

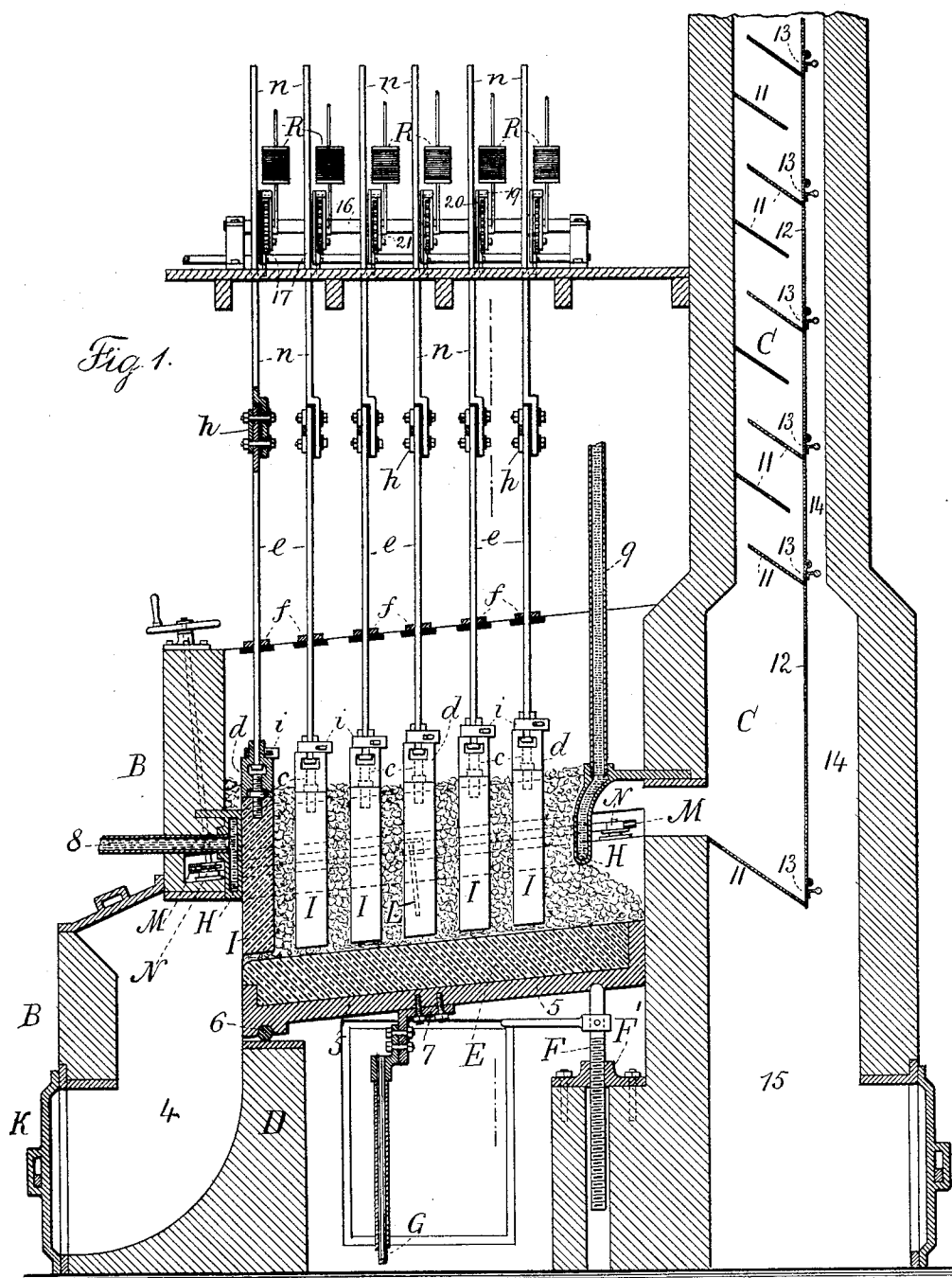
(No Model.)

