M. SPERLING.

COOLED BOTTOM ELECTRODE FOR ELECTRIC SMELTING FURNACES.

APPLICATION FILED NOV. 13, 1914.

1,234,947. Patented July 31, 1917.

Fig. 1.

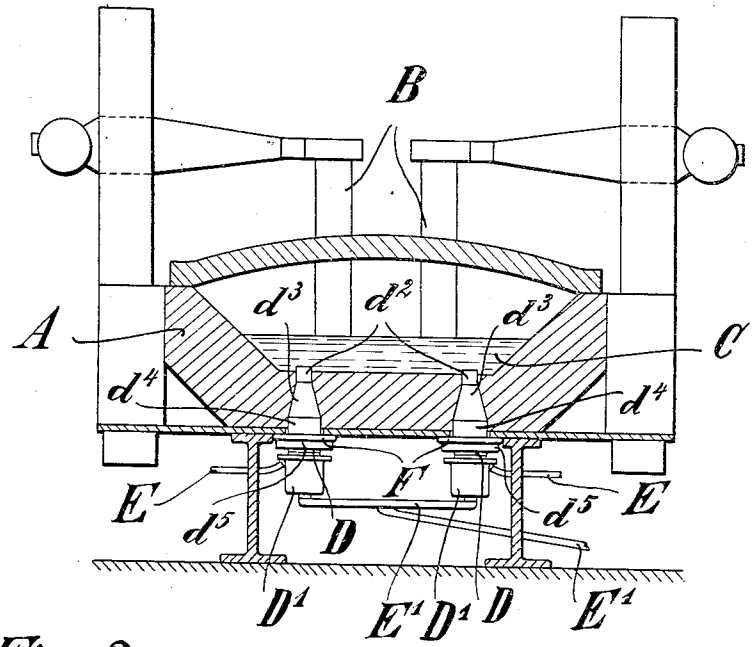
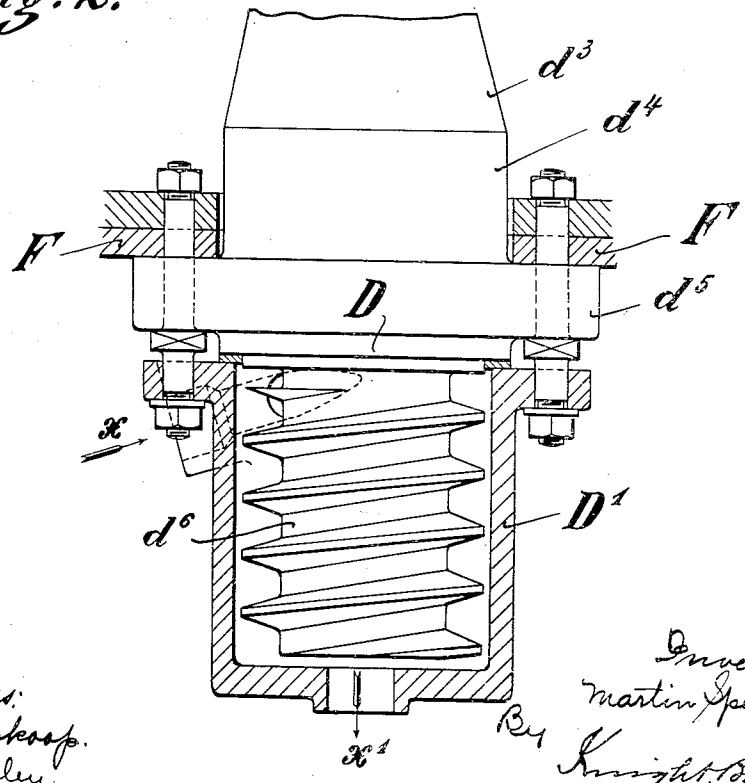


Fig. 2.



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COOLED BOTTOM ELECTRODE FOR ELECTRIC SMELTING-FURNACES.

1,234,947. Specification of Letters Patent. Patented July 31, 1917.

Application filed November 13, 1914. Serial No. 871,969.

To all whom it may concern:

Be it known that I, MARTIN SPERLING, residing at Essen-on-the-Ruhr, Germany, a citizen of the German Empire, have invented a certain new and useful Improvement in Cooled Bottom Electrodes for Electric Smelting-Furnaces, of which the following is a specification.

In electric furnaces the bottom electrodes must be prevented from melting or glowing by means of artificial cooling. For this purpose, it has been customary to widen the cross section of the electrodes downward, and to make the lower end of the electrodes hollow, so that a cooling fluid may be led through. The electric current enters at the lowermost end of the electrodes.

