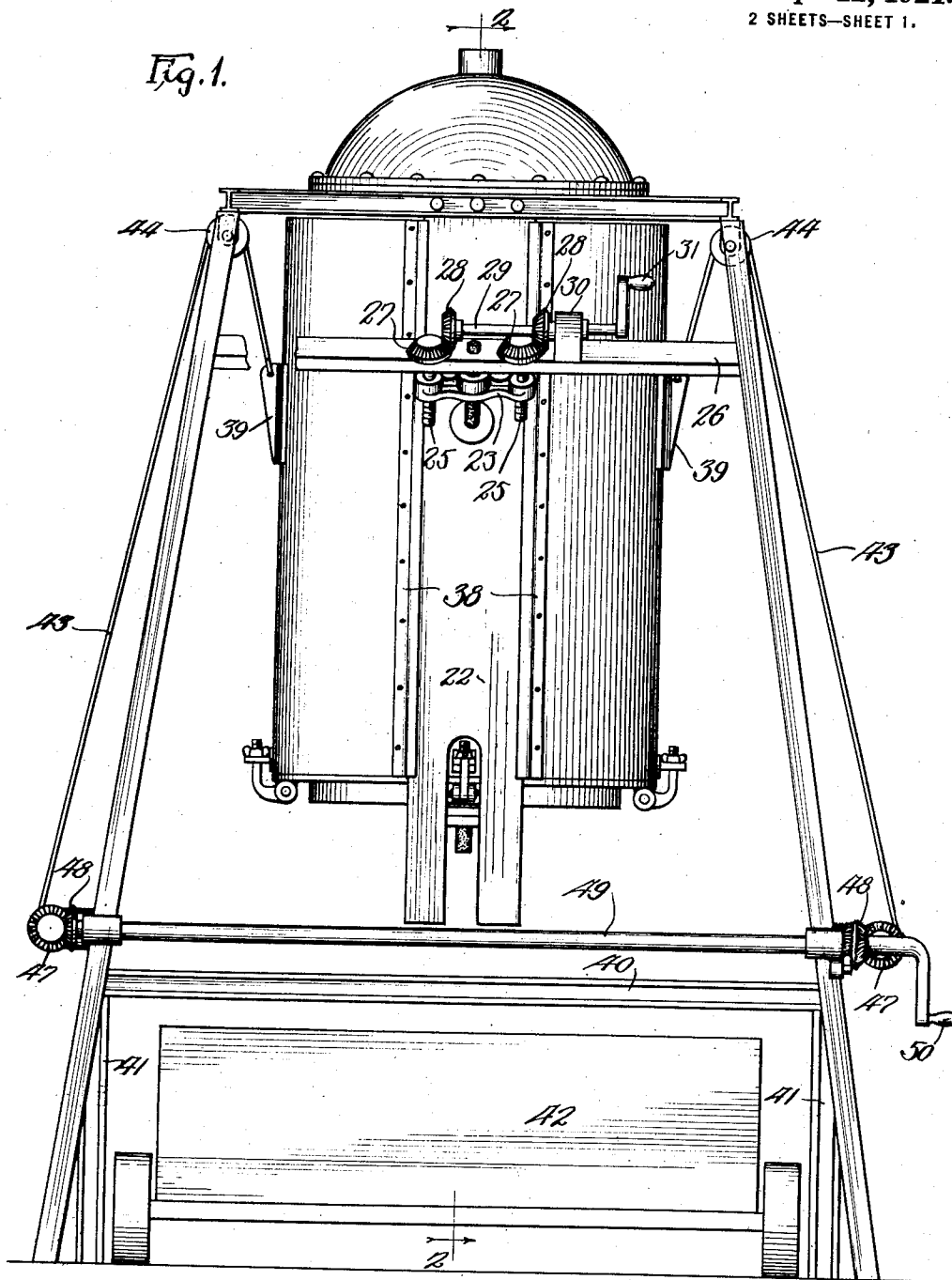


E. APPLEBY.
ELECTRIC FURNACE.
APPLICATION FILED NOV. 19, 1919.

1,374,802.

Patented Apr. 12, 1921.
2 SHEETS—SHEET 1.

Fig. 1.



