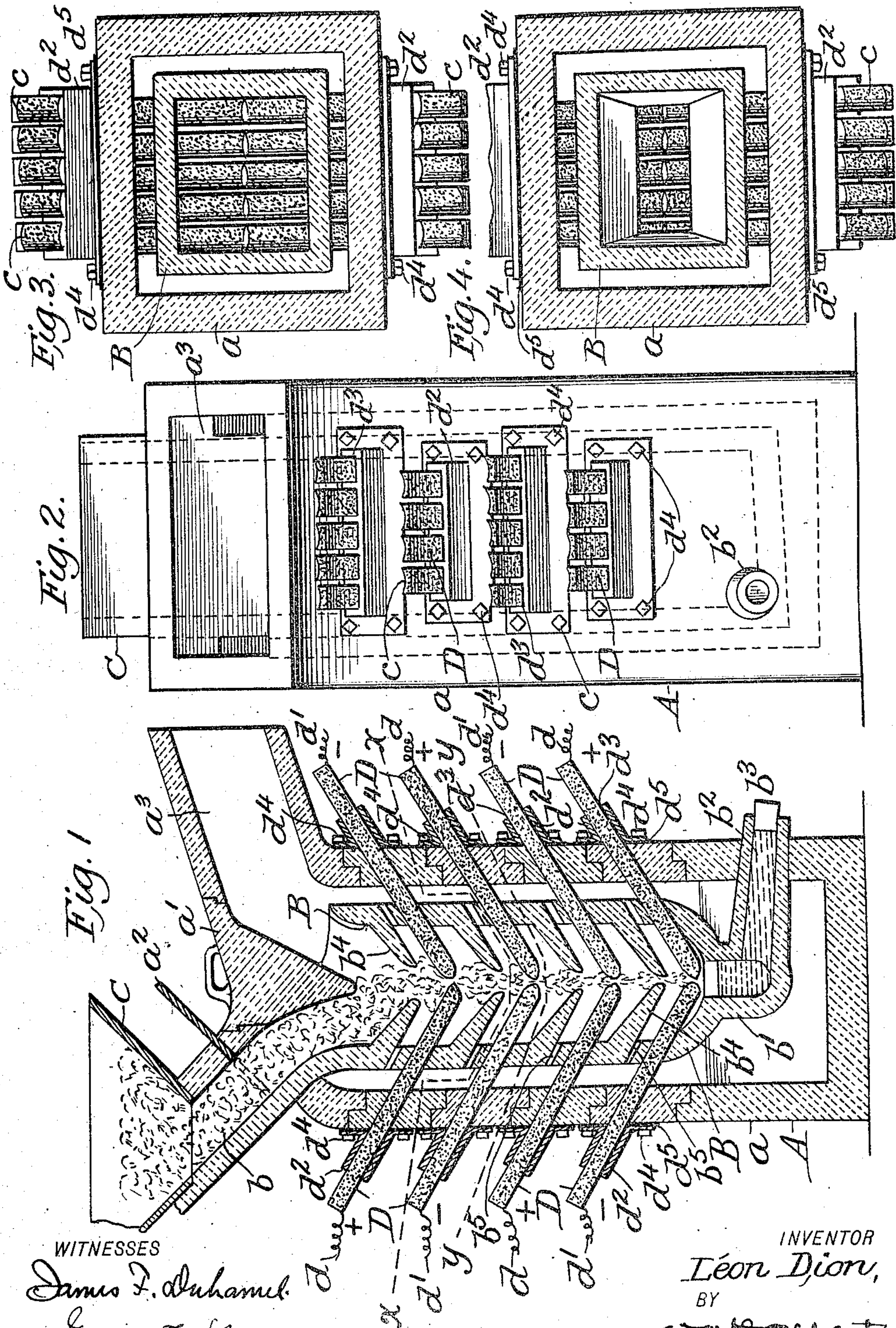


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PATENTED JAN. 8, 1907.

L. DION.
ELECTRIC FURNACE.
APPLICATION FILED APR. 30, 1906.



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ELECTRIC FURNACE.

No. 840,481.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, LÉON DION, a citizen of the United States, and a resident of Wilkes-Barre, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a specification.

My invention, while applicable in whole or in part to the various classes of electric furnaces at present in use, is designed more particularly for use in connection with that class of such devices which are employed in the fusing of metals and ores, its object being to simplify constructions of this character and to render them more efficient in operation than has been found possible with electric furnaces as heretofore in use.

To these ends the invention consists in certain peculiarities of construction and combinations of parts, which in the embodiment preferred by me will be hereinafter first described and the novel features of the invention then pointed out in the subjoined claims.

Referring to the accompanying drawings, in which my preferred form of construction is illustrated, Figure 1 is a vertical longitudinal section of an electric furnace constructed in accordance with my invention with a part of the feed-hopper broken away for convenience of illustration; Fig. 2, a side elevation thereof looking toward the left in Fig. 1; Fig. 3, a horizontal section of the furnace, taken in the line $x\ x$ of Fig. 1 and looking downward; and Fig. 4, a similar horizontal section of the same, taken in the line $y\ y$ of such Fig. 1 and looking in the same direction.

