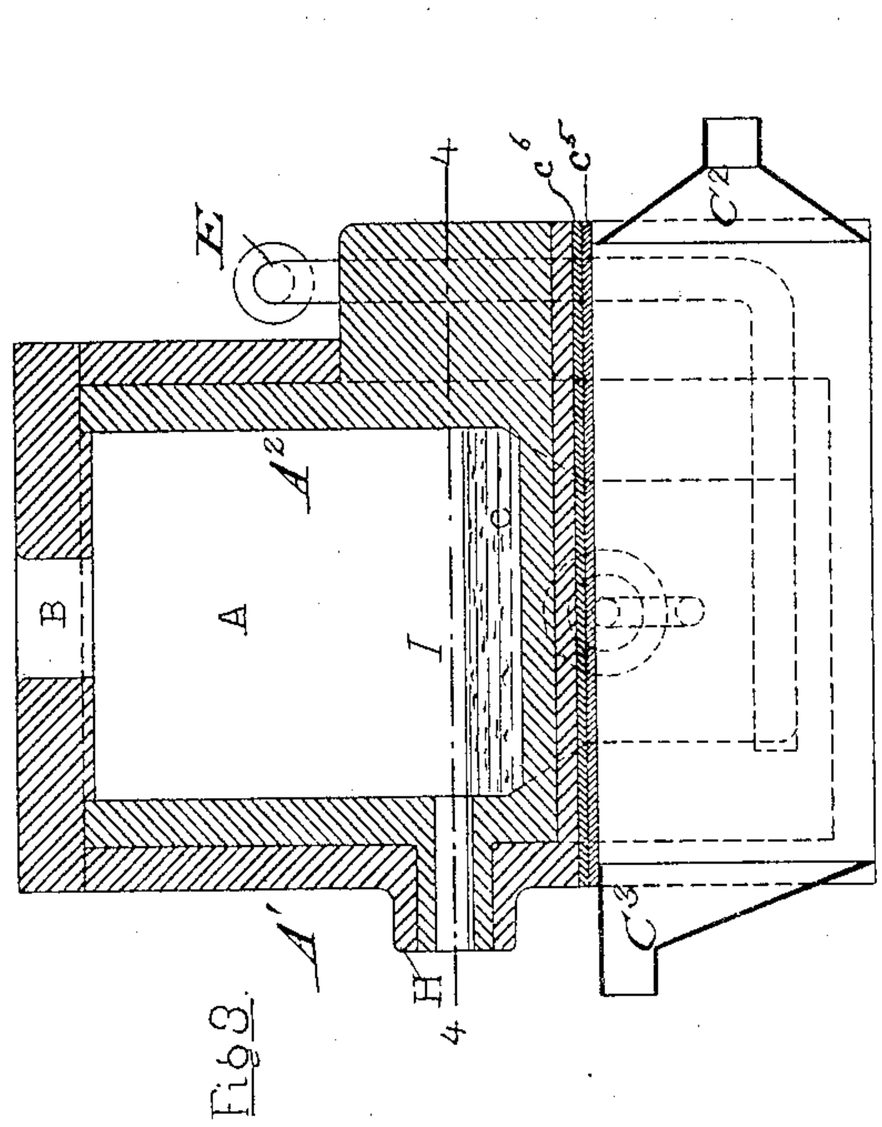

Fig 3.