2 Sheets—Sheet 1.

E. F. PRICE.
ELECTRIC FURNACE.

No. 583,936.

Patented June 8, 1897.



Witnesses:
J. Stait
Chas. H. Smith

Inventor:
Edgar F. Price
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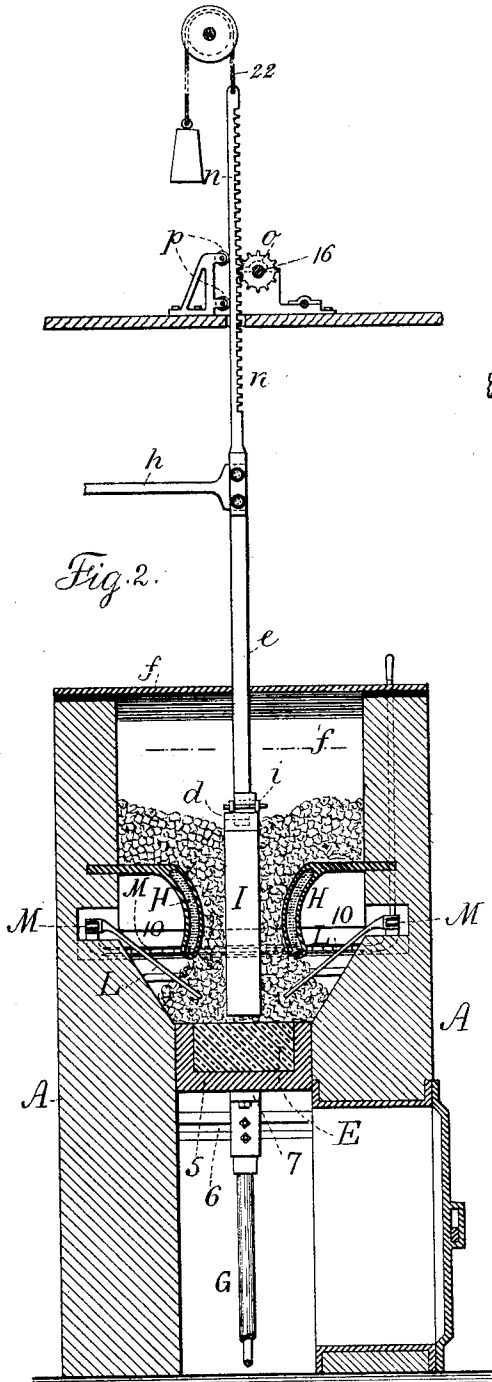
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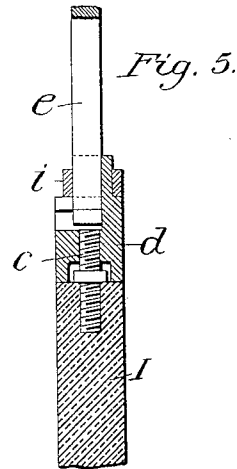
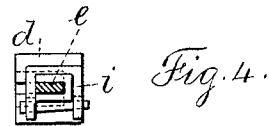
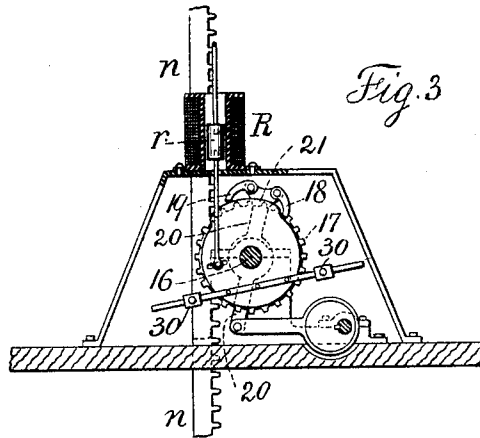
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Atty

UNITED STATES PATENT OFFICE.

