May 22, 1928. 1,671,026

C. H. GAGE

ELECTRIC FURNACE

Filed Feb. 12, 1926 6 Sheets-Sheet 1

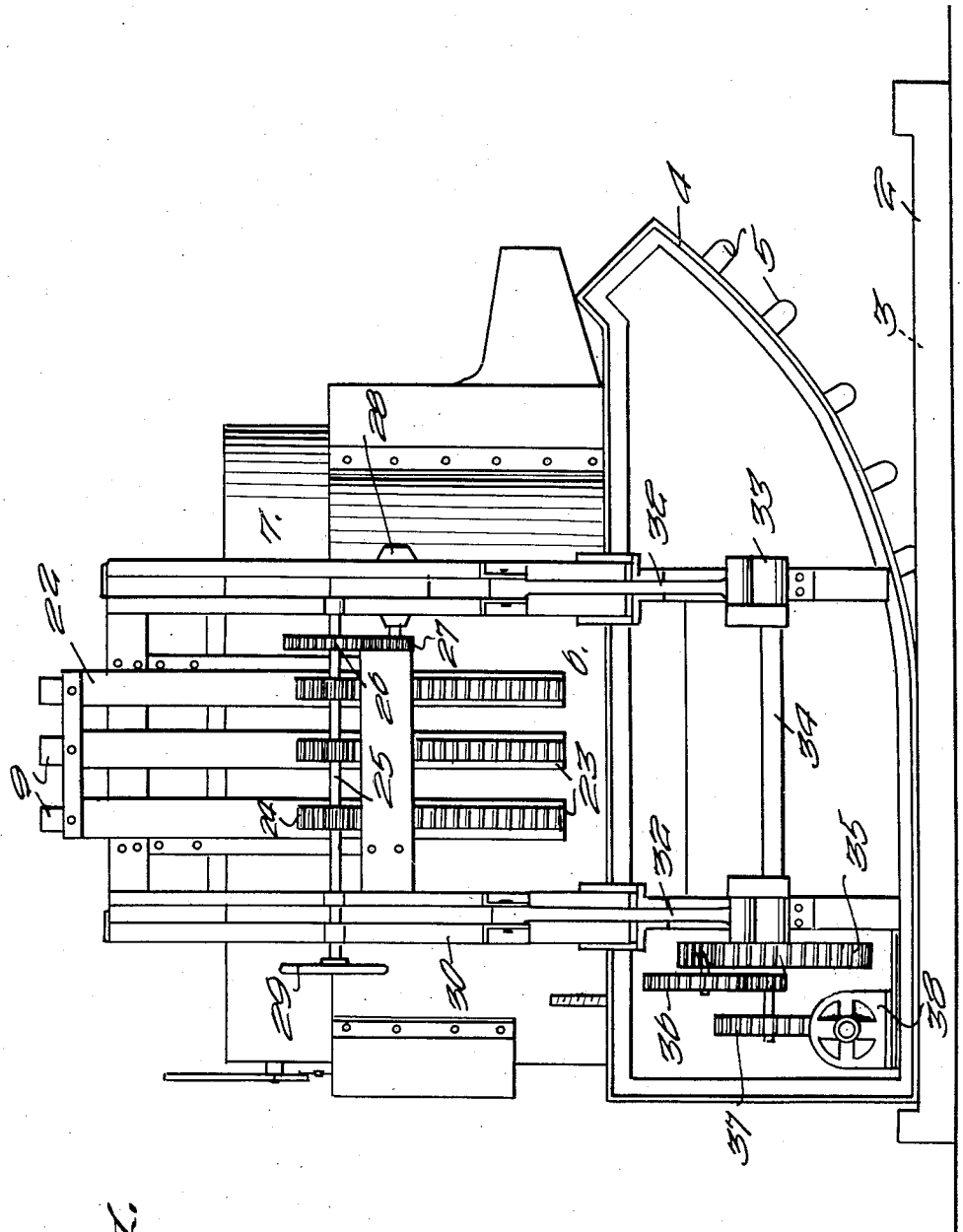


Fig. 1.

