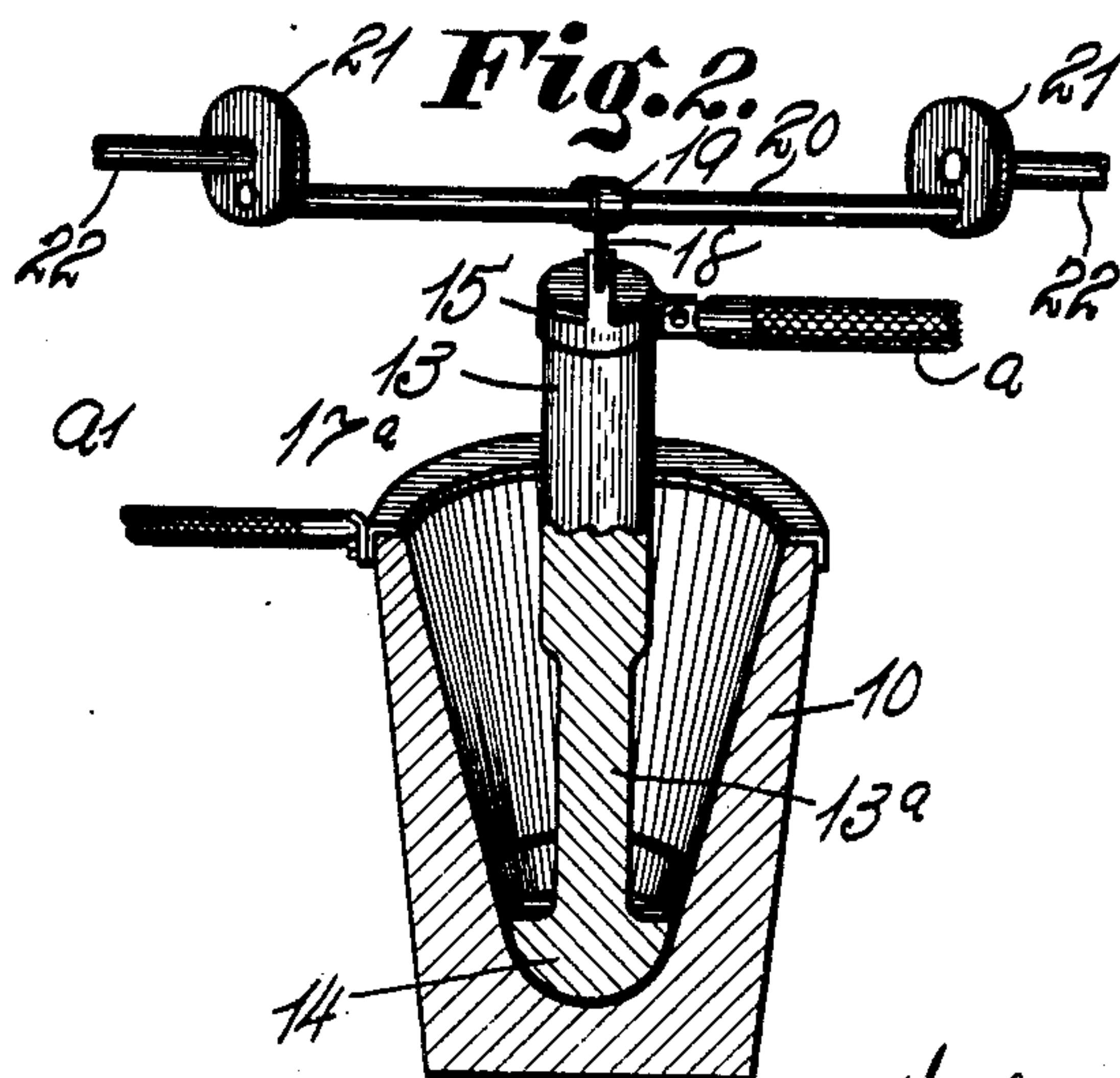
