(No Model.)

J. A. VINCENT.

ELECTRIC SMELTING FURNACE.

No. 567,699. Patented Sept. 15, 1896.

FIG. 1.

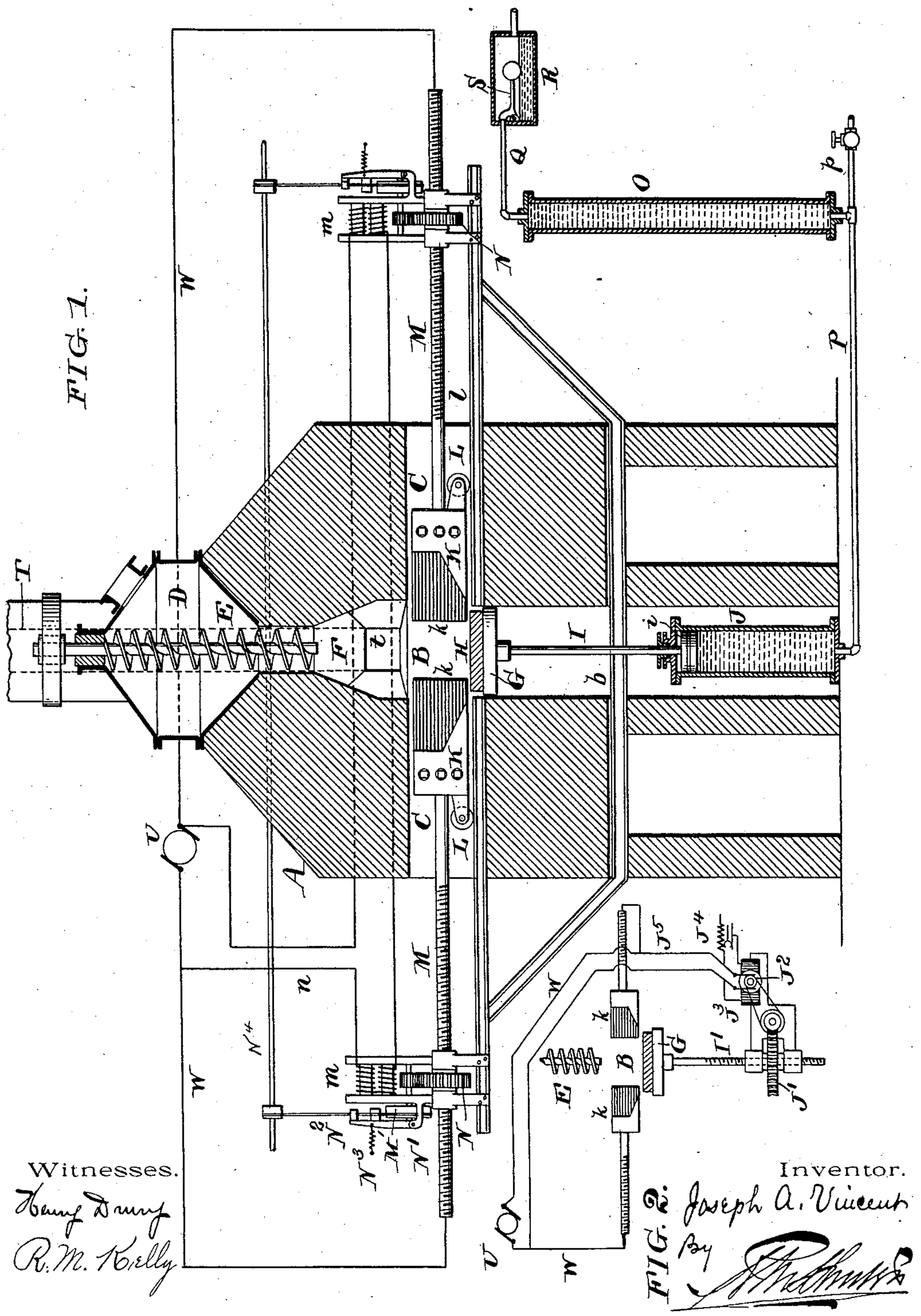

FIG. 2.