Inventor

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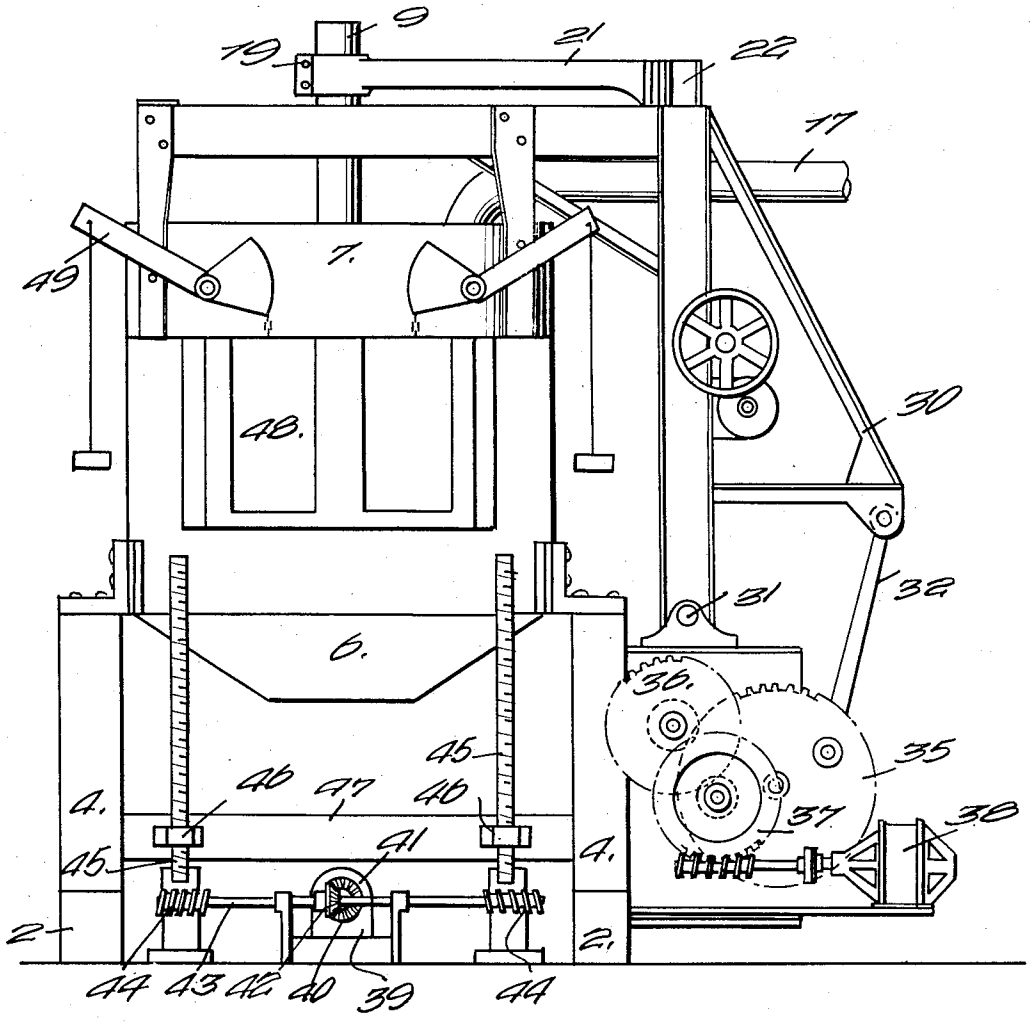
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Filed Feb. 12, 1926 6 Sheets-Sheet 2

Fig. 2.