Witness:
W. K. Olson

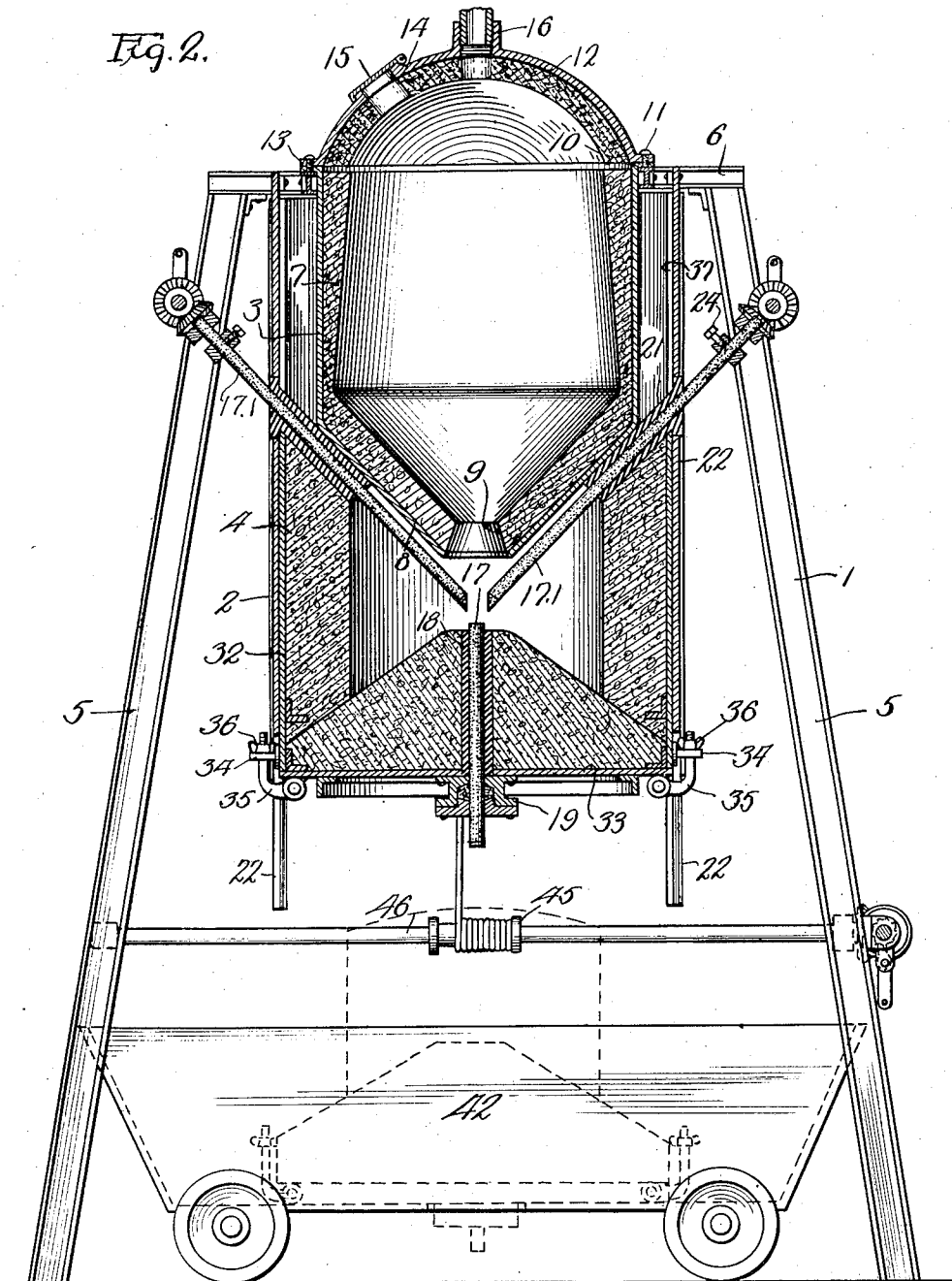
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By

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UNITED STATES PATENT OFFICE.

EDWIN APPELBY, OF CHICAGO, ILLINOIS.

ELECTRIC FURNACE.

1,374,802.

Specification of Letters Patent.

Patented Apr. 12, 1921.

Application filed November 19, 1919. Serial No. 339,052.

To all whom it may concern:

Be it known that I, EDWIN APPELBY, a subject of the King of Great Britain, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a specification.

This invention relates to electric furnaces and particularly to a type of electric furnace described in my Patent No. 882,733, issued March 24, 1908, which is adapted for the manufacture of calcium carbide and in which the constituents of the carbide are fused in a zone of intense heat produced by means of an electric arc and in which new material is continuously fed to the zone of activity while the completed carbide is being continuously withdrawn therefrom.

The main objects of this invention are to provide improved mechanism for gradually withdrawing the completed carbide from the zone of activity; and to provide an improved form and arrangement of the parts of the furnace whereby the contents may be readily removed therefrom.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which—

Figure 1 is a side elevation of the improved form of furnace.

Fig. 2 is a section taken on the line 2—2 of Fig. 1.

In the form shown in the drawings, the improved furnace comprises a supporting structure or frame 1 to which is secured a vertically disposed expansible crucible 2 which comprises a pair of telescoping receptacles 3 and 4.

The frame 1 is a suitable rigid structure represented in the drawings by the upright supporting members 5 and the horizontally disposed platform 6 mounted thereon.