EDGAR F. PRICE, OF NIAGARA FALLS, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE ELECTRO GAS COMPANY, OF WEST VIRGINIA.

ELECTRIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 583,936, dated June 8, 1897.

Application filed September 23, 1896. Serial No. 606,693. (No model.)

To all whom it may concern:

Be it known that I, EDGAR F. PRICE, a citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented an Improvement in Electric Furnaces, of which the following is a specification.

The object of this invention is especially to provide an electric furnace adapted to the fusing of materials, such as lime and carbon in the manufacture of carbide of calcium, but the same may be availed of in the electrical treatment of other substances. I make use of a hearth forming one electrode, and over the same are carbon electrodes, and the material is supplied through a hopper which is made with walls preferably double for allowing water to circulate through the same for keeping it cool, and the electrodes are constructed in a peculiar manner, as hereinafter designated, and mechanism is provided for agitating or stirring the materials near the electric arc, and the atmosphere is excluded during the operation, and the materials which may be carried off with the vapors generated pass up through an escape-flue with alternating deflectors, upon which the solid materials accumulate, and spring-doors are provided for the discharge of these materials into a receptacle. I also adjust the inclination of the hearth in such a manner that the materials that are melted in the electric arc flow toward and over the delivery end into a receiving-chamber and are taken from thence periodically through a suitable opening provided with a removable air-tight door.

In the drawings, Figure 1 is a longitudinal vertical section. Fig. 2 is a cross-section. Fig. 3 represents the upper end of one of the carbon rack-bars and the device for regulating the position of the carbons automatically. Fig. 4 is a plan view of the carbon-clamp; and Fig. 5 shows, in larger size, the cap connecting the carbon and the conductor.

The furnace is constructed with side walls A and a front wall B, and the escape-flue C is preferably in the rear, and these are to be of any suitable size and character, and behind the front wall B is a chamber 4 for receiving the finished product, and there is a wall at D that supports the lower front end of the hearth

E, which hearth is preferably made with a cast-iron bed-plate 5 at the sides and below the hearth E, which is advantageously of carbon, and the inclination of this hearth can be varied by the adjusting-screw F, passing through a nut F', such screw being below the back end of the hearth, and the front and lower end of the hearth rests upon a roller 6 to lessen friction as the parts may be adjusted. One pole of the electric generator is connected with this hearth E in any suitable manner. I have represented a bracket 7 bolted upon the bed-plate 5, and to this the conductor G is clamped, and this conductor should be insulated and of the proper size in proportion to the current made use of in the electric furnace.

Between the walls of the furnace there is a hopper H, made advantageously of molded fire-clay or of boiler-iron, with double walls, through which water is caused to circulate. I have shown the hopper made of boiler-iron, the water entering through a supply-pipe 8, the water passing away through the pipe 9, and the substances to be acted upon—such, for instance, as carbon and lime in their proper condition—are supplied into the hopper and pass down around the electrodes. For convenience in handling, the hopper may be made in sections, each section having an independent supply-pipe and an independent waste-water pipe.

The carbon electrodes I are to be of suitable size and more or less numerous. I have represented six of these carbon electrodes occupying a substantially vertical position above the hearth E and passing down through the opening in the hopper H, there being a sufficient space between the sides of the hopper and the carbon electrodes for the material to pass down freely; and it is to be observed that the surfaces of the hopper H are curved and are wider apart at the lower edges than they are in the middle portions of the hopper, so that the materials in the hopper will drop down progressively as the operations go on.

