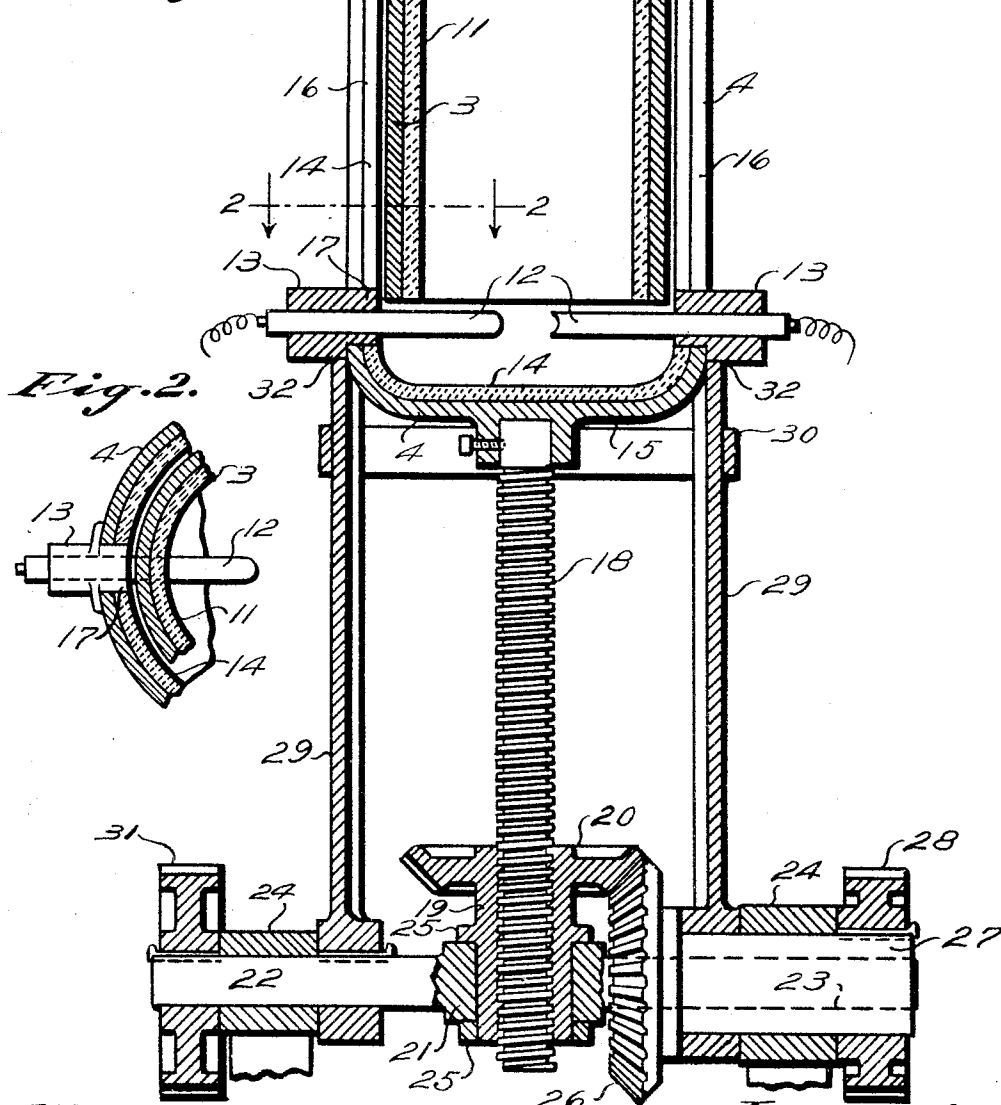
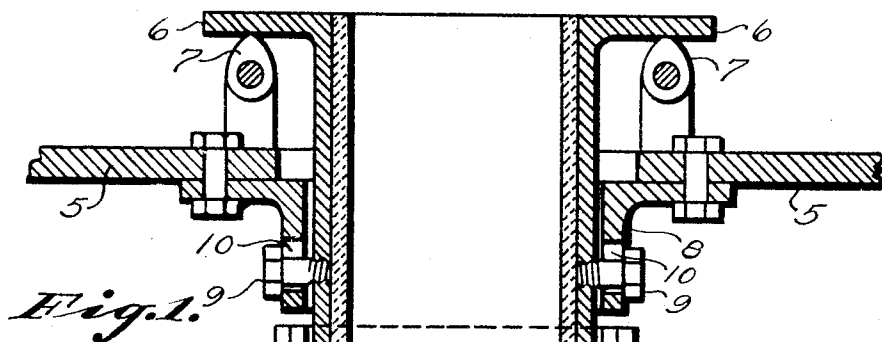


E. APPLEBY.
ELECTRIC FURNACE.
APPLICATION FILED JAN. 28, 1905.



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UNITED STATES PATENT OFFICE.

EDWIN APPLEBY, OF CHICAGO, ILLINOIS.

ELECTRIC FURNACE.

No. 803,147.

Specification of Letters Patent.

Patented Oct. 31, 1905.

Application filed January 28, 1905. Serial No. 243,134.