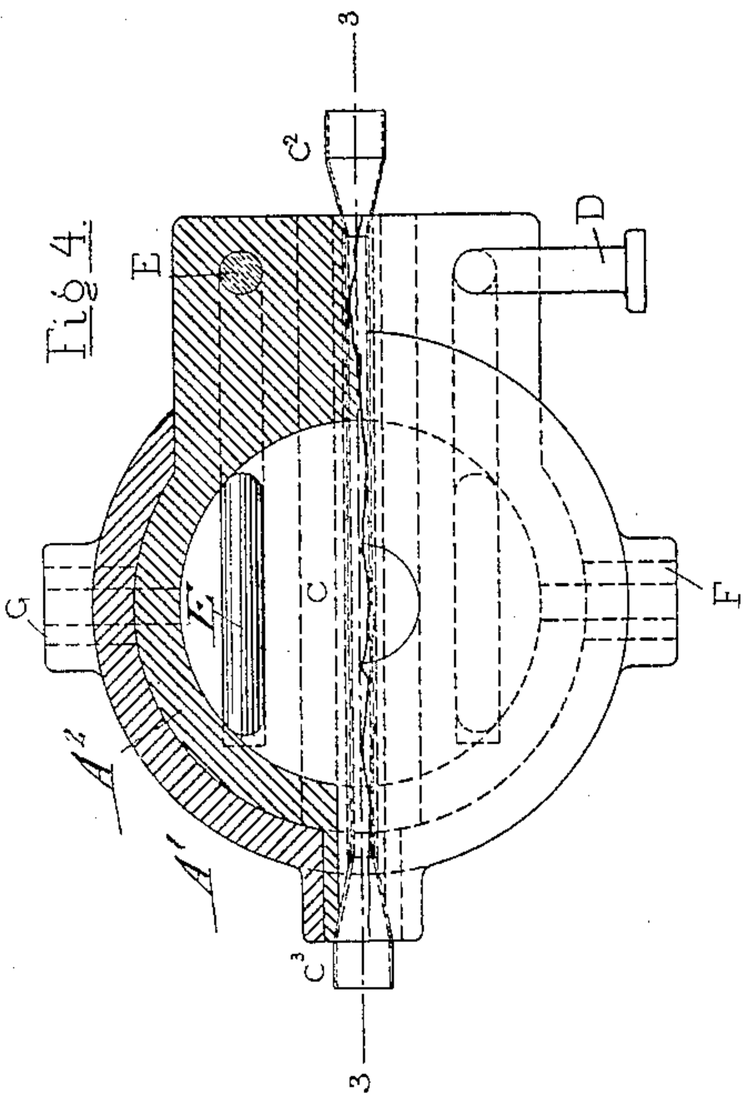

Fig 4.

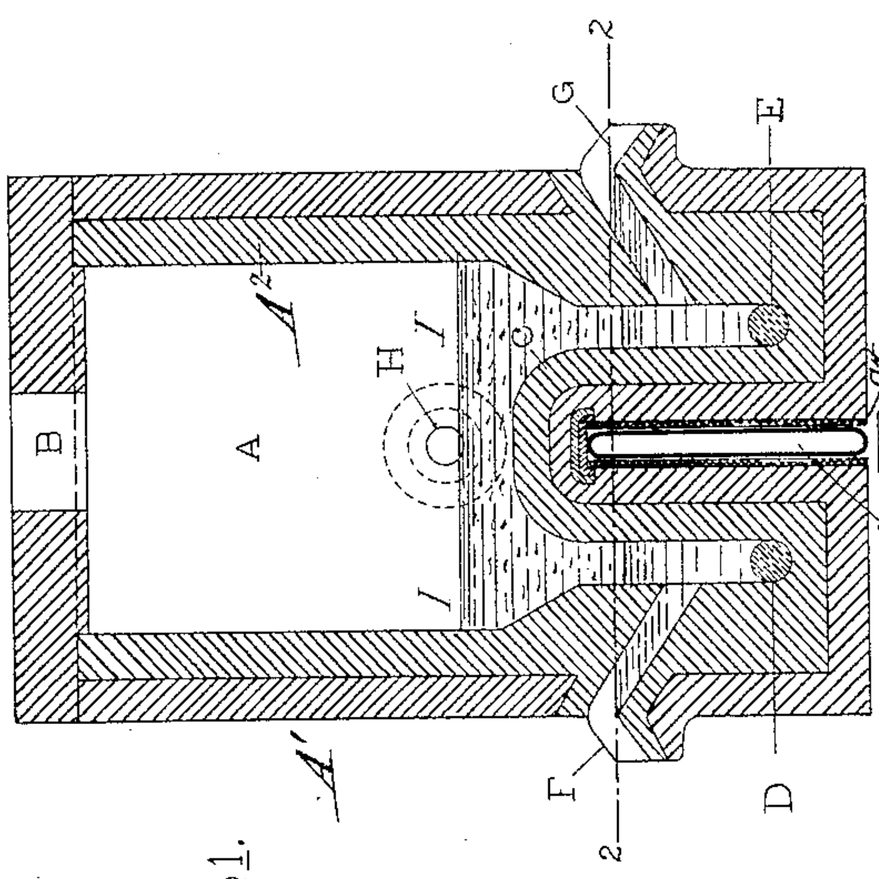

Fig 1.