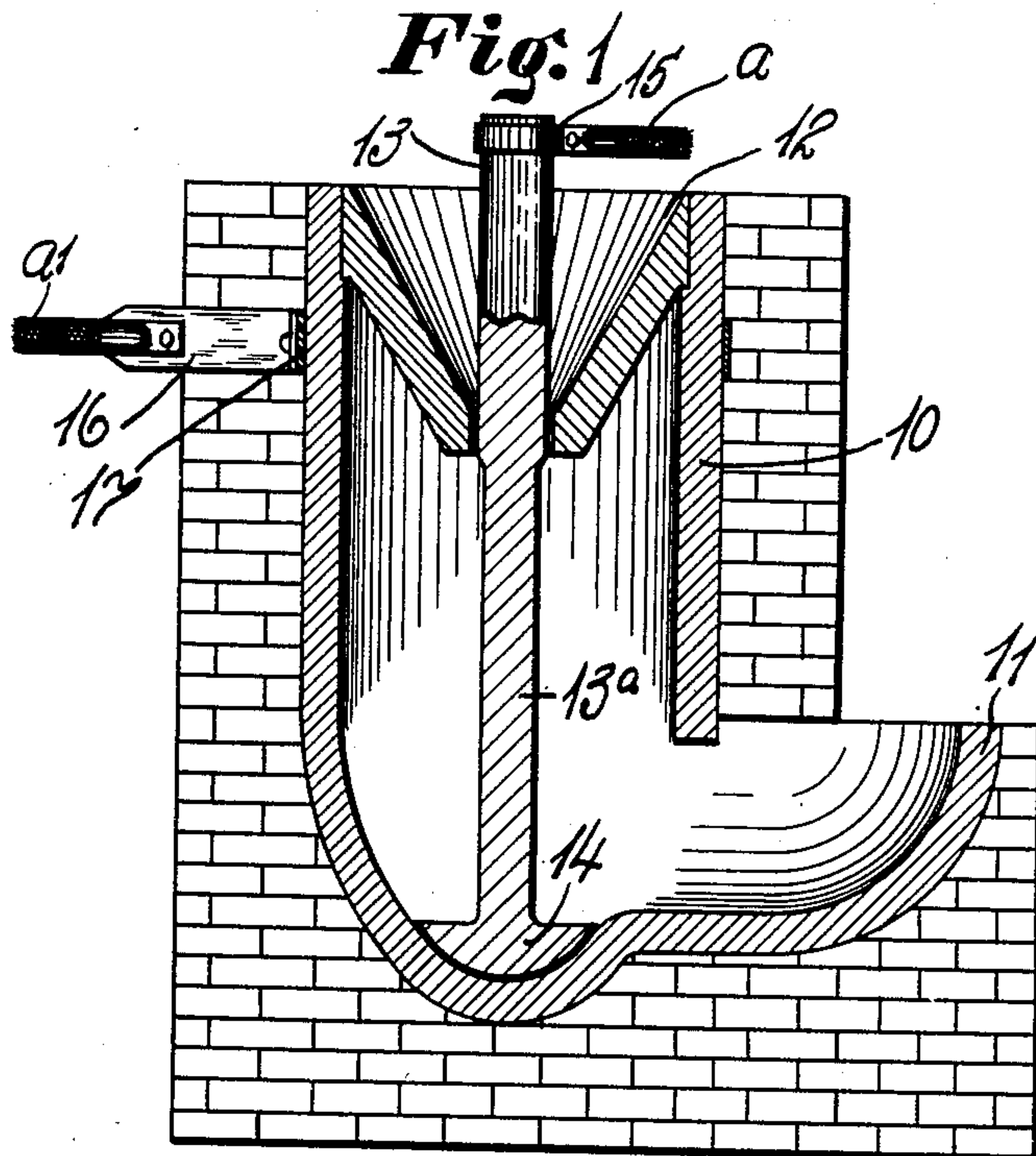