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Filed Feb. 12, 1926 6 Sheets-Sheet 3

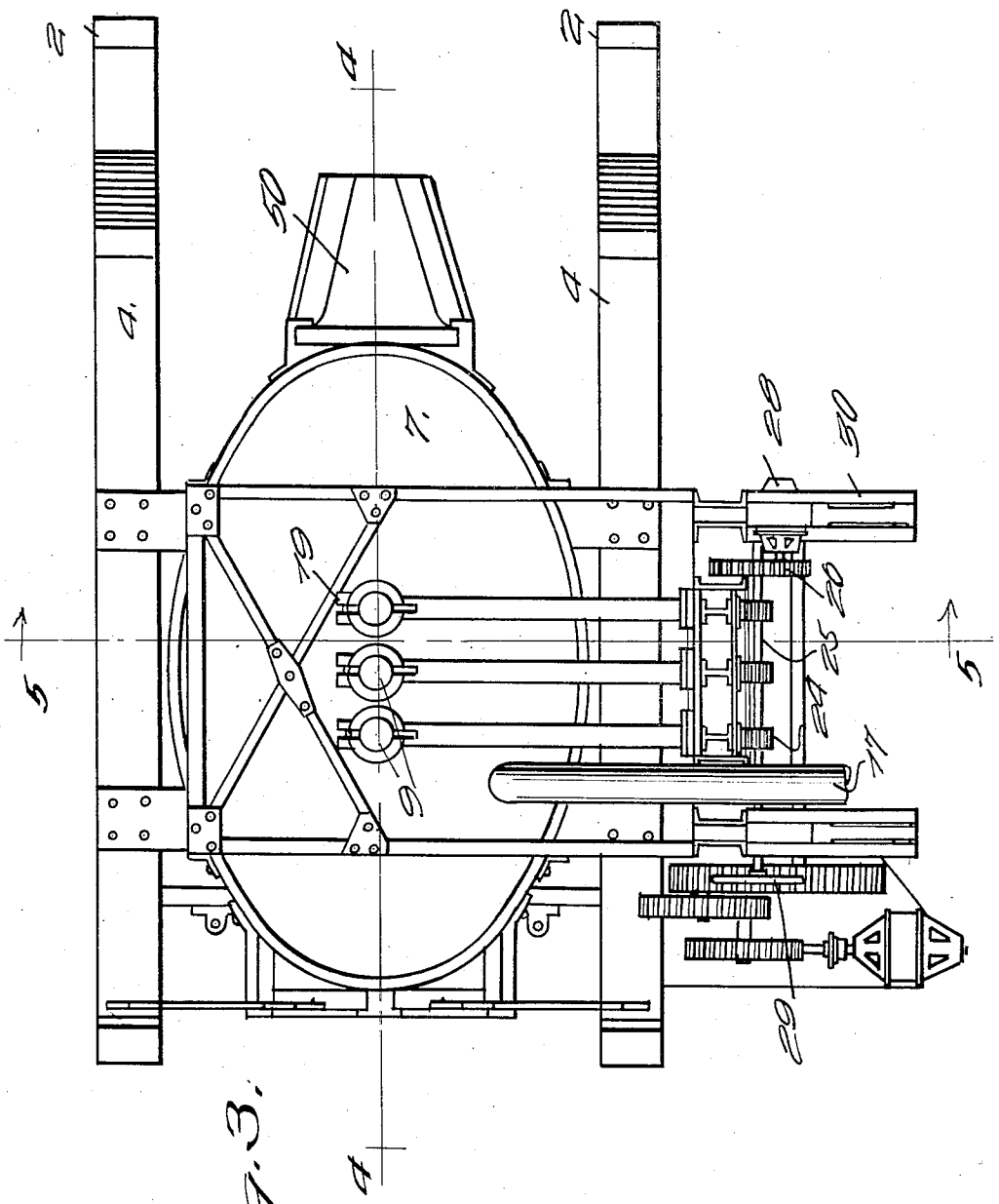


Fig. 3.

