(No Model.)

W. R. KING & F. WYATT.

ELECTRIC FURNACE.

No. 562,400. Patented June 23, 1896.

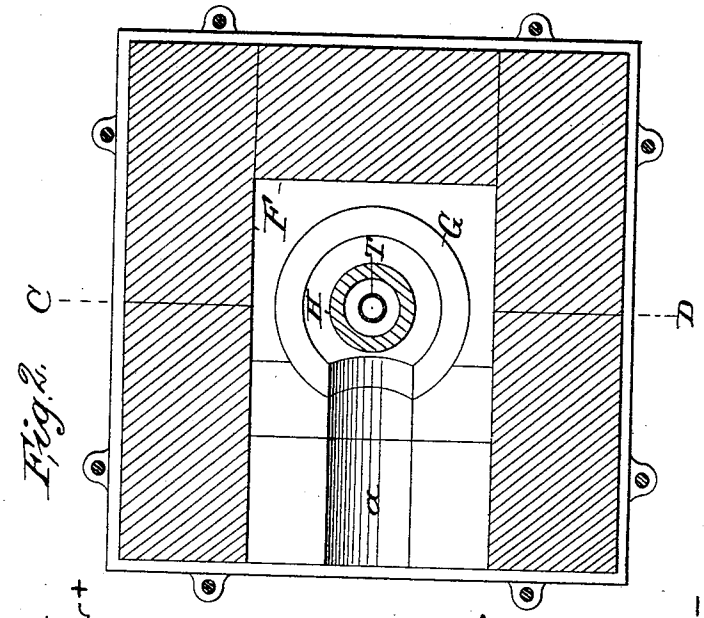

Fig. 2.

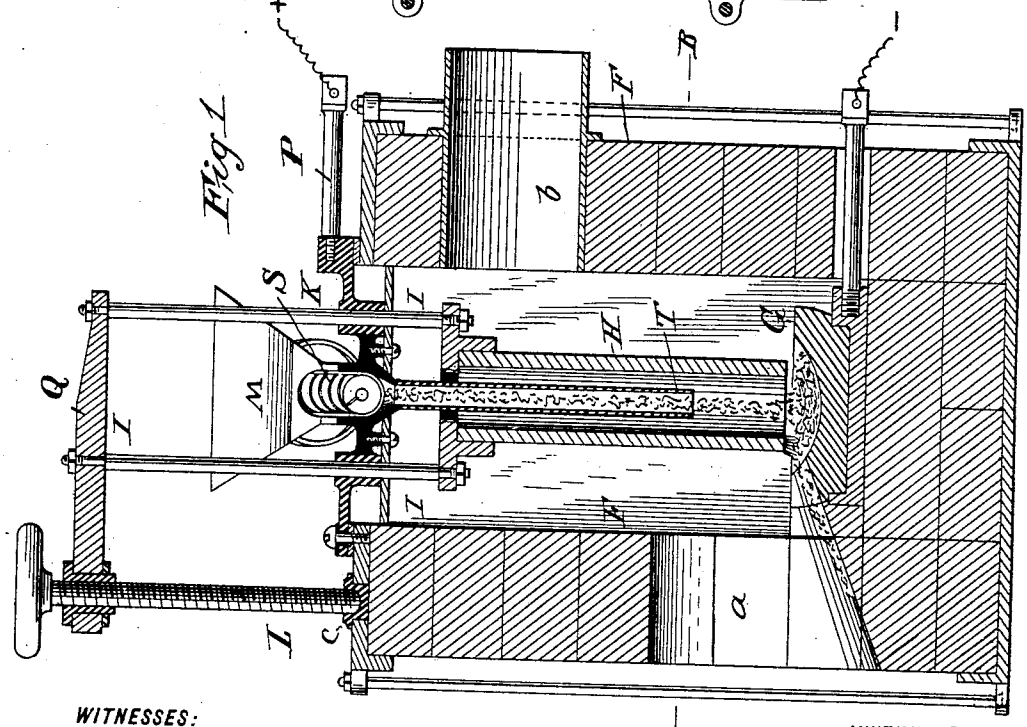

Fig. 1.

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UNITED STATES PATENT OFFICE.

WILLIAM R. KING AND FRANCIS WYATT, OF NEW YORK, N. Y.

ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 562,400, dated June 23, 1896.

Application filed January 24, 1896. Serial No. 576,659. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM R. KING, a citizen of the United States, and FRANCIS WYATT, a subject of Her Britannic Majesty, residents of the city, county, and State of New York, have made certain new and useful Improvements in Electric Furnaces, of which the following is a specification.

The object of our invention is to provide an improved electric-arc furnace for the manufacture of calcium carbid and for the reduction of metallic oxids generally.