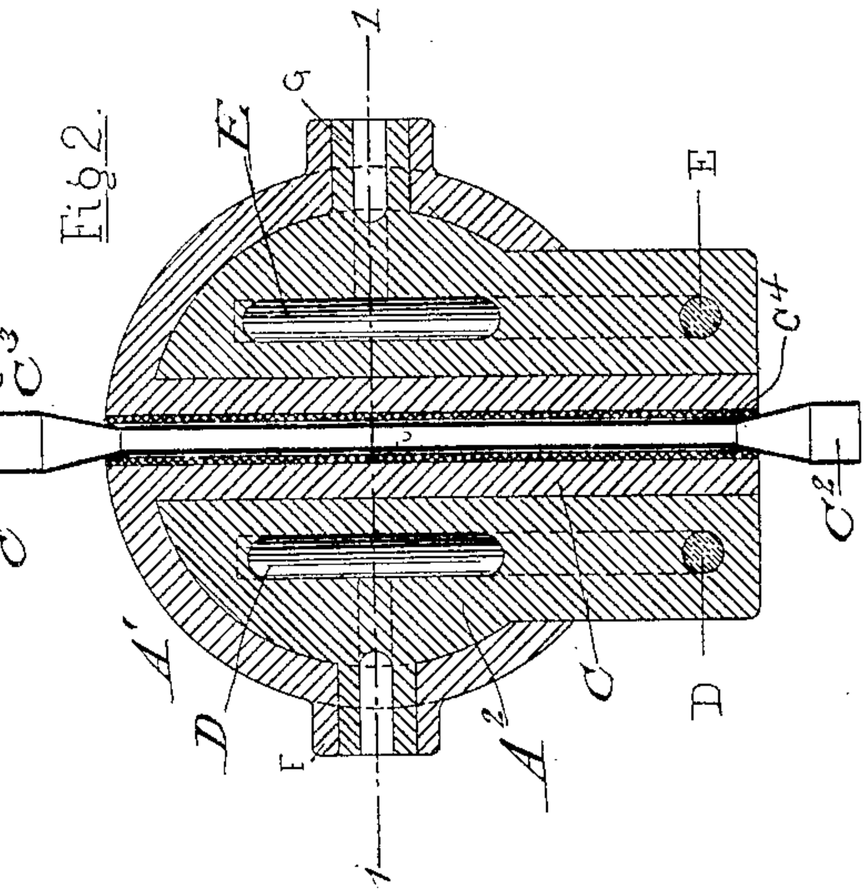

Fig 2.

WITNESSES
Harry Billard Griffiths
Sharon Hall

INVENTOR
C. G. P. de Laval.
BY Howson & Sayer
ATTORNEYS.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CARL GUSTAF PATRIK DE LAVAL, OF STOCKHOLM, SWEDEN.

METHOD OF MELTING IRON BY MEANS OF ELECTRICITY.

SPECIFICATION forming part of Letters Patent No. 585,040, dated June 22, 1897.

Application filed October 3, 1892. Serial No. 447,658. (No model.) Patented in Sweden March 8, 1892, No. 4,469; in England March 8, 1892, No. 15,793; in Germany June 12, 1892, No. 80,462, and in Norway September 7, 1892, No. 3,095.

To all whom it may concern:

Be it known that I, CARL GUSTAF PATRIK DE LAVAL, a citizen of Sweden, residing at Stockholm, Sweden, have invented certain new and useful Improvements in Methods of Melting or Overheating Iron, &c., by Means of Electricity, (for which I have obtained patents in Sweden, No. 4,469, dated March 8, 1892; in Germany, No. 80,462, dated June 12, 1892; in Norway, No. 3,095, dated September 7, 1892, and in England, No. 15,793, dated March 8, 1892,) of which the following is a specification.

The present invention refers to an improvement in electrical furnaces for melting or overheating iron or other material.

