

O. S. & O. J. D. EMBERG.  
SMELTING FURNACE.  
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1,069,326.

Patented Aug. 5, 1913.

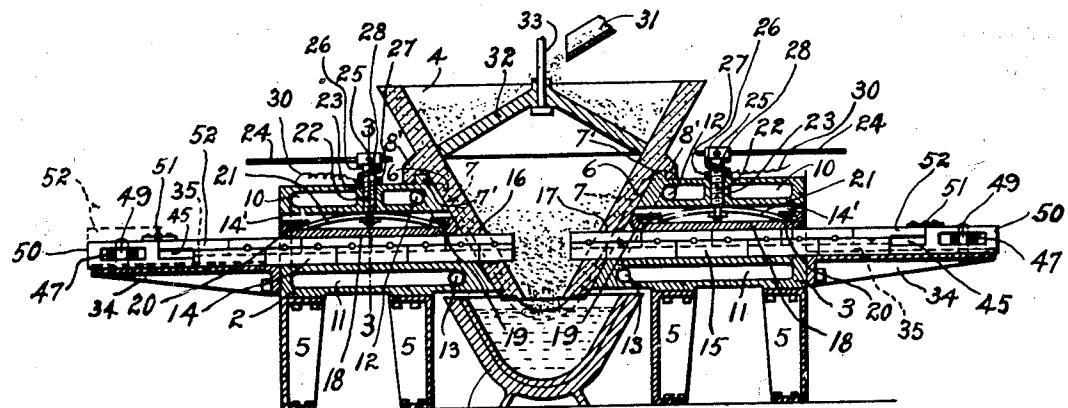


FIG. 1

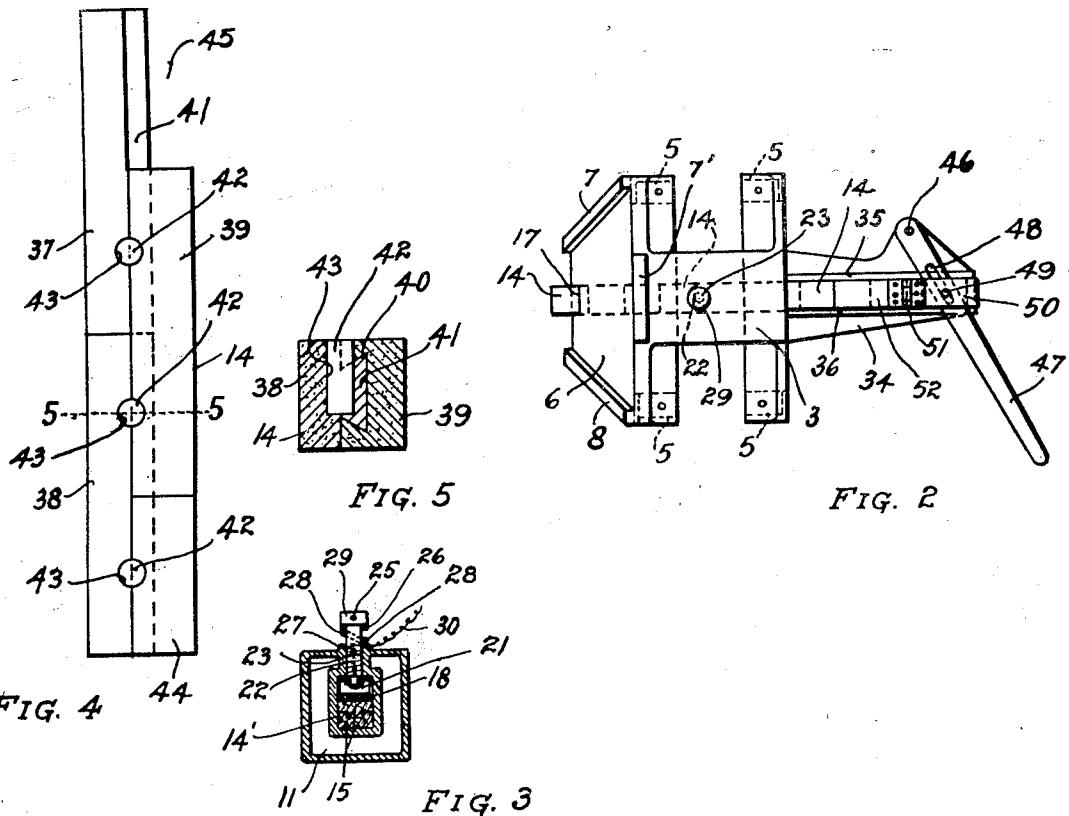


FIG. 4

FIG. 3

**WITNESSES**

Wm. Blomstrom.  
Lawrence Wilson Jr.