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Filed Feb. 12, 1926 6 Sheets-Sheet 4

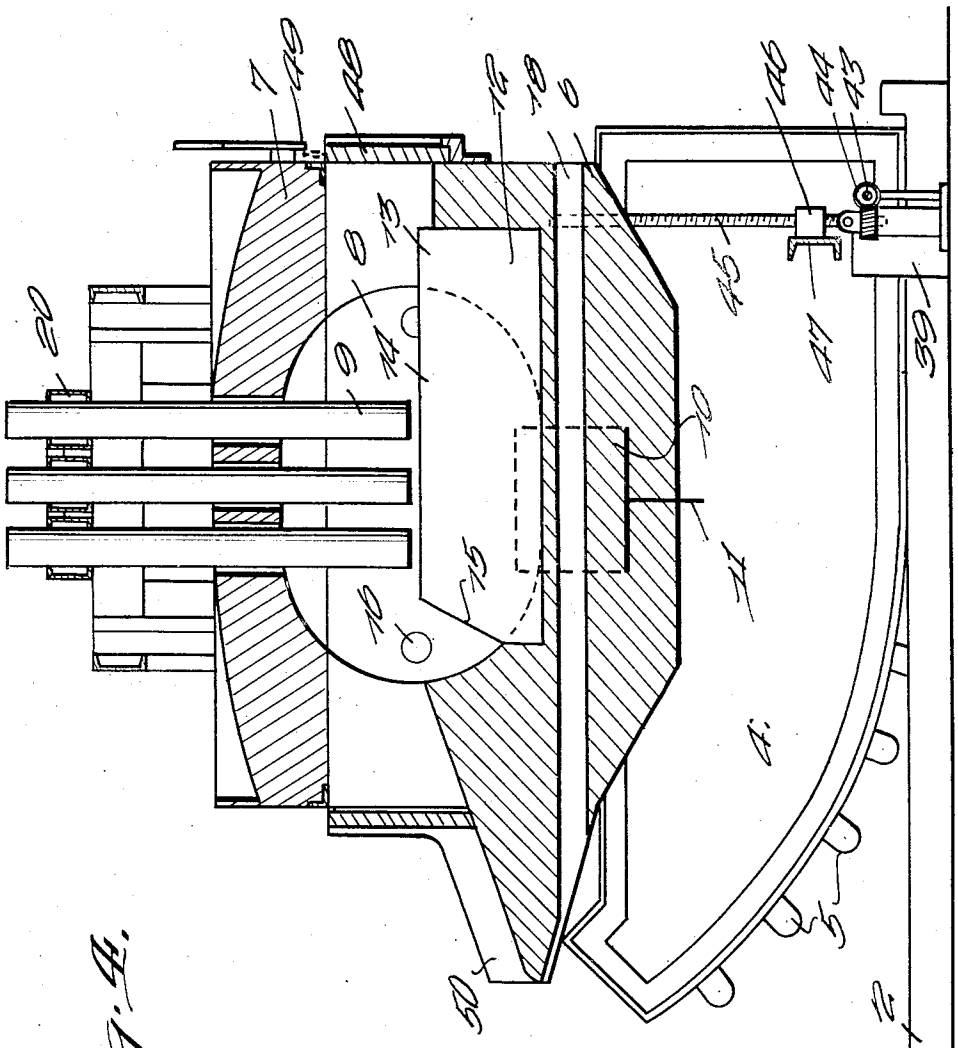


Fig. 4.