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JOSEPH A. VINCENT, OF PHILADELPHIA, PENNSYLVANIA.

ELECTRIC SMELTING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 567,699, dated September 15, 1896.

Application filed October 30, 1895. Serial No. 567,378. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. VINCENT, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Electric Smelting-Furnaces, of which the following is a specification.

My invention has reference to electric smelting-furnaces; and it consists of certain improvements which are fully set forth and are shown in the accompanying drawings, which form a part thereof.

In carrying out my invention I provide a furnace structure having a vertical hearth or channel for the material being smelted and the smelted product, and combine therewith lateral-acting electrodes, between which a current of electricity is maintained, and a movable bottom or floor which recedes as the smelted product increases within the hearth.

My improvements also comprehend various details of construction in a furnace of this class, all of which will be better understood by reference to the accompanying drawings, in which—

Figure 1 is a sectional elevation of an electrical furnace embodying my improvements, and Fig. 2 is a diagram illustrating a second form of apparatus for controlling the movable bottom of the hearth.

A is the body of the furnace and is formed of refractory material, such as fire-brick, and is provided with a vertical channel or hearth B, open at the bottom and terminating at the top in a neck F, leading to a feeding device adapted to positively force the material to be smelted into the hearth. The feeding device consists of a chamber or hopper D, into which the material, in a finely pulverized condition, is delivered, and a screw or mechanical propelling device E, extending from the hopper and into the discharge-neck therefrom, which opens into the hearth B. By rotating the said screw the materials from the hopper are forced with steady pressure into the hearth. While I have shown the screw as extending all the way through the hopper D, it is evident that it need only be in the neck F.

The floor or bottom of the hearth B consists of refractory material H, which is secured to the upper surface of the table G, secured to the piston-rod I, attached to the piston *i*, which works within a hydraulic cylinder J. The lower end of the cylinder J connects by a pipe P with a stand-pipe O, which has a sufficient height to create a pressure upon the underside of the piston and thus hold the refractory bottom of the hearth upward against any downward pressure which may be exerted upon it. The upper end of the stand-pipe O is connected by a pipe Q with a tank R, having a float-valve S, which normally closes the orifices of the discharge-pipe O with an elastic resistance, which may be overcome by a downward pressure upon the piston *i*, causing a discharge of the water from the discharge-pipe O into the tank. To cause the piston to rise within the cylinder J, water under pressure may be admitted to the pipe P under the control of a valve *p*.

Opening transversely into the hearth B, and substantially of the full width thereof, are flues C C, arranged diametrically opposite, through which the electrodes *k k* operate. The electrodes *k k* are of carbon and are carried upon the carriages K, having rollers L, running upon rails *l*, arranged in the lower part of the passage-ways C. The carriages K are moved from or toward each other by means of the screws M and electrically-controlled power devices N. These power devices N are controlled by an electromagnetic controller *m*, the whole operating in such a manner that when the resistance across the electrodes is abnormal, due to the burning away of the electrodes, the electromagnetic devices come into operation to feed the electrodes toward each other to insure the proper maintenance of the arc.

As shown the power devices are driven by a belt upon fast and loose pulleys M′, over which the belt is shifted by means of an electromagnetic belt-shifter N^2, which is actuated by an electromagnet *m* in a shunt-circuit *n* around the generator U, which supplies current to the electrodes by the circuits W. The belts are driven by pulleys upon a power-shaft N^4. By this construction it is seen that when sufficient current passes through the shunt-circuit *n* the magnet *m* shifts the belt until the electrodes are fed

sufficiently near. The current in the main circuit W then increases and the spring N^3 shifts the belt again upon the loose pulley and the electrodes once more remain stationary. It is evident that any other form of electric controller may be employed for operating the electrodes, or the same may be entirely dispensed with, if so desired, and the electrodes fed by hand.