No. 865,016.

W. G. CLARK.
ELECTRIC FURNACE.
APPLICATION FILED DEC. 17, 1906.

PATENTED SEPT. 3, 1907.

2 SHEETS—SHEET 1.



WITNESSES:
Frank L. Stubbs.

Ralph W. Lancaster

Walter G. Clark, ^{INVENTOR.}

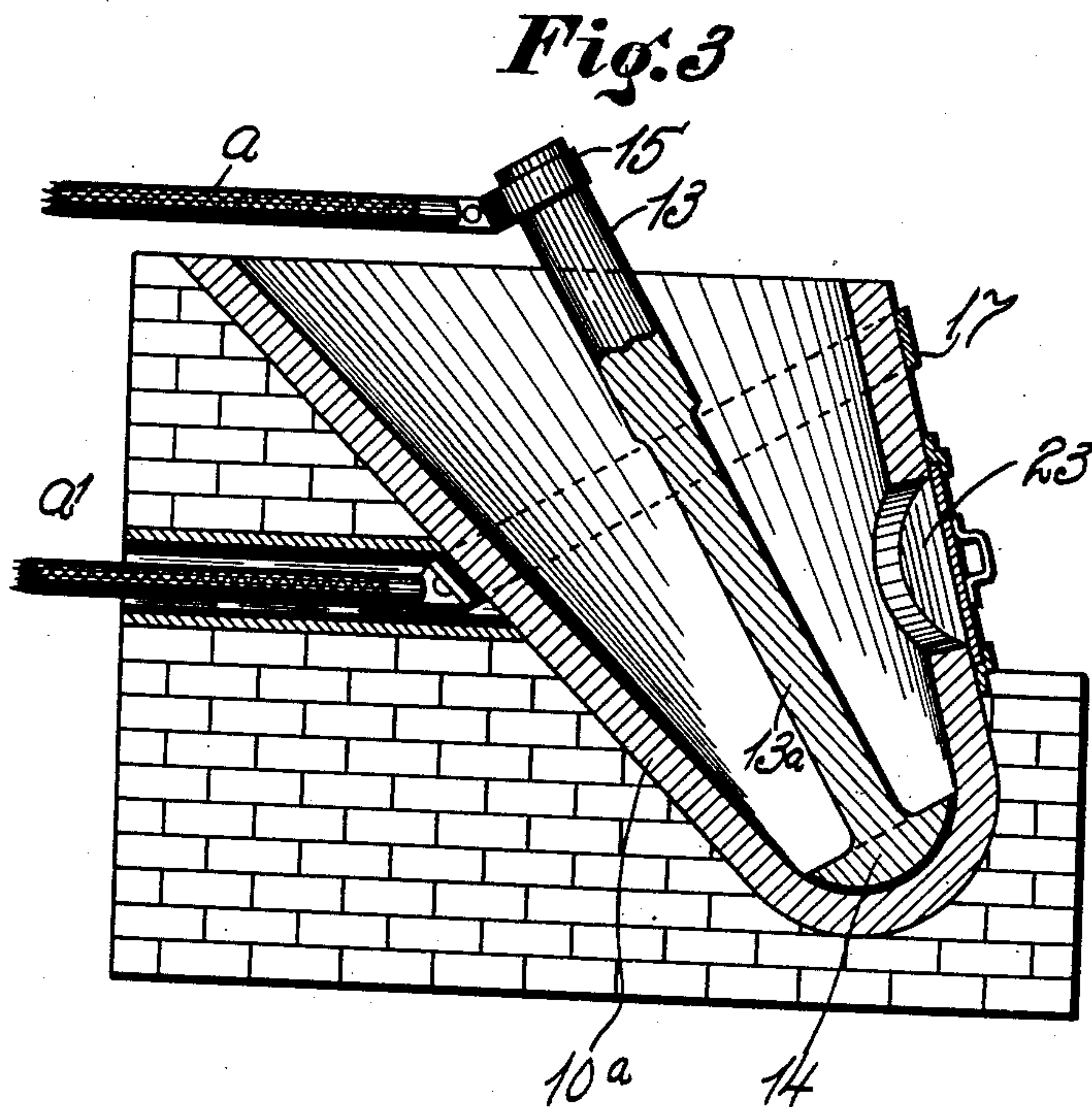
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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ELECTRIC FURNACE.

No. 865,016.

Specification of Letters Patent.

Patented Sept. 3, 1907.

Application filed December 17, 1906. Serial No. 348,331.

To all whom it may concern:

Be it known that I, WALTER G. CLARK, of the city, county, and State of New York, have invented a new and Improved Electric Furnace, of which the following is a full, clear, and exact description.

My invention relates to improvements in electric furnaces, and more especially electric furnaces of the incandescent type as distinguished from the arc type of furnaces.

Heretofore it has been common in incandescent electric furnaces to heat the furnace by passing a current of electricity through the furnace walls, but to get the furnace to a sufficiently high heat for melting purposes, such a system causes the furnace to be rapidly burned out and otherwise injured by the excessive current. Another common way of heating electric furnaces is to make the furnace walls of resisting but conducting materials, and use an electrode or heater, which is also a resistance conductor, and which extends downward into the material to be melted, or in the bath or slag, but in such cases the circuit is completed through the bath or slag, and the furnace is for this reason more or less inefficient, and especially as during the first melting processes short circuits are likely to occur which greatly interfere with the working of the furnace.

The object of my invention is to do away with the above difficulties, and I do this by providing a central electrode or electrodes, which electrode is shaped to fit the furnace bottom, and which for the greater part of its length is of higher resistance than its foot and than the furnace walls, so that the walls of the furnace are comparatively cool, while the central heater or electrode is highly incandescent. To facilitate melting I have the central heater or electrode constructed so that it can be removed slightly from the furnace bottom when the work is started, and so a series of arcs will be sprung between the foot of the central heater and the furnace wall, and this causes the material around the foot to be immediately melted, and then the foot can be dropped back against the wall, and as the melting is already started it will continue easily.

A further object of my invention is to provide a convenient, economic means of regulating the furnace feed so that the material to be melted can be heated and melted, or partially melted as it passes inward to the furnace. All this to the end that the heat generated by the current can be utilized to the best advantage, and by radiating it chiefly from the center, it is usable for melting purposes, whereas with the walls heated to a high state of incandescence, more heat is wasted than is actually utilized.