INVENTORS:  
Oscar J. Emborg and  
BY Oscar J. D. Emborg  
James D. Chapman,  
ATTORNEY

# UNITED STATES PATENT OFFICE.

OSCAR S. EMBERG AND OSCAR J. D. EMBERG, OF CHICAGO, ILLINOIS.

## SMELTING-FURNACE.

1,069,326.

Specification of Letters Patent.

Patented Aug. 5, 1913.

Application filed August 8, 1912. Serial No. 713,974.

To all whom it may concern:

Be it known that we, OSCAR S. EMBERG and OSCAR J. D. EMBERG, subjects of the King of Sweden, and residents of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Smelting-Furnaces, of which the following is a specification.

Our invention relates to the art of smelting ores and has particular reference to the employment of electricity for this purpose.

The object of our invention is to provide an improved electric furnace with means for renewing with substantial continuity and without interruption of the furnace operations, the electrodes employed.

The invention consists in the novel construction of furnace and the means for supplying continuous electrode service therefor, all as hereinafter described in detail, illustrated in the accompanying drawing and incorporated in the appended claims.

In the drawing Figure 1 is a vertical, longitudinal section of a furnace embodying our invention. Fig. 2 is a plan view of one of the two substantially identical ends of the supporting-frame for the crucible and electrodes. Fig. 3 is a section taken on line 3—3 of Fig. 1. Fig. 4 is an enlarged section of one form of continuously renewable electrode adapted for use in connection with our invention. Fig. 5 is a section taken substantially on line 5—5 of Fig. 4.

In the drawing, 2 and 3 represent two substantially identical ends or sections of a stand, frame-work, or support for a crucible 4. A plan view of one of these supports is shown in Fig. 2. Each of these supports is provided with legs 5, 5 and has an inclined surface 6 on which is supported one of two opposite sides of the crucible. The other two sides of the crucible are engaged by upwardly projecting ribs which extend convergently downward parallel with the sides of the crucible, which in this instance is shown as of hopper form rectangular in cross section. The sections 2 and 3 of the support for the crucible are shown secured to the latter by means of upwardly extending lugs 7 which are engaged by hooks 8, the lugs being parts of the support and the hooks being parts of the crucible. Underneath the crucible, and unattached thereto, is a bull ladle or pot 9, which is to receive the molten metal from the crucible 4.

As the construction of the two sections of

the support are substantially identical, a description of section 3 will also be a description of section 2, and same is as follows. The upper part of the support is substantially a water-jacket with supporting and bearing features forming a part thereof. The water-space is indicated as 10 and 11, with an inlet 12 and an outlet 13 thereto and therefrom. This water jacket portion surrounds a passage or bore 14' which contains one of the electrodes 14 and 15. The electrode is movable endwise and is continuously renewable in the manner herein-after to be described.

In opposite sides of the crucible are openings 16 and 17 which correspond in cross-section with the size in cross-section of the electrode. The width of the passage 14' is substantially the same as that of the electrode it contains, but its vertical depth includes space for a copper-plate 18 having bent over ends that provide hooks 19 and 20 which are engaged by a copper-spring 21 of bow-form and pressed against the plate 18 by a screw 22 threaded into a bore 23 through a solid part of water-jacket. The screw is turned by means of a rod 24 which may be loosely inserted in holes 25 in the head of the screw. Between washers 26 and 27 on the part of the screw which projects above the water-jacket is a coiled spring 28 through which pressure is imparted to the washer 27 by the screw-head 29 as indicated in Fig. 3. To the washer 27 is attached the electric wire or cable 30 leading to one of the poles of the electric circuit. The current is conveyed through the water-jacket, the screw, the spring 21 and the plate 18 to the electrode.

The details of insulation are not a material part of the invention and may be varied in numerous approved ways. Such parts as the legs 5 may consist wholly of insulating material, if preferred, as also the rods 24, the fire-pot or crucible 4, etc.