As is well known, the heat is generated in electric-arc furnaces by the passage of an electric current between two separated electrodes, thereby forming an arc within the field of which the heat is of the desired intensity, while outside of said field the heat is not of sufficient intensity to be available for smelting purposes. The power consumed, therefore, in generating this unavailable heat is largely wasted and constitutes a formidable element in the cost of running such furnaces. The operative field of such an electric arc is necessarily small, and consequently the amount of ore or other material effectively treated by said furnace at once must be confined within a comparatively small space.

Various devices have been suggested for increasing the efficiency of electric-arc furnaces relatively to the cost of generating the required heat; but, so far as we know, all electric-arc furnaces heretofore known are subject to very serious disadvantages in their practical operation.

One of the most serious of these disadvantages lies in the feeding of the material to be treated into and out of the field of the electric arc. In methods heretofore employed there has been great danger of short-circuiting the current; and in cases where the melted material is allowed to accumulate and the movable carbon electrode is allowed to retreat from the surface of such material to prevent short-circuiting, the resistance is constantly increased, thereby seriously impairing the commercial usefulness of the furnace.

We have devised an electric-arc furnace in which the resistance to be overcome by the current in crossing the arc is made constant and in which the feed of the material is so arranged that the freshly-introduced material always occupies a uniform position with regard to the feed of the electric arc, whereby the operation of said furnace is rendered much more certain, reliable, and easily calculable, as well as more effective, than is the case with furnaces heretofore known.

To this end our invention consists in an electric-arc smelting-furnace provided with a movable hollow electrode, through which the material to be smelted may be introduced, and with suitable mechanism for regulating the distance between said movable electrode and the other electrode, which may be stationary or movable, as desired, whereby the distance between said electrodes may be kept constant, although the material of which they are composed may be gradually consumed in the operation of the furnace. Various forms may be given to this hollow movable electrode. Various substances may be used in its construction. Various devices may be employed for moving said electrode, so as to regulate the length of the arc. Said hollow electrode may also be introduced into said furnace vertically or at such angle as may be desired; and said hollow electrode may be used either as the anode or cathode, as preferred, in forming the arc.

We have found that it is preferable to form the movable electrode as a cylindrical tube of carbon hung vertically in the center of the furnace, so that the material to be smelted may be fed centrally to the hearth; and we prefer to use said movable electrode as the anode.

What we consider the best form of embodying our invention in a practical furnace is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical section through line C D of Fig. 2. Fig. 2 is a horizontal section through line A B of Fig. 1.

Same letters indicate similar parts in the different figures.

F is the furnace, constructed of proper fireproof material and provided with the outlet *a* for removing the smelted product and with the flue *b*, through which the volatile matters escape.

G is the hearth, of suitable and desired construction, preferably somewhat shallow and

of good conducting material and is connected to one pole of the electric generator or dynamo, as shown by the post N.

H is the movable carbon electrode, formed as a cylindrical tube situated centrally in the furnace and mounted upon the frame I, which is supported by the cap or cover K. To this cover is attached the post P, which is connected by a wire (not shown) to the positive pole of the electric generator. The head and frame or so much of them as may be necessary are made of good conducting material to transmit the current received through P to the carbon electrode H.

The frame I is raised and lowered through the cap K by means of the lifting-screw L, the lower end of which is inserted in the socket *c* in the top of the furnace.

M is the hopper, through which the material to be smelted is introduced into the furnace through the tube T, which descends a suitable distance centrally through the hollow electrode H.

S is a feed-screw of ordinary construction, the intermittent turning of which allows the material to drop through the tube T, as shown.

Q is the upper cross-bar of the frame I, which may be of iron or any suitable durable material.

It is obvious that the electric arc will be established between such point of the annular lower end of the hollow electrode H and the hearth G as offers least resistance to the passage of the current and that the position of this arc, owing to the change of place of the point of least resistance caused by the eating away of the electrode, can only take place circumferentially around the central line, that is the vertical center of said electrode. As the material to be smelted is always dropped in the line of this vertical center and remains in said line until melted by the action of the arc, each fresh quantity of material must be presented to substantially the same degree of heat without regard to the variance in the position of the electric arc along the path of its circumferential play.

As a matter of convenience in the practical operation of our above-described furnace, the hearth or pan G is easily accessible, so that the smelted material can be at any time readily removed through the opening *a* without danger and without the least interference with the passage of the electric current.

An important feature of our improved furnace as compared with those heretofore known is found in the fact that its action is in no way dependent upon the presence of any material to be smelted. In other words, the normal action of the furnace is, so to speak, "dry;" and this action does not have to be varied to conform to the changes of electrical resistance interposed in the electric arc by the presence of varying quantities and conditions of the material to be smelted.

We claim—

An electric-arc smelting-furnace provided with a centrally-located hollow movable electrode, mechanism for moving said electrode, whereby the length of the electric arc is regulated, an inner tube extending downward inside said hollow electrode and serving as a central feed, and mechanism, whereby the material to be smelted is fed into said furnace through said inner tube and deposited within the field of said electric arc, as and for the purposes specified.

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