The upper receptacle 3, which serves as a hopper for the material to be treated, consists of a metal shell having a lining 7 of refractory material and provided with a downwardly converging conical bottom 8 having a central opening 9 which forms the throat of the hopper. A peripheral flange 10 is formed at the upper edge of the shell for supporting it on the platform 6 to which the receptacle is rigidly secured by bolts 11 or other suitable fastening means. A dome-shaped cover 12 is mounted on the upper end of the receptacle 3 and is provided with

a peripheral flange 13 which is supported on the flange 10 and secured thereto by the bolts 11. An inlet 14 is formed in one side of the cover and is closed by a gas-tight door 15. A nipple 16 at the top of the dome serves as a vent to which a pipe may be connected for conducting away the carbon monoxide and other gases resulting from the chemical action which takes place. The cover 12 is also lined with a refractory material whereby the heat rising in the hopper will be conserved and returned to the zone of activity as in a reverberatory furnace.

A plurality of electrodes 17 and 17.1 extend into the crucible below the throat of the hopper and are connected electrically to a source of power not shown in the drawings. The particular arrangement of electrodes shown is designed for polyphase currents. The negative electrode 17 is vertically disposed and is seated in a bushing 18 which extends through the bottom of the receptacle 4. A stuffing box 19 prevents the inflow of air around the electrode 17. The electrodes 17.1 are carried by bushings 21 supported in vertically disposed plates 22, which have their upper ends rigidly secured to the platform 6 and are slidably connected to the walls of the lower receptacle 4 so as to serve as closures for the slot through which the electrodes extend.

Means are provided for the longitudinal adjustment of the electrodes 17.1, each of which has a clamping member 23 to which the outer end of the electrode is secured by means of a set screw 24. A pair of feed screws 25 have threaded engagement with the clamp 23 and are journaled in a horizontally disposed supporting member 26 which is secured at each end to the frame 1. Worms 27 are fixed on the upper end of the screws 25 and mesh with worms 28 fixed on a shaft 29 journaled in a bearing 30. A crank 31 is provided on the free end of the shaft 29, by means of which said shaft and screws 25 are rotated to advance or retract the electrodes 17.1.

The receptacle 4 is telescopically arranged with respect to the hopper 3 and is vertically shiftable with respect thereto by means of a hoisting mechanism. The receptacle 4 is lined with refractory material and comprises cylindrical metal side walls 32 having a bottom member 33 detachably secured thereto so that in the operation of removing the contents of the crucible, the side walls

32 may be raised independently of the bottom member. A plurality of lugs 34 are secured adjacent the lower end of the walls 32 and are arranged at regular intervals around the periphery thereof. A plurality of shackles or clamps 35 are pivotally mounted on the lower side of the bottom member 33 and are adapted to be swung into engagement with the lugs 34 and to be secured thereto by wing nuts 36.

The upper face of the refractory material which constitutes the lining of the member 33 is inclined downwardly toward the side edges thereof whereby the material fused in the zone of activity is urged toward the side walls of the lower receptacle and the ingot assumes the shape shown in dotted outline in Fig. 2. Slots 37 formed in the side walls 32 of the crucible permit the vertical movement of the receptacle 4 without affecting the position of the electrodes 17.1. A pair of guideways 38 are formed in the wall 32 for slidably engaging the side edges of the vertically disposed supporting plates 22.

The hoisting cables 43 are secured to the lugs 39 and pass over a pair of drums 44 journaled at the upper end of the frame 1 on respectively opposite sides thereof. The hauling ends of the cables are secured to drums 45 fixed on horizontally disposed shafts 46 journaled in bearings mounted on the upright supporting members 5. Bevel gears 47 on the shafts 46 mesh with bevel gears 48 on a shaft 49 and cause the simultaneous rotation of the shafts 46. The shaft 49 is rotated by means of a crank 50.

A truck 42 is located directly beneath the crucible in position to receive the bottom member 33. The bottom of the truck is provided with a central opening to receive the stuffing box 19 when the member 33 is seated therein.

The operation of the device shown is as follows: The materials which are to be fused, as for instance in the case of the manufacture of calcium carbide, powdered coke and lime are placed in the hopper 3 and flow through the throat 9, filling the unoccupied part of the interior of the receptacle 4 below the receptacle 3. An electric current is then passed through the electrodes and forms an electric arc between the opposed ends thereof, heating the surrounding materials to white heat. This heating is continued until all or practically all of the coke and lime which has entered the crucible has become fused and has been exposed to the heating effect of the electric arc for a predetermined interval of time. The lowering mechanism is then put into operation and causes the receptacle to slowly descend. As the receptacle descends, the materials in the hopper 3 flow into the receptacle 4. The lowering of the receptacle is gradual or intermittent, the speed of descent being de-

termined by experiment and when once determined is the same whenever the same materials are being operated upon. When the receptacle 4 is lowered sufficiently to cause the bottom member 33 to rest in the truck 42, the clamps 35 are disengaged from the lugs 34 and the walls 33 are then raised by means of the hoisting mechanism. The truck 42 may then be moved to one side of the frame so as to permit the removal of the ingot from the member 33 by a crane or other hoisting mechanism.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that numerous details of the construction shown may be altered or omitted without departing from the spirit of the invention as defined by the following claims:

I claim:

1. In a furnace, the combination of a frame, a vertically disposed crucible mounted on said frame and comprising a pair of relatively shiftable telescoping receptacles, means for heating the contents of said crucible, mechanism for vertically shifting one of said receptacles in said frame, the lower one of said receptacles comprising side walls in combination with a bottom member detachably secured thereto whereby the contents of said lower receptacle may be discharged through the lower end thereof.

2. In a furnace, the combination of a frame, a vertically disposed crucible mounted on said frame and comprising a pair of relatively shiftable telescoping receptacles, means for heating the contents of said crucible, and mechanism for vertically shifting the lower one of said receptacles in said frame, said lower receptacle comprising side walls in combination with a bottom member detachably secured thereto whereby said walls may be raised independently of said bottom member whereby the contents of said lower receptacle may be discharged through the lower end thereof.

3. In an electric furnace, the combination of a frame, a vertically disposed crucible mounted on said frame and comprising a pair of relatively shiftable telescoping receptacles, the upper one of said receptacles being constructed so as to form a hopper for the material to be treated, said hopper having a throat at its lower end communicating with the lower receptacle, electrodes extending into said crucible below said throat, and mechanism for vertically shifting said lower receptacle relatively of said hopper for increasing the capacity of said crucible below said throat, said lower receptacle being arranged to discharge its contents through the lower end thereof.

4. In an electric furnace, the combination of a frame, a vertically disposed crucible mounted on said frame and comprising a

pair of relatively shiftable telescoping receptacles, the upper one of said receptacles being constructed so as to form a hopper for the material to be treated, said hopper having a throat at its lower end communicating with the lower receptacle, electrodes extending into said crucible below said throat, and mechanism for vertically shifting said lower receptacle relatively of said hopper for increasing the capacity of said crucible below said throat, said lower receptacle being arranged to discharge its contents through the lower end thereof, the inner face of said bottom member being convex whereby the fused material therein will be urged by gravity toward the side walls thereof.

5. In an electric furnace, the combination of a frame, a vertically disposed crucible mounted on said frame and comprising a pair of relatively shiftable telescoping receptacles, the upper one of said receptacles being of hopper shape and having a throat at its lower end communicating with the lower one of said receptacles, mechanism for vertically shifting said lower receptacle vertically of said hopper for increasing the capacity of said crucible below said throat, said lower receptacle comprising side walls in combination with a bottom member detachably secured thereto whereby said walls may be raised independently of said bottom member, and electrodes extending into said crucible below said throat, one of said electrodes being carried by said bottom member.

6. In an electric furnace, the combination of a frame, a vertically disposed crucible mounted on said frame and comprising a pair of relatively shiftable telescoping receptacles, the upper one of said receptacles being constructed so as to form a hopper for the material to be treated, said hopper having a throat at its lower end communicating with the lower one of said receptacles, electrodes extending into said crucible below said throat, and mechanism for vertically shifting said lower receptacle rel-

atively of said hopper for increasing the capacity of said crucible below said throat, said upper receptacle having a dome-shaped cover member lined with refractory material whereby the heat ascending in said crucible is reverberated toward the zone of activity.

7. In an electric furnace, the combination of a frame, a vertically disposed crucible mounted on said frame and comprising a pair of vertically aligned telescoping receptacles, the upper one of said receptacles being constructed so as to form a hopper having a throat formed at the lower end thereof and communicating with the lower one of said receptacles, electrodes extending into said receptacles below said throat, mechanism for vertically shifting said lower receptacle for increasing the capacity of said crucible below said throat, said lower receptacle comprising side walls in combination with a bottom member, said member being detachably secured to the side walls of said receptacle whereby said walls may be raised independently of said bottom member, and a car for supporting said bottom member in its lowered position, said car being shiftable laterally with respect to said frame so as to permit the removal of the ingot supported on said bottom member.

8. The combination of a receptacle for containing a heated mass, a frame for supporting said receptacle, mechanism for vertically shifting said receptacle in said frame, means for supporting said receptacle in its lowered position, said receptacle comprising side walls in combination with a bottom member having a convex inner face, lugs formed on said walls adjacent the lower edge thereof, and clamps pivotally mounted on the lower face of said bottom member and adapted to engage said lugs for detachably securing said bottom member to said walls.

Signed at Chicago this 15th day of Nov., 1919.

EDWIN APPLEBY.