The furnace consists of a vessel of some refractory material provided with a transverse bridge, on each side of which cavities are provided at the bottom of the furnace for the two pole-pieces. Thus the current must pass around this bridge and through the material to be molten, which is introduced in the furnace through a hole at the top of the furnace in order to pass from one pole to the other. As these pole-pieces are situated under the material to be molten, they will during the process melt down a little, so as to be transformed in the molten metal, and the two poles will thus in the present method consist of molten metal. If it be desired to make the progress continuous, the metal is supplied continually and the produced molten metal is maintained automatically at a constant or practically-constant height by means of outlets formed as overflows and situated in the wall of the furnace.

In the accompanying drawings, Figure 1 is a vertical sectional view on line 1 1, Fig. 2, of my improved furnace for smelting or overheating metals by electricity. Fig. 2 is a horizontal sectional view on line 2 2, Fig. 1. Fig. 3 is a vertical sectional view on line 3 3, Fig. 4; and Fig. 4 is a horizontal sectional view on line 4 4, Fig. 3, one-half, however, being in plan.

Similar letters of reference indicate corresponding parts.

A indicates the furnace, into which, when iron is to be molten, for instance, spongy iron may be introduced through the charging-hole B.

A′ is the casing, of iron or other convenient material, which is provided with a lining A of refractory material. In the lower part of the furnace there is located a bridge C of some refractory material, extending transversely across the furnace, on each side of which bridge cavities are provided adapted to receive the pole-pieces D and E, which are connected with a source of electricity. These pole-pieces consist, in this example, of iron bars, which are inserted at the bottom of the furnace into said cavities between the bridge C and the wall of the furnace, as distinctly shown in the drawings.

F and G are two outlets for the metal, which are disposed as overflows, so that the metal flows out when it has risen to a certain height. The bridge C is represented hollow and a flattened pipe C′ passes through this hollow bridge in order to effect the requisite refrigeration of the bridge by conducting water or the like through the mouthpiece C^2.

C^3 is the outlet for the water on the refrigerating liquid.

C^4 is a lining of iron or other material to make the bridge strong enough, said lining being provided directly above the tube C′ with two covers C^5 and C^6. When the furnace is to be put in action, the metal to be molten is added through the hole B and the pole-pieces D E are connected with the generator of electricity. The metal thereby melts and runs away through the outlets F G. If desired, an electrolyte may be introduced in the furnace for obtaining the necessary heat. In this case molten electrolyte I is poured in through the holes B, and the pole-pieces D E are connected with the generator of electricity. The current then passes through the electrolyte and over the bridge C, thus heating the electrolyte still more. The metal being now added in some form sinks down through the electrolyte while being heated by the latter to the temperature of melting, and gathers, when fused, on the bottom of the furnace. The pole-pieces D and E melt also a little, so that the poles will consist of molten metal. As the metal is constantly

supplied, sinks down through the layer I, and gathers on the bottom of the furnace, this molten layer ascends at last, so that metal flows out through the outlets F and G. Their height above the bottom of the furnace determines thus the distance between the two poles, or the so-called "pole-level," and consequently the way which the current must pass through the electrolyte from one pole to the other. In the same way the height of the electrolyte layer I is automatically regulated by the hole H. The above method and furnace can also be employed to overheat a metal. The metal is in this case introduced in fusion, and it obtains the overheat when passing through the electrolyte layer, which communicates its heat to the molten metal.

Though only metals are mentioned hereabove, which may be molten or heated in the described manner, the method may also be employed for other materials which are desired to be molten or heated.

It may be well observed that the above mentioned and described layer of slight conductivity, called the "electrolyte," does not act as reducing material in the process, but only as a liquid heating material, and it is called an "electrolyte" because it consists of a liquid conductor for the electric current. For that reason alternating currents may be employed, so that said layer may not be decomposed. As an electrolyte, magnetic iron ore may be used for smelting iron.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an electric furnace for melting or overheating iron or other materials, a transverse bridge of refractory material, cavities situated at the bottom of the furnace on each side of the bridge, and fusible pole-pieces received by the cavities, substantially as set forth.

2. In an electric furnace for melting or overheating iron or other materials, a transverse bridge of some refractory material, cavities situated at the bottom of the furnace on each side of the bridge and adapted to receive the pole-pieces, and outlets for the molten metal, formed as overflows in the wall of the furnace, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

CARL GUSTAF PATRIK DE LAVAL.

Witnesses:

WALDEMAR BOMAN,

WILLIAM ANDERSSON.