In the construction shown in Fig. 2 we have the same general features of Fig. 1, but with the furnace-masonry omitted. In this case the table G for holding the movable refractory floor H is sustained by a screw I', which is raised or lowered by worm-gearing J', driven by an electric motor J^2 in a shunt-circuit J^5, and having the field-circuit J^3 provided with a rheostat J^4 to regulate its speed. Any other suitable arrangement of power devices may be employed to positively move the gearing with the object of lowering the floor gradually and uniformly. This speed can be regulated to suit that of the production of the smelted product. It is also evident that where the bottom is moved by mechanical means in this manner the materials may be fed into the top of the hearth in any manner, and need not be forced into it, as in the case of Fig. 1.

My improved furnace is excellently adapted for the production of calcium carbide, and may be used for smelting processes generally.

In operation the material is fed down between the electrodes *k k* in the hearth B under the positive action of the screw E. As the material is smelted the product presses upon the floor H, and under the pressure of the incoming material to be smelted causes the smelted product to descend with said floor, thus allowing a continual stream of fresh material to be brought within the zone of fusion between the electrodes and without interfering with the continuous operation of the furnace. It is evident that with a furnace constructed in this manner the ingot of smelted material may be of great length by simply providing a large capacity to the movement of the movable floor. When the floor is fully lowered, the ingot may be removed from the space *b* below the hearth B. The products of combustion and gases in the process of smelting may escape by a flue *t*, extending laterally from the hearth B and leading to the chimney T.

While I prefer that the hearth shall be vertical, it is evident that it may be at an angle, if so desired, or in any upright shape, the object being to so construct a furnace that the tendency of gravity to cause the material to freely pass between the electrodes shall be counteracted by providing a movable floor to support the said material in position between the said electrodes and only permit it to be removed therefrom under positive feeding operations. I do not therefore limit myself to the minor details of construction, as my improvements may be modified in various ways without departing from the spirit of the invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an electric furnace the combination of an upright hearth open at the top and lower portions, a movable floor or bottom for said hearth movable bodily to and from the electrodes in the hearth during the smelting operation, positive feeding devices at the top or upper portion of said hearth for feeding the materials to be smelted, and electrodes opening into the sides of the said hearth, whereby the material to be smelted may be forced down between the electrodes and the smelted product moved downward with the floor with a speed commensurate with the incoming material to be smelted.

2. In an electric furnace the combination of an upright hearth open at the top and lower portions, a movable floor or bottom for said hearth movable bodily to and from the electrodes in the hearth during the smelting operation, electrodes opening into the sides of the said hearth, positive feeding devices for the top or upper portion of said hearth, and a flue or escape-outlet from the hearth for the products of combustion and gases, whereby the material to be smelted may be forced down between the electrodes and the smelted product moved downward with the floor with a speed commensurate with the incoming material to be smelted and the gases are carried off from the furnace.

3. In an electric furnace the combination of an upright hearth open at the top and lower portions, a bodily-movable floor or bottom for said hearth, electrodes opening into the sides of said hearth, means for feeding the materials into the top or upper portion of said hearth, devices to permit the floor or bottom of the hearth bodily to move downward slowly during the smelting operation, and feeding devices for feeding the electrodes relatively to or from each other above the movable bottom, whereby the material to be smelted may be forced down between the electrodes and the smelted product moved downward with the floor with a speed commensurate with the incoming material to be smelted.

4. In an electric furnace the combination of an upright hearth open at the top and lower portions, a bodily-movable floor or bottom for said hearth, electrodes opening into the sides of said hearth, positive feeding devices at the top or upper portion of said hearth, devices to permit the floor or bottom of the hearth bodily to move downward slowly during the smelting operation, and electromagnetic controlling or feeding devices for feeding the electrodes relatively to or from each other above the movable bottom, whereby the material to be smelted may be forced down between the electrodes and the smelted product

moved downward with the floor with a speed commensurate with the incoming material to be smelted.

5. In an electric furnace the combination of an upright hearth, means for feeding the material to be smelted into the upper portion of the hearth, electrodes opening into the sides of the hearth between which an arc is maintained and the materials to be smelted fed, a bodily-movable floor or bottom for the hearth below the electrodes, and mechanical devices for controlling the descent of the movable floor or bottom during the smelting operation.

In testimony of which invention I have hereunto set my hand.

J. A. VINCENT.

Witnesses:
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