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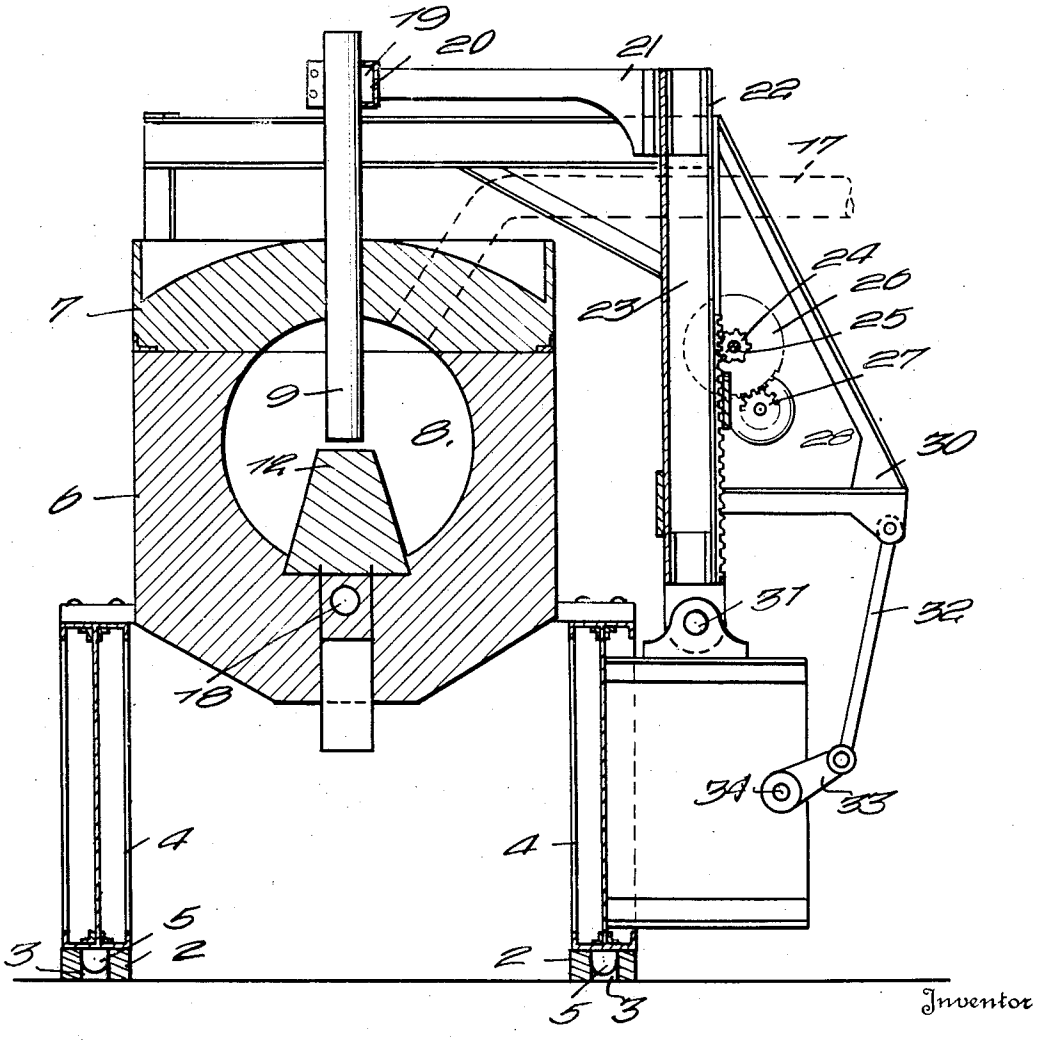
May 22, 1928. 1,671,026

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ELECTRIC FURNACE

Filed Feb. 12, 1926 6 Sheets-Sheet 5

Fig. 5.