In all the figures like letters of reference are employed to designate corresponding parts.

A indicates a chamber which is inclosed within suitable side walls a , formed from masonry or otherwise, and receives what I call herein a "crucible" B, in which the fusing of the ores or other substances is effected. In the construction of this chamber A any appropriate contour may be adopted, and the same is also true respecting the crucible B; but whatever their forms the crucible will preferably be of a dimension somewhat less than the interior of the chamber A, whereby to form a space between them to allow of the escape of the fumes, gases, or other vapors

which arise from the fusion of the ores or other substances and from the molten metal or metals, and the chamber will or may be provided in its walls with a door a' , through which access to its interior may be had when desired. With the crucible thus arranged within the chamber A it is connected at its top with a hopper or receptacle C through the intervention of a chuteway b and is constructed with a contracted lower chamber portion or reservoir b' in its lower portion which is preferably provided with an outlet-pipe b^2 , that extends therefrom to and outward through the walls a of the furnace and to the outside thereof, where it is or may be equipped with suitable appliances—such, for instance, as a plug b^3 —by means of which the opening and closing of the passage-way may be effected when required.

Extending inward from opposite directions through the walls of both the chamber A and the crucible B, with their inner ends in close relationship, but at a short distance apart, are the electrodes D, by means of which the current or currents of electricity to fuse the ores or other substances is or are applied. These electrodes may be of various forms. In the embodiment of the invention, however which I have selected for purpose of illustration they are constructed in the form of plates, which may be made either of a width to extend entirely across the interior of the crucible B or of a width that will extend but partially across. In the drawings, however, I have shown them as made of a width to extend but partially across, with the upper surface of each provided with a longitudinally-disposed shallow concave groove c , as shown, and the same form of construction may be adopted when these electrodes are made of a width to extend entirely across the interior of the crucible B or otherwise, as may be preferred.

When the electrode is made of a width to extend entirely across the interior of the crucible, then but a single positive and a single negative electrode in each set will be required. On the other hand, when the electrode is of a width to extend but partially across then a number of positive and a number of negative electrodes will be required in each set, in which case the electrodes of each

polarity will be placed edge to edge, and in Figs. 3 and 4 of the drawings I have shown five of such electrodes as thus arranged. This, however, is merely illustrative, and a greater or lesser number may be employed, or a greater number in one set and a lesser number in the next may be made use of, and in Fig. 2 I have shown this latter arrangement adopted, in which sets of five of these electrodes in each polarity are shown as alternated with sets of four.

In some instances but two sets of electrodes D will be required. In others three or more sets will be necessary, and in the drawings I have shown four sets as thus employed; but whatever the number of sets thus made use of may be they are preferably disposed the one above the other, whereby to act successively upon the ores or other substances supplied to the crucible, and in such cases the constituent members of one set may be variously arranged with respect to the constituent members of the other set or sets. I prefer, however, to arrange the constituent members of the different sets in quincunx order, with the longitudinal centers of the members of one set in line with and above the spaces between the members of the other, whereby to prevent any of the ores or other substances supplied to the crucible D passing downward between the electrodes B without being brought in direct contact with the members of one or the other of the sets.

As thus arranged the electrodes D are connected with any appropriate source of electric supply, as, for instance, with a dynamo or dynamos (not shown) through the intervention of suitable conductors d and d' , which may be so disposed that the positive or + electrodes of all the sets may be on one side of the furnace and the negative or - electrodes of all the sets on the other. In the drawings, however, I have shown these electrodes as so connected with the source of electric supply that the positive and negative members of the different sets alternate with one another on each side of the furnace, with, say, the negative electrodes of the upper set, the positive electrodes of the next set, the negative electrodes of the next, and the positive electrodes of the bottom set all on one side, and the reverse of this arrangement on the other, with the positive electrodes of the upper set, the negative electrodes of the next, the positive electrodes of the next, and the negative electrodes of the bottom set arranged on the opposite side, and this is the arrangement I prefer in practice, as thereby a more efficient operation of the furnace is insured than when all the positive electrodes are arranged on one side and all the negative electrodes on the other.

With the electrodes arranged and connected as thus explained and an appropriate electric current or currents passed through

them, the ores or other substances supplied from the hopper or receptacle C through the chuteway b will be delivered upon the upper surface of the inner ends of the upper set of electrodes, and after having been fused or highly heated by the current passing through them will pass downward between their inner ends to and upon the upper surface of the next lower set, where the same operation will be repeated, and so on; the ores or other substances passing downward upon and between the respective positive and negative members of the succeeding sets, with the result that the ores or other materials passing downward between the succeeding sets will be fused and finally fall into the contracted lower chamber portion b' , from which it may be drawn through the outlet-pipe b^2 by withdrawing the plug b^3 , as will be readily understood.