31 represents the lower end of a chute leading from any suitable source or bin containing the ore to be smelted.

32 represents a hood upon which the ore is dropped and which is raised or lowered by means of a rod 33 connected with any suitable mechanical means for operating it. This hood spans the space between the inclined walls of the crucible or hopper 4 some distance below its upper or largest portion and by raising said hood from the

position in which it is shown resting on the walls, openings will be provided around its edges for admitting the ore to the lower part of the crucible, which openings will be varied according to the height to which the hood is lifted, and provides means for varying the volume of flow of material to the electrode portion of the crucible.

From the section 3 (and likewise from 10 the section 2) extends a platform, arm or bracket 34 from which rises a pair of wings or flanges 35 and 36 which support the stick or prism of electrode which is exposed outside of the opening 14' therefor. In the 15 channel formed between the sides 35 and 36 the electrode is added to as it burns out in the crucible by joining additional sections such as, for instance, the structure shown in Figs. 4 and 5 composed of electrode sections 20 37 and 38 joined end to end and held together by another section 39 in which is a mortise 40 that is engaged by a tenon 41 in each of the sections 37 and 38. The three 25 sections are held together by dowel-pins 42 occupying transverse bores 43 formed through the dove-tail joint. These dowel-pins may be made of the same material as the body of the electrode. With the exception of the first or inner section each of the 30 electrode sections is of uniform cross section throughout its length, but the tenon section 39 is, as shown in Fig. 4, arranged to cover the junction line between the ends of sections 37 and 38 and to overlap both substantially an equal distance. This necessitates 35 provision in the first section of an offset, or enlarged portion 44 which forms substantially a continuation of the section 39 to the end of the section 38. The offset, 45, at the 40 opposite end of the electrode shown in Fig. 4 serves to receive another section 39, this, in turn forming another offset adapted to receive a section 37. By this means the electrodes are extended to such lengths as 45 shown in Fig. 1, and to the platform or bracket 34. On this extension or platform is pivoted at 46 a lever 47 in which is a slot 48 engaging a pin 49 projecting upwardly from a block 50 to which is hinged at 51 another block 52 which is of substantially 50 the same length as one of the electrode sections and may be thrown back on top of the block 50 to form an opening for the insertion of an additional electrode section and 55 dovetailing it to the rear section of the electrode-stick extending into the crucible. By swinging the lever 47 inward the whole stick is moved longitudinally to readjust the adjacent inner ends of the electrodes. 60 When the lever has been swung inwardly and has moved the electrodes to the extent that the lever movement is capable of mov-

ing them, the lever is swung back, the block 52 lifted on its hinge and laid back on the block 50 to permit the insertion and dovetailing onto the electrode of another section. The term "electrode" is used in this connection to designate a block or electrode length composed of a plurality of sticks or sections dove-tailed together side by side, 70 or longitudinally, only a portion of each stick or section being in contact with its companion member of the electrode, the remaining portions forming projections which form offsets into which additional 75 like sticks or sections are received and longitudinally dove-tailed to said projections. Each additional stick is thus dove-tailed sidewise to the projecting section of the electrode while its end registers with the 80 end of the other section.

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

1. The combination with a crucible, of a support in two sections, means in each of said sections for supporting and cooling an electrode, means for continuously adding to said electrode, and means for readjusting said electrode endwise into said crucible. 90

2. The combination with a crucible, of a hood therefor, means for adjusting said hood and crucible relative to each other to vary material-inlet openings therebetween, and continuously renewable electrodes for 95 said crucible, said electrodes composed of sticks or sections jointed together to support each other end to end.

3. In a smelting furnace, the combination with a hopper-form crucible having downwardly converging sides, of a hood engaging the inner sides of said crucible and providing material inlets between its edges and said crucible when raised, a pair of supports for said crucible, means for removably fastening said supports to said crucible, means in each of said supports for supporting an electrode, adjustable means for closely inclosing said electrode within said support, an extension platform on said support, an electrode extending through said support into said crucible and having its rear end exposed on said platform, and means on said platform for moving said electrode endwise into said crucible. 100 105 110 115

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

OSCAR S. EMBERG.  
OSCAR J. D. EMBERG.

Witnesses:

W.M. G. BLOMSTRAN,  
J. W. BECKSTROM.