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ELECTRIC FURNACE

Filed Feb. 12, 1926 6 Sheets-Sheet 6

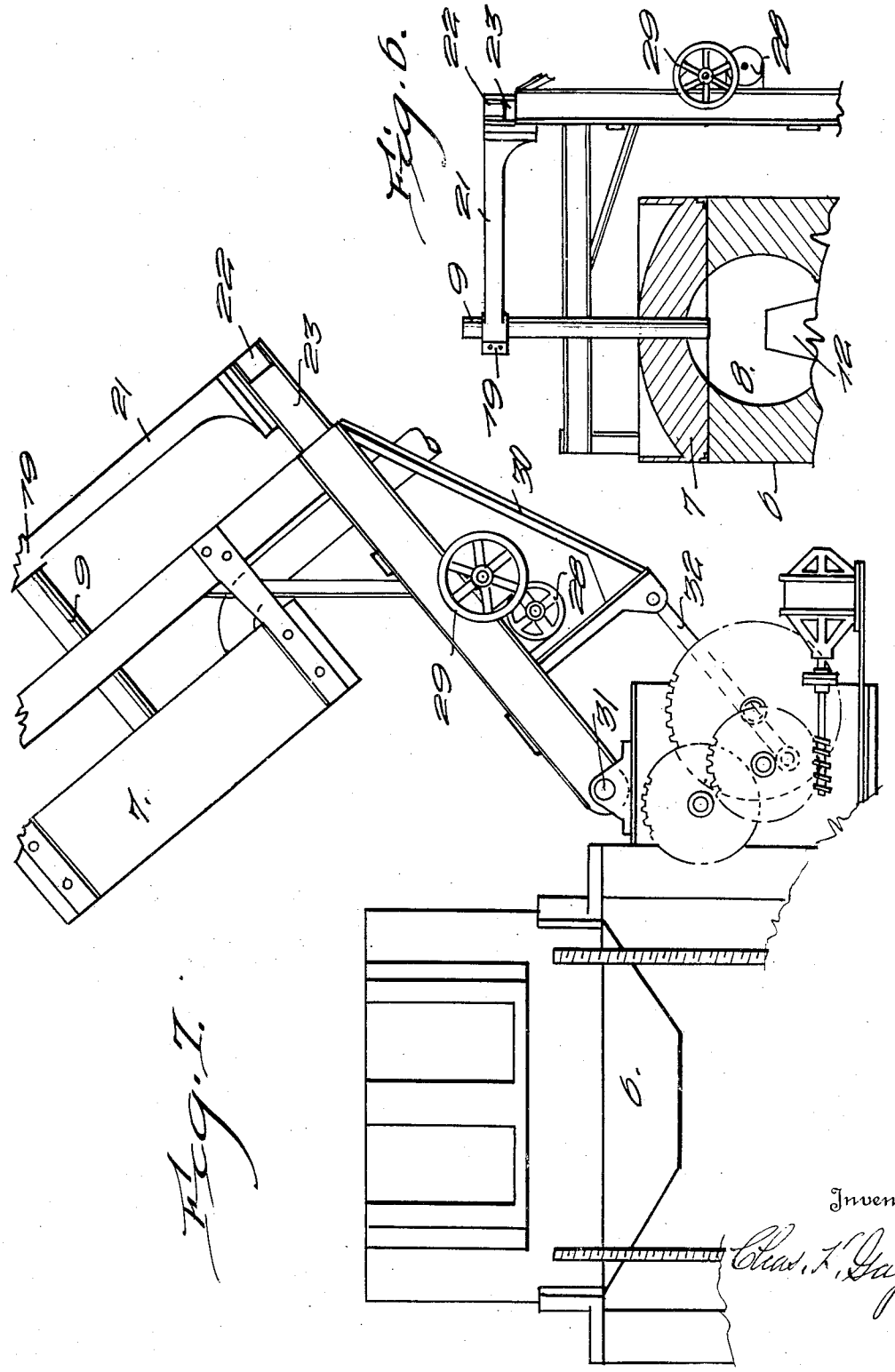


Fig. 6.

Fig. 7.

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Patented May 22, 1928. 1,671,026

UNITED STATES PATENT OFFICE.

CHARLES H. GAGE, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE-FOURTH TO LINN W. SEARLES, OF CHEVY CHASE, MARYLAND.

ELECTRIC FURNACE.

Application filed February 12, 1926. Serial No. 87,967.

This invention relates to electric furnaces.

An object of this invention is to provide a continuous feed, electric furnace. In electric furnaces heretofore the electrolyte or material which is being acted upon in the furnace serves as a medium for causing electric arcs, and partially for this reason it is impracticable to attempt a continuous feed of an electric furnace, due to the fact that it is necessary to heat each individual charge and discharge the same. It is an object of this invention to overcome this difficulty and to provide a continuous feed and discharge thru the electric furnace.

A further object of this invention is to provide an electric furnace in which the heat at every portion of the furnace is uniform. It has been found, in electric furnaces, that certain portions of the lining burn out and certain other grave and serious difficulties occur, and I have found that such is due to uneven temperature throughout the furnace, or in spots in the furnace. It is an object of this invention to overcome this difficulty.

A further object of this invention is to provide a wide flame area, and to this end I provide a widely distributed arc surface; and to provide an improved electrode of a composition and a shape such as to provide a wide area for an arc flame, and to direct the flame equally and suitably through the electrolyte.