To all whom it may concern:

Be it known that I, EDWIN APPLEBY, a subject of the King of Great Britain, and a resident of Chicago, in the 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 has particular reference to a type which is useful for the manufacture of calcium carbid.

The main objects of my invention are to provide a form of electric furnaces in which a limited zone of intense heat is formed by means of an electric arc and which is provided with improved mechanism for continuously and uniformly supplying to the said zone the granular constituents from which the carbid is formed, such as mixed powdered lime and coke, together with improved means for continuously withdrawing from the zone of activity the newly-formed carbid, all without unnecessary waste of heat through the heating of the material for longer periods than is necessary for forming the carbid, to provide means in a device of this class for agitating the walls thereof to prevent uneven flow of the powdered material toward the zone of activity, and to provide ready means for discharging the resulting carbid from the device. I accomplish these objects by the device shown in the accompanying drawings, in which—

Figure 1 is a vertical section of an electric furnace constructed according to my invention. Fig. 2 is a horizontal section of the same on the line 2 2 of Fig. 1, being drawn on a slightly-reduced scale.

In the form shown in the drawings the main body of the furnace consists of two vertically-disposed cylindrical receptacles 3 and 4, opening toward each other and telescoping each other at their open ends. The outer and lower receptacle 4 is mounted to slide vertically over the walls of the inner receptacle 3 and is adapted to be tilted to discharge its contents after having been withdrawn from its telescoping engagement with the inner receptacle.

The receptacle 3 is mounted so as to have a vertical longitudinal reciprocatory movement in the supporting-frame 5. The receptacle 3 is provided with an outwardly-extending flange 6 at its upper end and is supported upon the heart-shaped cams 7, which engage the flange 6 and through rotation of the cams

impart the desired vibratory movement to the receptacle 3. The cams 7 are journaled on the supporting-frame 5 and are geared together to be operated simultaneously by mechanism which is not shown in the drawings. The movement of the receptacle 3 is guided by the collar 8, which surrounds the said receptacle, and by the bolts 9, which are secured to the walls of the receptacle and pass through slots 10 in the collar 8.

The main body of the receptacle 3 is of tubular form, open both at the top and bottom, and is preferably formed of metal lined with a coating 11 of refractory material. A pair of opposed electrodes 12 are mounted in fixed members 13 of the main supporting-frame and extend across the lower end of the receptacle 3. The electrodes are adjustable in the members 13 in the usual manner for controlling the distance of separation of their opposed ends. The outer receptacle 4 is also of metal and is similarly lined with a refractory coating 14.

The receptacle 4 is provided with a closed bottom 15, and its vertical walls are slotted at 16 to fit the parts 17 of the members 13, through which the electrodes enter the interior of the furnace. The receptacle 4 is supported upon a vertically-disposed screw-threaded shaft or strut 18 and is vertically adjustable therewith, as will be hereinafter described. The shaft 18 has threaded engagement with the hub 19 of a bevel-gear 20. The said bevel-gear is in turn journaled in a member 21, which is provided with horizontally-disposed trunnions 22 and 23, journaled in bearings 24 in the main supporting-frame. The toothed gear 20 is prevented from shifting axially in its bearing by the collars 25. Rotation of the bevel-gear 20 is accomplished by means of a second bevel-gear 26, which meshes with the bevel-gear 20 and is loosely journaled on the trunnion 23. The bevel gear 26 is provided with a hollow shaft 27, which extends through the bearing 24, concentrically with the trunnion 23, and has keyed to its end a gear 28, to which power is applied by means of mechanism (not shown) for raising and lowering the receptacle 4. Leakage of molten or semimolten material through the slots 16 while the receptacle 4 is being lowered below the lower ends of the receptacle 3 is prevented by means of the curved guide-plates 29, which have close sliding contact with the walls of the receptacle 4 in the vicinity of said slots. The upper ends

of the guide-plates 29 are steadied by means of a band 30, and the lower ends are provided with hubs, respectively fitting the trunnion 22 and hollow shaft 27. The trunnion 22 is provided at its outer end with a gear 31, connected with suitable mechanism (not shown in the drawings) for rotating the trunnions, together with the receptacle 4 and the guide-plates 29, so as to tilt the same toward one side for the purpose of discharging the contents of said receptacle. The guide-plates 29 make a close joint at 32 with the members 13, and their upper ends are curved on the arc of a circle having its center in the trunnions, so as to permit the plates 29 to rotate about said trunnions without interfering with the members 13.