In the cross-section, Fig. 2, it will be observed that there are spaces below the hopper H and between the same and the side wall, which spaces form flues 10 for the pas-

sage of any gases that may be generated as they are led away through these flues 10 to the escape-flue C, and this escape-flue is advantageously vertical and provided with inclined deflectors 11, placed alternately, as represented, the lower edge of one deflector being connected to the vertical partition 12, and there is a space between such partition and the next deflector above, so that the gases and any solid materials that may pass away with such gases travel in a zigzag direction, and the solid materials will drop upon the deflectors and accumulate adjacent to the vertical partition, and at 13 doors or flaps are provided which open by the pressure of materials that may accumulate upon the deflector, so as to allow such materials to pass down the flue 14 to a receptacle 15 at the bottom of the chimney. These doors or flues 13 should be closed either by weights or springs as soon as the material has opened such doors and discharged down the flue 14. By this arrangement the atmosphere is excluded from the furnace, but the gaseous products are allowed to pass away progressively through the chimney or escape-flue.

At the delivery end of the hearth E materials that have been fused or otherwise acted upon by the heat pass into the chamber 4, and there are doors K that close openings in the walls of the furnace, and by the removal of one or more of these doors access is given for taking the carbide of calcium or other material out of the chamber 4, and these doors should be provided with cross-bars and screws or latches for holding such doors tightly closed and excluding the atmosphere. It will be noticed that the carbon electrode which is over the delivery end of the hearth is closely adjacent to the hopper H, so that the materials in the hopper do not pass down between such electrode and the hopper at the delivery end of the furnace. Hence there is little or no risk of material escaping into the chamber 4 until properly acted upon by the electric current.

I find it advantageous to make use of stirrers L within the flues 10 and below the hopper. These stirrers L are to be moved backward and forward at the proper periods of time, so as to prevent the material acted upon becoming clogged or obstructed in its descent to the hearth. I prefer to connect these stirrers to an endless chain M, that passes around pulleys N, and one of these pulleys should have sprocket-wheel projections to act upon the chain, and the shaft and pulley should be connected together, the shaft passing up through the wall of the furnace and receiving at its upper end a hand-wheel or other device by which the parts can be actuated first in one direction and then in the other to move the chain and carry the stirrers backward and forward beneath the hopper and at the sides of the carbon electrodes.

Difficulty has heretofore been experienced in electric furnaces in so connecting the con-

ductors to the carbon electrodes that there will be little or no resistance at the point of contact between the carbon and the metal. To insure extent and intimacy of contact between the carbon and the metal, I form in the upper end of the carbon a hole and tap the same with a screw-thread and screw into the same a plug *c* of copper or similar material, and the metal cap *d* is screwed upon the upper end of this plug, and the lower end of the cap is thereby pressed into intimate contact with the upper end of the carbon, and in the cap *d* is a lateral notch for receiving the copper bar *e*, the head of the bar coming into a recess in the cap, and the clamp *i* around the copper bar and at the top of the metal cap serves to hold the copper bar firmly into contact with the metal cap. By this arrangement the copper conductor is firmly connected with the carbon electrode, and the parts can be easily disconnected from an electrode that may have become too short and connected to a new carbon, so as to be inserted into the furnace, and these copper bars *e* are guided by cross-bars *f* above the wall of the furnace, and these cross-bars should be insulated, so as to prevent ground-currents, and the electrodes pass down progressively as they are consumed, and I provide automatic means, as next described, for regulating the position of these carbon electrodes according to the strength of the current that may be passing between the end of such electrode and the carbon hearth.

The current is supplied to the copper bar *e* through a conductor *h*, which is clamped firmly to the bar *e*, and above this bar is a rack *n*, which is advantageously insulated from the copper bar *e*, and there is a pinion *o* that engages this rack, and one or more friction-rolls *p* are provided behind the rack *n*. The pinion *o* and the gear-wheel 17 are permanently connected; but they are loose on the shaft 16, and the pawls 18 and 19 are connected in reverse positions to a vibrating frame 20, and there is a segment 21, adapted to swing upon the shaft 16, and in its normal position it holds both of the pawls 18 and 19 out of contact with the ratchet-wheel 17, and this segment is connected to the core *r* of a solenoid R, and this solenoid is placed in a shunt or branch circuit to the carbon or in the induced circuit of a series or shunt transformer, and the parts are so proportioned that when the proper current is passing to the carbon electrode I the segment 21 will hold both pawls out of action. If the current is too great, the segment 21 will be moved so that one of the pawls will act to raise the carbon electrode. If the current is insufficient, the segment 21 will hold that pawl out of action and bring the other pawl into action, so as to lower the carbon electrode nearer to the hearth E and increase the current passing between the two electrodes.