A further object of this invention is to provide an improved means of controlling the electrodes, and to provide an improved means of controlling the furnace top or cover.

A further object of this invention is to provide an improved means of cooling a portion of the furnace and equalizing the temperature of the furnace.

A further object of this invention is to provide an electric furnace which will produce a superior refinement and which will in a better manner withdraw the deleterious gases and other volatile elements, and which may be used both as an electric furnace and as an oxidizing or other separating retort or element.

A further object of this invention is to provide an improved means of tilting an electric furnace.

With the foregoing and other objects in view I have invented the device shown in the accompanying drawings, in which:

Figure 1 is a side elevation of my improved device,

Fig. 2 is an end elevation,

Fig. 3 is a top plan view;

Fig. 4 is a longitudinal section at 4—4 of Fig. 3;

Fig. 5 is a transverse section at 5—5 of Fig. 3;

Fig. 6 is a fragmentary showing, with the electrodes in a different position; and

Fig. 7 is a fragmentary showing, with the cover tilted.

Like reference characters indicate like parts throughout the several figures and in the specification; in which there is provided a track 2, provided with sockets 3; riding upon which track 3 is a runner frame 4, the runner frame 4 being provided with dowel-like pins 5; the pins 5 fitting in the sockets 3, so that upon the tilting of the rocker or runner frame 4 the furnace is held in a fixed position against lateral or longitudinal movement. Mounted upon the runner frame 4 is a furnace wall element 6, of any suitable material, such as fire clay, which forms the base or crucible portion of the furnace; over which is a removable top 7; the element 6 and the element 7 being provided with an internal chamber 8, which constitutes the furnace chamber; the chamber 8 being elliptical in longitudinal section and circular in transverse section, and being provided with a plurality of electrodes 9. The terminal electrodes are spaced relative to the end walls of the ellipse so that the distance from the other terminals or arc points is equal to that of the distance of the electrode points from the side walls of the furnace. By this arrangement the heat zone has exactly the same radius throughout the furnace, and every portion of the furnace wall has an equalized heat. In forming the element 6 a metallic electrode 10, preferably of a bronze metal, is inserted in the element 6, to which element 10 leads a wire 11, from a suitable source of electric power. Formed over the electrode 10, by tamping within a mold a composition hereinafter described, is the distributor electrode 12, which distributor electrode is of trapezoidal cross section and of rectangular longitudinal section, extending substantially the entire internal

length of the chamber 8, and extending (as at 13) beyond the wall of the chamber. The distributor electrode 12 is made of a composition consisting of equal parts of carborundum, fire clay, cryolite, dehydrated magnesite; the whole bound together by coal tar, which binder volatilizes under the first heat of the furnace, leaving an artificial electrolyte within the furnace, of suitable shape, whereby, by reason of the resistance of this composition, the arc from the electrodes 9 is distributed over the top 14, and the side wall 15, of the element 12, and is distributed thoroughly through the electrolyte or other material within the chamber 8.

There are provided peepholes 16, and there is further provided an exhaust pipe 17, which exhaust pipe 17 is connected with a forced draft, such as a fan or other such element, whereby not only is the electric furnace product when used for smelting, refined by the scavenging and withdrawal of deleterious gases and other elements, but, also, the furnace may be used as a retort or other oxidizing or separating element.

The lining of the furnace may be either acid or basic. Beneath the lining and through the element 6, is an air or blower channel 18, whereby a cooling or temperature-equalizing effect may be had.