For holding the electrodes in place various means may be employed. I prefer, however, to make use of holders d^2 for the purpose and to construct them with passage-ways d^3 , extending through them, through which the electrodes may be fed and in which they are held and to secure these holders to the walls a of the furnace in any appropriate manner—as, for instance, by screws d^4 , with suitable insulating-strips d^5 interposed between the faces of the holders and the walls, as shown.

As thus far described the construction of the parts is such that the ores or other substances supplied to the crucible B will fall upon the upper surface of the upper sets of electrodes without being confined to any particular portion thereof, and such an arrangement will be found useful with some of the less refractory materials. When, however, the more refractory kinds of ores or other substances are being treated, it is found more desirable and economical to confine the contact with the electrodes to areas nearer their inner approaching extremities. To this end the crucible B is or may be provided on its interior a short distance above each of the sets of electrodes with an inwardly and downwardly extending flange b^4 , by which means the ores or other material supplied to the crucible are deflected inward toward its center and caused to fall upon the electrodes at the points of their nearest approach, where the heat from the electric current is the most intense, while beneath each of these flanges b^4 are formed through the walls of the crucible a series of apertures or orifices b^5 , through which the fumes, gases, or vapors arising from the fusing of the ores or other substances and from the molten metal or metals may escape into the space between the crucible and the walls a of the furnace, whence they will pass upward and outward through a suitable passage-way a^3 , with which the furnace is provided, and are thence delivered to con-

centrating or other mechanism, (not shown,) by which the metal or metals contained in them are recovered or otherwise.

In some instances and with some kinds of ores or other materials the operation of the furnace may be continuous and such ores or other materials supplied to the hopper or receptacle C passed downward continuously through the chuteway *b* to the bowl or crucible B, where it is subjected to the action of the electric current passing through the electrodes, and in such cases the chuteway *b* will remain open and unobstructed, as shown by full lines in Fig. 1. In other cases, on the other hand, as where some of the more refractory and valuable ores or other materials are being treated, the ores or other materials instead of being supplied to the bowl or crucible in a continuous stream will be supplied thereto intermittently in measured quantities, whereby to prevent the escape and loss of any of the fumes, vapors, or gases upward through the chuteway *b*, and in these cases provisions are made to thus open and close the chuteway at proper time to respectively permit of the passage of the successive quantities therethrough and the closing of the same. The means by which this opening and closing of the chuteway may be effected may be of various kinds. In the form of the invention which I have adopted for the purpose of illustration, however, it consists of a door or gate *a*², which is fitted to slide back and forth across the chuteway, as shown in full and dotted lines in Fig. 1.

With the parts constructed and arranged as above set forth an electric furnace is produced which is possessed of great simplicity and which owing to the multiplicity of heating-points and the manner in which the ores or other substances to be treated are handled is extremely easy of and efficient in operation and capable of fusing or otherwise treating the most refractory of them.

While in the foregoing I have described the best means contemplated by me for carrying my invention into practice, it is obvious that various changes and modification may be made in its various parts without changing its mode of operation and departing from its essential spirit and scope.

Having now described my invention and specified certain of the ways in which it is or may be carried into effect, I claim and desire to secure by Letters Patent of the United States—

1. The combination, with a furnace-chamber provided with a passage-way at its upper end, and a hopper or receptacle, of a crucible arranged in such chamber and provided with a contracted chamber portion or reservoir at its lower end, of a chuteway for connecting the hopper or receptacle with the crucible; a plurality of sets of electrodes extending inward through the walls of both the furnace-chamber and the crucible and adapted to be connected with a source of electric supply, with such sets of electrodes disposed the one beneath the other, substantially as described.

2. The combination, with a furnace-chamber provided with a passage-way at its upper end, and a hopper or receptacle, of a crucible arranged in such chamber and provided with a contracted chamber portion or reservoir at its lower end, with a number of inwardly and downwardly extending flanges disposed upon its interior, with apertures beneath them, a chuteway for connecting the hopper or receptacle with the crucible, and a plurality of sets of electrodes extending inward through the walls of both the furnace-chamber and crucible and adapted to be connected with a source of electric supply, with such sets of electrodes disposed the one beneath the other, substantially as described.

3. The combination, with a furnace-chamber provided with a passage-way at its upper end, and a hopper or receptacle, of a crucible arranged in such chamber and provided with a contracted chamber portion or reservoir in its lower end, with means for withdrawing the contents of the chamber or reservoir, with a number of inwardly and downwardly extending flanges disposed upon its interior, and with apertures beneath them, a chuteway for connecting the hopper or receptacle with the crucible, means for opening and closing such chuteway, and a plurality of sets of electrodes extending inward through the walls of both the furnace-chamber and the crucible beneath the flanges and adapted to be connected with a source of electric supply, with such sets of electrodes disposed the one beneath the other, substantially as described.

In witness whereof I have hereunto set my hand this 25th day of April, 1906.

LÉON DION.

Witnesses:

WILLIAM C. ALLAN,
CHARLES A. DURANT.