No. 726,364. PATENTED APR. 28, 1903.

E. A. SJÖSTEDT.

ELECTRIC FURNACE.

APPLICATION FILED SEPT. 20, 1901.

NO MODEL.

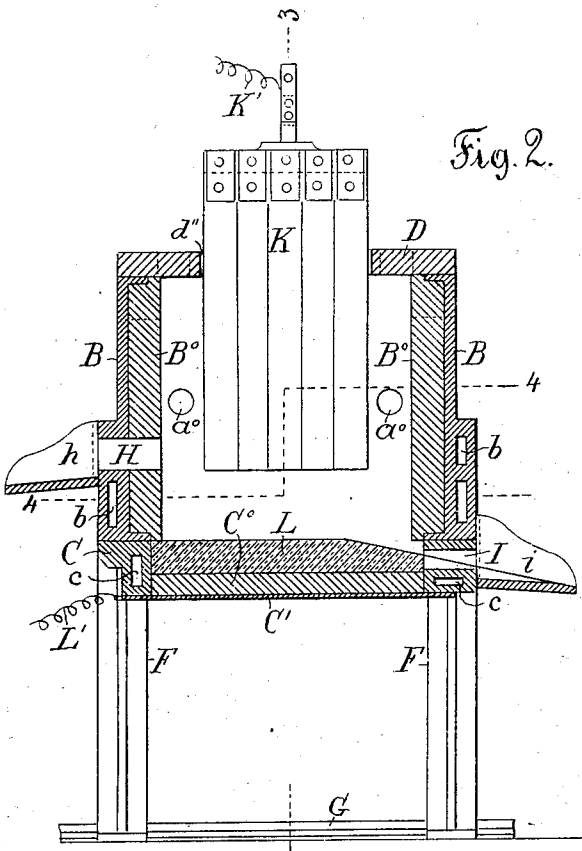


Fig. 2.

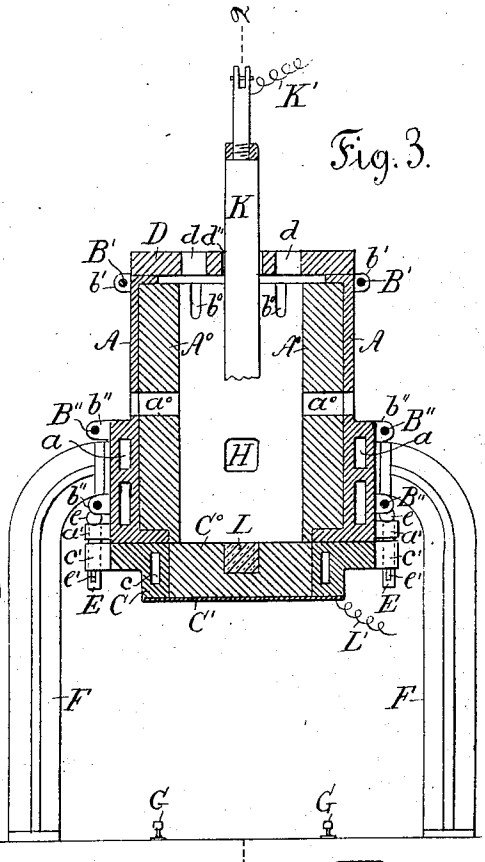


Fig. 3.

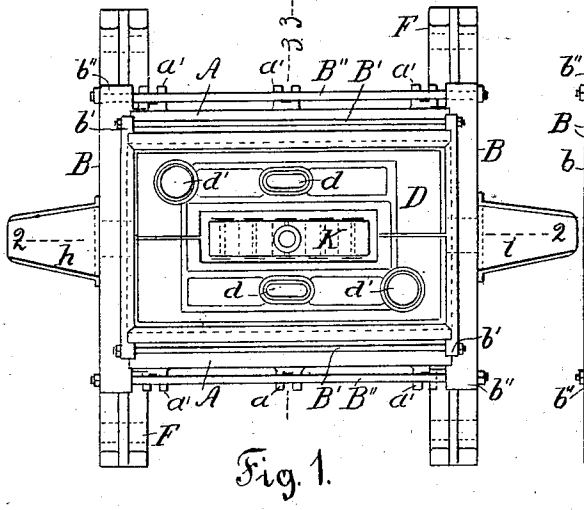


Fig. 1.

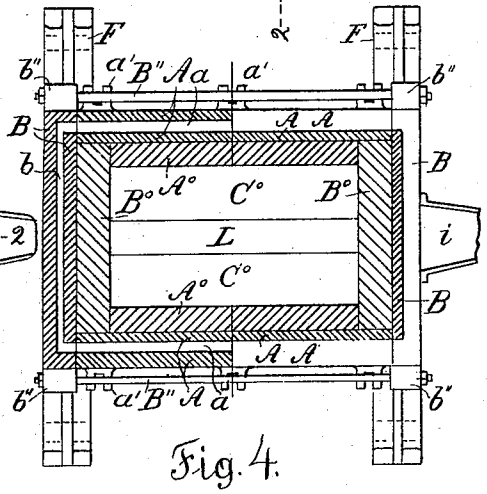


Fig. 4.

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

# UNITED STATES PATENT OFFICE.

ERNST A. SJÖSTEDT, OF SAULT STE. MARIE, CANADA, ASSIGNOR TO THE LAKE SUPERIOR POWER COMPANY, OF SAULT STE. MARIE, CANADA.

## ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 726,364, dated April 28, 1903.

Application filed September 20, 1901. Serial No. 75,991. (No model.)

*To all whom it may concern:*

Be it known that I, ERNST ADOLF SJÖSTEDT, of Sault Ste. Marie, in the district of Algoma, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Electric Furnaces; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention, which will be hereinafter fully set forth and claimed, relates to an electric furnace for smelting ores.

The object of my invention is an electric furnace for smelting ores that will withstand for a reasonable time the great heat developed in such appliances, have apertures for the escape of gases of combustion and for tapping the slag and metal, also stoking-holes for breaking up the slag-crusts, and a furnace that has one of its electrodes so placed in the bottom as to be protected and is substituted when burned out by the smelted metal itself.

Figure 1 is a top view of my improved electric furnace. Fig. 2 is a vertical longitudinal section of the same on line 2 2, Figs. 1 and 3. Fig. 3 is a vertical transverse section of the same on line 3 3, Figs. 1 and 2. Fig. 4 is a horizontal section of the same on the broken line 4 4, Fig. 2.

The furnace-body for convenience sake is made of rectangular shape. It is constructed of cast-iron sides and ends A and B and a bottom frame C with an interior lining $A^0$ $B^0$ $C^0$ of refractory material, the bottom lining $C^0$ being retained by a steel plate C', secured to the frame C. D is a cover of refractory material. The refractory material may consist of slabs or bricks of fire-clay.

The lower parts of the sides and ends and the bottom frame are constructed with water-jackets *a*, *b*, and *c*, respectively. The end plates are provided with projecting lugs *b' b''*, through which the ends of stay-bolts B' B'' are passed, secured by nuts, bracing the sides between the ends.

The bottom is removable. Registering slotted lugs *a'* and *c'* are provided on the lower parts of the sides A and the bottom frame C, respectively, and these receive cross-headed bolts E, resting with their heads *e* on the upper lugs and being provided at the lower ends with mortises *e'* to receive wedges driven in below the lower lugs, as shown in Fig. 3.

The furnace-body is supported at an elevation above the floor by legs F to make room for ladle-cars running on rails G.

One of the ends is provided with an opening H for drawing off the slag, said slag-notch H being some distance above the bottom and provided with the customary spout *h*.

The iron-notch I, with spout *i* for drawing off the metal, is formed within the bottom frame C at the end opposite to that of the slag-notch and below the upper surface of the bottom lining.

In the sides A $A^0$ and above the level of the slag-notch are vent-holes $a^0$, and in the ends are provided stoke-holes $b^0$, these openings enabling the escape of the gases of combustion and the latter the breaking up the slag-crusts that may form and for facilitating the even settling of the stock.

The cover D, besides the central opening *d''* for the electrode, has feed-holes *d* for the introduction of the ore and flux and vent-holes *d'* for the escape of gases of combustion.

K and L are respectively the upper and lower electrodes with connecting-wires K' and L'. The upper electrode consists of a battery of square carbon pencils, suitably connected at the top and held adjustably suspended by a suitable mechanical device within the central opening *d''* of the cover D. The bottom electrode L, consisting of a carbon bar, is embedded within the bottom lining $C^0$ and extends longitudinally from the metal-notch to the end of the bottom frame with which it is in contact. In this manner connection is made with the base of the furnace to which the electrode-wire L' is attached, and as the carbon is consumed it is substituted by molten metal, which answers the same purpose.

In starting the furnace when smelting iron ores the upper or pendent electrode K is lowered close to the bottom electrode L, when an arc is drawn, and by feeding the composition of powdered ore and flux a slag is soon formed, which acts as an electrode, and thus protects the bottom carbon. As the ore is reduced the metal sinks to the bottom, and as the slag and metal is formed the pendent electrode is

gradually raised in accordance with the required volume of current. When the slag reaches near the vent-holes $a^0$, it is drawn off through the slag-notch H, and this operation is repeated until the metal reaches the bottom of the slag-notch, when it is tapped out through the metal-notch I into a ladle or direct into sand beds or molds.

I claim as my invention—

1. In an electric smelting-furnace, the combination of a water-jacketed body-case with refractory lining provided with slag-notch, vent-holes and stoke-holes, a water-jacketed bottom frame held removably on said body and carrying a refractory lining on a plate secured to said frame and having a tapping-hole or metal-notch provided in one of the ends, a cover of refractory material having feed and vent holes and opening for the electrode, an upper electrode held adjustably suspended within said opening of the cover and a bottom electrode embedded in the bottom lining and its ends in contact with the metallic frame of the bottom and wires connecting the upper electrode and the bottom frame to a suitable electric generator, substantially as set forth.

2. In an electric smelting-furnace, the combination of side plates water-jacketed at the lower parts, end plates water-jacketed at the lower parts and one of them provided with a slag-notch, lugs on one set of plates, stay-bolts passing through said lugs and bracing the other set of plates between them, a water-jacketed bottom frame with bottom plate and metal-notch, slotted lugs on said frame and registering lugs on the lower edge of the side plates, cross-headed bolts suspended on the upper lugs and holding up said bottom frame, a cover and lining of the sides, ends and bottom of refractory material, legs supporting said body at a suitable elevation, an electrode embedded in the bottom lining longitudinally from the metal-notch to the end of the bottom frame and in contact with the latter, and an upper electrode adjustably suspended through the cover by suitable mechanical means, substantially as set forth.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

ERNST A. SJÖSTEDT.

Witnesses:
FRANK E. LEACH,
S. J. HOPKINS.