As a means of lifting the electrodes 9, I provide a clamp 19, adapted to embrace the electrodes 9, the clamp 19 being water-jacketed at 20, and being carried by worms 21; the worms 21 being selectively, vertically movable upon the upper terminals 22, of rack plates 23. The rack plates 23, are driven in unison by a pinion 24 carried upon a shaft 25; the shaft 25 being driven by a gear 26, likewise carried upon the shaft 25; the gear 26 being driven by a pinion 27; the pinion 27 being driven by being carried upon the shaft of a motor 28; there being carried upon the shaft 25, a hand wheel 29, whereby the electrodes 9 will be automatically lifted by a thermostatic control of the motor 28, or manually elevated by the turning of the wheel 29, or selectively elevated by the movement upon the heads 22. The elements 23 to 28, inclusive, are carried by a frame 30, which frame 30 is pivotally mounted at 31, and is connected by a pair of links 32, with cranks 33; the cranks 33 being carried by a shaft 34, which shaft 34, is driven by a gear 35; the gear 35 being in turn driven by jack gears 36; which jack gears 36 are driven by jack gears 37; which jack gears 37 are driven by a motor 38; by means of which, motor 38, through the reducing speed mechanism of the gears 35, 36 and 37, causes either a pull or a push upon the links 32; the action of which is to move the frame 30 upon its pivot 31, thereby lifting the cover together with the electrodes 9, and replacing the cover as selectively desired.

As a means for tilting the whole furnace upon its rocker carriage 4, I provide a motor 39, carrying upon its shaft 40 a bevel gear 41, which bevel gear 41 drives a bevel gear 42, the bevel gear 42 being fixedly mounted on a shaft 43. Upon the terminals of the shaft 43 are a pair of worms 44, acting upon worm gears carried by screw shafts 45; which shafts 45 vertically pass through nuts 46, and upon the turning of which shafts 45 a vertical movement of the nuts 46 is had, causing a lifting of an angle brace bar 47, connecting the rear ends of the runner frame 4, whereby a vertical movement of the rear end of the frame 4 is had, thereby rocking or tilting the frame upon its runner base.

In operation it is obvious that by lifting the doors 48, by any suitable means, such as door-control elements 49, and continuously feeding the furnace chamber 8 with the desired electrolyte or other element, that a continuous flow through a continuous flame is had, and out through a spout 50, delivering both the molten metal or other element together with the slag.

Claims:

1. In an electric furnace, a furnace chamber embodying upper and lower parts, which when assembled, produce a chamber which is substantially elliptical in longitudinal section and substantially circular in cross section, a plurality of spaced electrodes arranged within the chamber at the central longitudinal axis of the same, the end electrodes being spaced from the ends of the chamber for a distance equal to the radius of the cross section of the chamber, the ends of said electrodes terminating at the central longitudinal axis of the chamber, and co-acting electrode element arranged in the bottom of the chamber with its top adjacent to the central longitudinal axis thereof, said top being spaced from the ends of the electrodes, said electrode element having its sides inclined and converging upwardly whereby the major portion of the wall of the bottom of the chamber is uncovered.

2. In an electric furnace, a furnace chamber which is substantially elliptical in longitudinal section and substantially circular in cross section, said chamber having an inlet at one end and an outlet at the opposite end, a plurality of substantially vertical electrodes extending downwardly through the top of the chamber and having their free ends terminated adjacent to the central longitudinal axis of said chamber, the extremities of the end electrodes being spaced from the ends of said chamber for distances substantially equal to the radius of the transverse section of the chamber, co-acting electrode means arranged in the bottom of the chamber and extending longitudinally thereof, and means for turning the chamber upon its transverse axis so that the mate-

rial may be discharged from the outlet thereof.

3. In an electric furnace, a furnace chamber including upper and lower parts which when assembled produce a chamber which is substantially elliptical in longitudinal section and substantially circular in cross section, said chamber being provided with inlet and outlet openings at its ends, a longitudinal row of vertical spaced electrodes arranged within the chamber and having their inner ends terminating adjacent to the central longitudinal axis of the chamber, the inner ends of the outer electrodes being spaced from the end walls of the chamber for distances substantially equal to the radius of the transverse section of the chamber, an electrode element extending longitudinally of the chamber and co-acting with the first named electrodes, the electrode element tapering inwardly, and means whereby the chamber may be turned upon its transverse axis so that the outlet opening may be lowered for discharging the contents of the chamber.

In testimony whereof I affix my signature.

CHARLES H. GAGE.