It has been noted, that of a number of such bottom electrodes, connected in parallel, some few explode and consequently destroy the smelting furnace. The object of the present invention is now to prevent with certainty the described disturbances.

The invention is based on the knowledge, that the explosions are caused simply by excessive load of current and not, as was supposed for a long time, by the heat from the smelting bath. Such overload may however, be accounted for by the occasional interruption of the conductivity between the bottom electrodes and the smelting bath occurring simultaneously in a greater number of electrodes through clinker or other portions of the furnace lining, such as dolomite. The other electrodes then have to carry a current load, which is considerably in excess of the calculated amount, and which will soon bring into incandescence the lowermost annular portion of the electrodes, sprinkled by the cooling fluid. The consequences of this, is decomposition of the cooling water and the formation of oxyhydrogen gas, which explains the violent explosion.

In accordance with the present invention, the circuit connects with that portion of the electrode which is situated between the fluid-containing part and the head piece of the electrode.

The invention is illustrated in the accompanying drawings where:—

Figure 1 shows a vertical section through an electrode-furnace, indicating the position of the electrodes in the furnace bottom, and

Fig. 2 an elevation and part section in larger scale of one embodiment of the invention.

Referring more particularly to Fig. 1, A denotes the hearth of the smelting furnace, B the main electrodes composed of carbon and suspended over the furnace, C the smelting bath and D the bottom electrodes of wrought iron arranged in a circle and built into the bottom of the smelting furnace. Each of these is provided with a cooling cap D^1 beneath the furnace bottom. The corresponding cooling fluid supply and discharge conduits are indicated by E and E^1 respectively.

The electrode bodies have a cylindrical head piece d^2 at their upper end, followed by a widening conical portion d^3, a cylindrical portion d^4 and a collar d^5. To this is bolted the already mentioned cooling cap D^1. This cap incloses, with a slight clearance, the lowermost, threaded end d^6 of the electrode body, see Fig. 2. The cooling fluid, which flows through the threads in the direction indicated by the arrows x and x^1, then comes in contact with a comparatively great area of the surface to be cooled of the electrode end d^6. On the upper side of the collar d^5 are bolted cover plates F of bronze for leading in the current.

The conical widening of the electrode-body serves, in accordance with the present invention, not only to provide necessary space for the cooling fluid, as is customary with known electrodes, but it causes at the same time, the current density in the electrode-body to decrease toward the lower end. Under otherwise similar conditions, an electrode constructed in accordance with the present invention will therefore be heated considerably less, than an electrode, which, as heretofore customary, has a lower hollow portion through which the current flows, to permit effective cooling. In any case, parts, which come in direct contact with the cooling fluid, can never become incandescent during very much stronger overload of current.

I claim:

1. In an electric smelting furnace having upper and lower electrodes, the lower one of said electrodes comprising a head, a central portion, and a cooling fluid-containing portion, including a guide member for conducting the fluid in a downward direc-

tion, said central portion being used for the connection of the current conductor.

2. In an electric smelting furnace having upper and lower electrodes, the lower one of said electrodes comprising a head, a central portion, and a cooling fluid-containing portion; said central portion being used for the connection of the current conductor; and said cooling fluid-containing portion having a cap and a core member inclosed by said cap so as to leave a slight clearance between them for guiding the fluid circuitously in a downward direction.

3. In an electric smelting furnace having upper and lower electrodes, the lower one of said electrodes comprising a head, a central portion, and a cooling-fluid-containing portion; said central portion being used for the connection of the current conductor; said cooling-fluid-containing portion having a cap and a core member inclosed by said cap so as to leave a slight clearance between them; and means for giving the fluid a circuitous path around said core member.

4. In an electric smelting furnace having upper and lower electrodes, the lower one of said electrodes comprising a head, a central portion, and a cooling fluid-containing portion; said central portion being used for the connection of the current conductor; said cooling fluid-containing portion having a cap with a fluid inlet at the top and an outlet at the bottom, and a core member inclosed by said cap so as to leave a slight clearance between them, said cap being rigidly secured to said central portion; and means for causing the fluid to take a helical path through said cap.

5. In an electric smelting furnace having upper and lower electrodes, the lower one of said electrodes comprising a head, a central portion, and a cooling-fluid-containing portion; said central portion being used for the connection of the current conductor; said cooling-fluid-containing portion having a cap with a fluid inlet at the top and outlet at the bottom, and a core member inclosed by said cap so as to leave a slight clearance between them, said cap being rigidly secured to said central portion; and said core member being provided with screw threads.

The foregoing specification signed at Barmen, Germany, this 2nd day of October, 1914.

MARTIN SPERLING. [L. S.]

In presence of—
HELEN NUFER,
ALBERT NUFER.