The operation of the device shown is as follows: The powdered materials, such as coke and lime, in the proper proportions for forming calcium carbide, are filled into the upper end of the receptacle 3. Electric current is then applied to the electrodes, causing an electric arc between their opposed ends and heating the adjacent particles of matter. This heating is allowed to continue until a zone of fused carbide is formed in the vicinity of the electrodes. Then the mechanism for rotating the gear 20 is put in operation and the receptacle 4 is gradually drawn downward. The timing of these operations is determined in the first instance by experiments and is thereafter always substantially the same. The speed at which the receptacle 4 is lowered is such that the powdered materials will become thoroughly fused during their passage through the zone of activity—that is, the zone extending across the furnace in the neighborhood of the electrodes. During all of these operations the inner receptacle 3 is continuously vibrated by means of the cams 7, so as to prevent the material from bridging between the walls of the receptacle 3 and interfering with the uniform feeding of the material to the zone of activity. When the outer receptacle 3 has been lowered so that its upper edge will clear the bottom of the members 13, then the operation of the lowering mechanism is stopped and the mechanism connected with the gear 31 is put into operation for tilting the receptacle 4 to a downwardly-inclined position and discharging the contents therefrom. The capacity of the whole furnace when the receptacles are in the position shown in the drawings is substantially the same as the capacity of the receptacle 4 after the same has been withdrawn from engagement with the receptacle 3. The receptacle 4 has sufficient capacity to accommodate an entire charge. The timing of the operation of lowering the receptacle 4 is so adjusted that the contents pass out of the zone of activity immediately after being formed into calcium carbide, and the calcium carbide in the lower part

of the receptacle 4 has time to cool to some extent during the descent of said receptacle to its lowest position. The fact that the gear 26 is journaled concentrically of the trunnion 23 permits the receptacle 4 to be tilted without disconnecting any of the operating gearing. When the receptacle 4 is tilted, the gear 20 rides on the gear 26, rotating slightly and causing a slight longitudinal movement of the shaft 18 within the hub of the gear 20. As soon as the contents of the receptacle 4 have been discharged the said receptacle may be rotated back into a position of alinement with the receptacle 3 and then raised to its original starting position. The device is now ready to repeat its operation, the discharge being rapid and causing but little delay in the continuous operation of the furnace.

It will be seen that the device shown will be useful for many other purposes besides the manufacture of calcium carbide and that numerous details of the construction shown may be altered without departing from the spirit of my invention.

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

1. In the electric furnace, the combination of a vertically-disposed tubular receptacle open at the bottom; a second receptacle surrounding the first and having a bottom movable in alinement with said first receptacle, a pair of electrodes mounted in said frame and extending into the furnace near the lower end of said first receptacle; mechanism for gradually moving said bottom downwardly away from said electrodes; and mechanism for agitating the walls of said first receptacle, substantially as described.

2. In an electric furnace, the combination of a vertically-disposed tubular receptacle open at the bottom; a second receptacle surrounding the first and having a bottom movable in alinement with said first receptacle, a pair of electrodes mounted in said frame and extending into the furnace near the lower end of said first receptacle; mechanism for gradually moving said bottom downwardly away from said electrodes; and mechanism for causing said first receptacle to reciprocate vertically, substantially as described.

3. In an electric furnace, the combination of a frame; a vertically-disposed receptacle mounted in said frame and open at the bottom; a second receptacle open at the top and telescoping with the first; a pair of electrodes mounted in said frame and extending into the furnace near the lower end of said first receptacle; mechanism for drawing said second receptacle downwardly; and mechanism for agitating said first receptacle, substantially as described.

4. In an electric furnace, the combination of a frame; a vertically-disposed tubular receptacle mounted in said frame and open at

the bottom; a second receptacle having tubular walls in axial alinement with the first receptacle and forming a continuation thereof having a bottom movable toward and
 5 away from the lower end of said first receptacle, said bottom being movable for a considerable distance without breaking the continuity of said walls; and trunnions supporting said second receptacle and adapted to
 10 permit the same to be tilted angularly thereon for discharging its contents, substantially as described.

5. In an electric furnace, the combination of a frame; a vertically-disposed receptacle
 15 mounted in said frame and open at the bottom; a second receptacle open at the top and telescoping with the first; a pair of electrodes mounted in said frame and extending into the furnace near the lower end of said first
 20 receptacle; a strut supporting said second receptacle; a member supporting said strut and being journaled in said frame on an axis transverse to said strut; mechanism for adjusting said strut vertically on said member;
 25 and mechanism controlling the rotation of said member on its axis, substantially as described.

6. In an electric furnace the combination of a frame; a vertically-disposed receptacle
 30 mounted in said frame and open at the bottom; a second receptacle open at the top and telescoping with the first; a pair of electrodes

mounted in said frame and extending into the furnace, near the lower end of said first receptacle; a member journaled in said frame
 35 on an axis transverse to said strut; a threaded hub meshing with said strut and rotatably mounted on said member; said hub being secured against shifting on said member longitudinally of said strut; and mechanism
 40 for rotating said hub for raising and lowering said second receptacle, substantially as described.

7. In an electric furnace, the combination of a frame; a vertically-disposed receptacle
 45 mounted in said frame and open at the bottom; a second receptacle open at the top and telescoping with the first; a pair of electrodes mounted in said frame and extending into the furnace near the lower end of said first
 50 receptacle; mechanism for drawing said second receptacle downward with respect to the first; and mechanism for tilting said second receptacle and discharging its contents after
 55 it has been drawn out of the telescopic engagement with said first receptacle, substantially as described.

Signed at Chicago this 23d day of January, 1905.

EDWIN APPLEBY.

Witnesses:

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