The segment or disk 21 has fastened to it a bar with adjustable weights 30, which can be

placed so as to vary the weight to be moved by the electromagnet and thus determine the normal current passing to the electrode.

It is to be understood that a device of the aforesaid character is to be provided with each electrode, so that the current can be automatically regulated as the electrodes are consumed. If desired, there may be a cord or chain 22 connected with the upper end of the rack *n* and passing over a pulley to a weight, so as to partially counterbalance the weight of the electrode.

I claim as my invention—

1. The combination with a hearth having a slab of carbon and forming one electrode, of inclosing walls, a wall and roller for supporting one end of the hearth, and an adjusting-screw for regulating the inclination of the hearth, and carbons adjacent to the hearth forming the other electrode, substantially as set forth.

2. The combination with a hearth having a carbon slab forming one electrode, of inclosing brickwork, a range of carbon electrodes above the hearth, a hopper surrounding the electrodes and having hollow walls and pipes through which water is caused to circulate, substantially as set forth.

3. The combination with the hearth forming one electrode, of a range of carbon electrodes and means for supporting the same above the hearth, a hopper surrounding the carbon electrodes with one end of the hopper directly above the delivery end of the hearth, the end carbon in the range of electrodes being closely adjacent to the hopper so as to prevent material passing down between the carbon electrode and the hopper at the delivery end of the hearth, substantially as set forth.

4. The combination with the hearth having a slab of carbon forming one electrode, of a range of carbon electrodes and means for supporting the same above the hearth, a hopper around the upper electrodes having double walls and pipes for circulating water within the walls of the hopper, the lower portion of the hopper flaring slightly to prevent the material clogging as it passes down to the hearth, substantially as set forth.

5. The combination with the electrodes in an electric furnace, of a hopper for supporting the material and supplying the same between the electrodes, exterior walls and flues

below the sides of the hopper, a vertical escape-flue into which the side flues open, a vertical partition and deflectors within the vertical escape-flue for arresting the solid materials passing off with the gases and doors or flaps at the lower ends of the deflectors for discharging such solid materials, substantially as set forth.

6. The combination in an electric furnace, of stationary walls, a hopper for containing the material operated upon, a hearth between the walls having a surface of carbon, means for supporting the hearth and for adjusting the inclination of the same for the materials acted upon to pass off gradually, a chamber into which the materials pass at the end of the hearth, a range of carbon electrodes above and with their ends near such hearth, and means for adjusting such carbon electrodes, substantially as set forth.

7. The combination with the carbon electrode having a hole drilled therein and screw-threaded, of a metal plug screwed into such hole, a cap screwed upon the plug and notched, a conductor having a head received into the cap and a clamp for connecting the conductor and cap, substantially as set forth.

8. The combination in an electric furnace, of a hearth forming one electrode, a range of carbon electrodes above the hearth, a hopper surrounding the electrodes and through which the material to be acted upon passes, stirrers and means for actuating the same for loosening the material below the hopper and adjacent to the electrodes, substantially as set forth.

9. The combination in an electric furnace, of a hearth forming one electrode, a range of carbon electrodes above the hearth, a hopper surrounding the electrodes and through which the material to be acted upon passes, stirrers, an endless chain with which the stirrers are connected, pulleys around which such chain passes, and means for moving the chain and stirrers first in one direction and then in the other to loosen the material around the electrodes, substantially as set forth.

Signed by me this 10th day of September, 1896.

EDGAR F. PRICE.

Witnesses:

FREDERICK CHORMANN,
A. D. RICHARDS.