With these ends in view, my invention consists of

an electric furnace, the construction and operation of which will be hereinafter clearly described and the novel features claimed.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a vertical section of a furnace embodying my invention, and shows an open hearth type of furnace which is well adapted to melting glass, and especially the harder kinds of glass. Fig. 2 shows in vertical section a furnace which can be used for melting purposes, and which has means for raising and lowering the central heater or electrode, and Fig. 3 is a vertical section of a type of furnace which is well adapted for use in melting quartz or other material requiring a high temperature.

The furnace 10 can be of any suitable shape, but I prefer to give it a rounded bottom, and it is constructed with an open hearth 11, into which an operator may dip to remove the melted material as it is needed. The material of the furnace is such as to withstand the action of the current and of the melted material, and I find graphite is perhaps the best material for this purpose, especially as in my type of furnace the furnace wall is of comparatively low resistance, and the relatively pure graphite is better for this reason than it is to have the graphite mixed with fire clay or other material of higher electrical resistance.

For the glass furnace and for melting many other things, I prefer the type shown in Fig. 1, and here a feed chute or pocket 12 of the same material as the furnace 10 is arranged in the upper part of the furnace, and it has an opening therethrough in which fits loosely the central heater or electrode 13, and this can be reduced in cross section through its central and lower part as shown at 13^a, to make this part of higher resistance so that the heating at this point will be more quickly accomplished. The electrode or heater 13 terminates in the foot 14 which is of larger cross section than any other part of the electrode, and which is preferably rounded on the bottom so as to fit snugly against the furnace bottom. It will be seen that the sand or other material which is fed into the pocket 12 will be melted by the heat from the wall of the pocket, and more especially from the electrode 13, and will drop down into the furnace bottom and can be removed when sufficiently liquid from the hearth 11. To start the action the foot 14 can be raised slightly so as to spring arcs between itself and the furnace wall, thus melting a little of the material very quickly, after which the foot can be dropped back into place. Of course this could be done even though the bottom of the electrode 13 were no larger than the rest of the

electrode or heater, but in such case the arc being concentrated would have a tendency to destroy quickly the furnace bottom.

The electrical connections can be made in any convenient way, as for instance I have shown the electrode 13 provided with a metal strap 15, which connects with a leading-in wire "a", while the furnace wall is provided with a strap 17 which connects with a suitable conductor 16, and this connects with a second leading-in wire a¹.

In Fig. 2 I have shown a furnace substantially as described, but have illustrated a simple means of raising and lowering the heater or electrode 13. As here shown, the ring 15 connects by means of a tongue 18 with the collar 19 on the shaft 20, and the latter has a crank connection with the wheels 21 of the shaft 22, so that when the shaft is rotated the wheels are turned and the part 13 can be raised or lowered. I have shown this means of raising and lowering the electrode in mere outline, as obviously any usual mechanical contrivance for raising and lowering objects can be used, and I do not claim the mechanism itself.

In Fig. 3 I have shown the furnace arranged at an inclination so that when heated one can dip down into it easily, and in either type of furnace the electrode or heater can have some suitable means for raising and lowering it. The furnace 10^a shown in Fig. 3 has an opening in the side near the bottom which can be closed by a cover 23, and the latter can be removed and the material dipped out in a liquid state from the hottest part of the furnace. This type of furnace is better adapted for melting quartz or other material requiring a relatively high temperature. It will be understood, of course, that in either type of furnace I can use a plurality of the internal resistance heaters or electrodes, instead of one, this depending on the size of the furnace.

From the foregoing description it will be seen that the furnace which I have described is a very simple and inexpensive one, that a very high heat can be maintained in it, and especially that the heat and current are economized.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent:—

1. An electric furnace having its walls of conducting material of relatively low resistance, and an internal heater or electrode arranged to contact at its lower end with the furnace walls, and being of less resistance at its end portions than at its intermediate portions and means for elevating the electrode. 45
2. An electric furnace having its walls of relatively low electrical resistance, and an internal electrode or heater of relatively high electrical resistance, the said internal heater having its lower end arranged to contact with the furnace wall, and being of higher resistance above its lower end than at the said extreme lower portion and means for elevating the electrode. 50
3. An electric furnace having a wall of relatively low electrical resistance and an internal heater or electrode of relatively high resistance, the internal heater or electrode having a foot piece of less resistance than its body portion, and having said foot piece shaped to fit snugly against the furnace wall and means for elevating the electrode. 55
4. An electric furnace having its wall of relatively low electrical resistance, and having an internal electrode or heater of relatively high resistance, the said electrode being movable in and out of the furnace and having its lower end terminating in a foot piece which fits the furnace bottom and means for elevating the electrode. 60
5. An electric furnace having its wall of relatively low resistance, and with an opening in the side thereof for the removal of material, and an internal electrode or heater of relatively high resistance, movable in and out of the furnace and having its lower end shaped to fit the furnace bottom and means for elevating the electrode. 65

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Witnesses:

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