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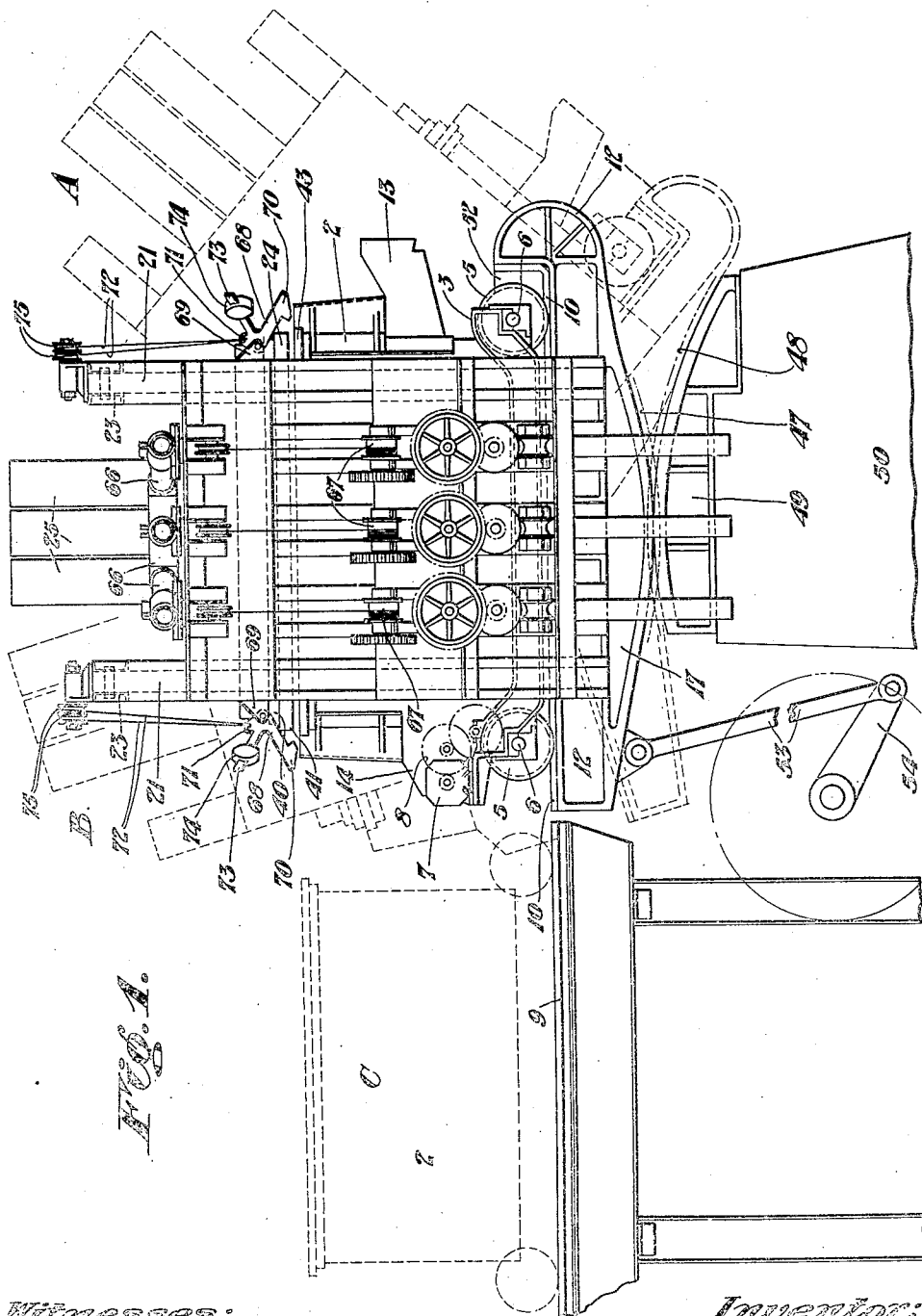
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ELECTRIC FURNACE

Filed Dec. 15, 1926

6 Sheets-Sheet 1



Witnesses:

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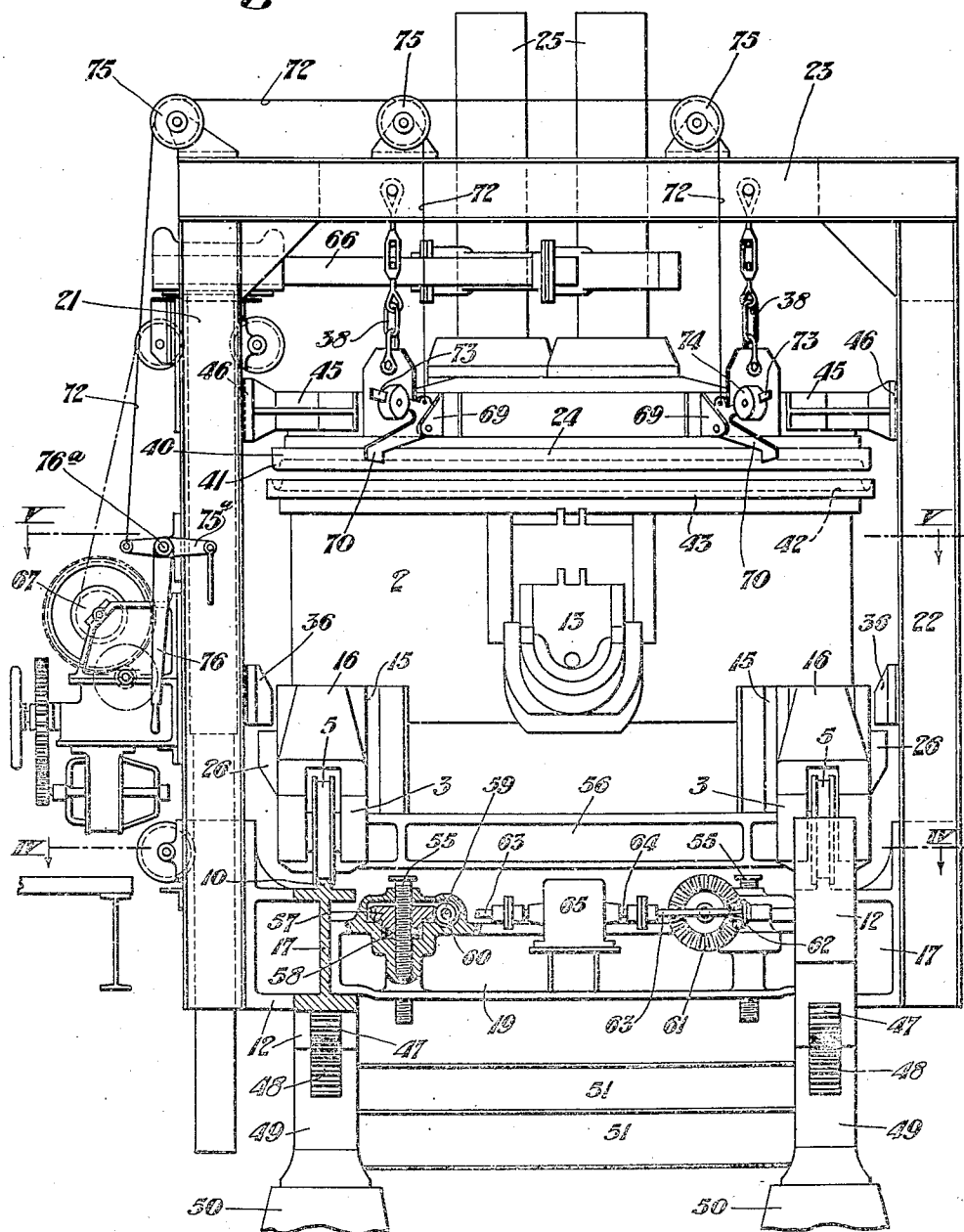
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ELECTRIC FURNACE

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6 Sheets-Sheet 2

*Fig. 2.*



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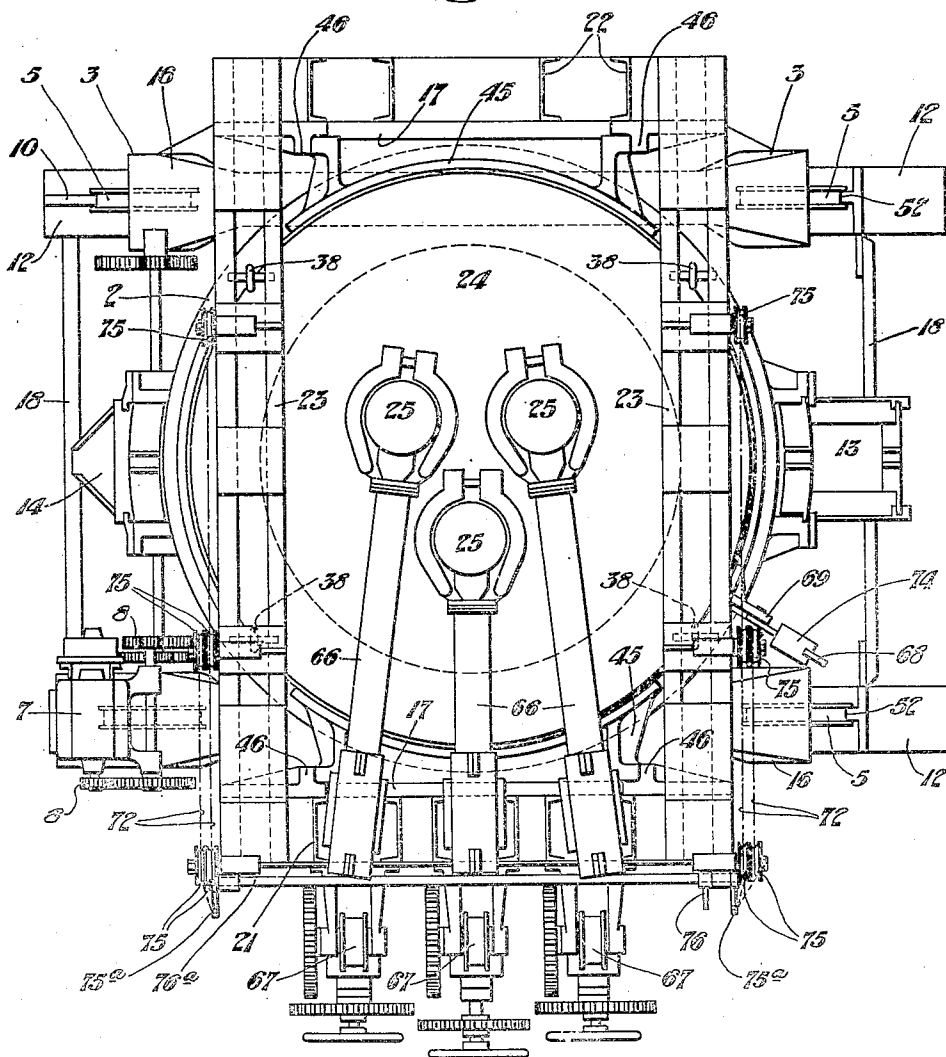
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6 Sheets-Sheet 3

*Fig. 5.*



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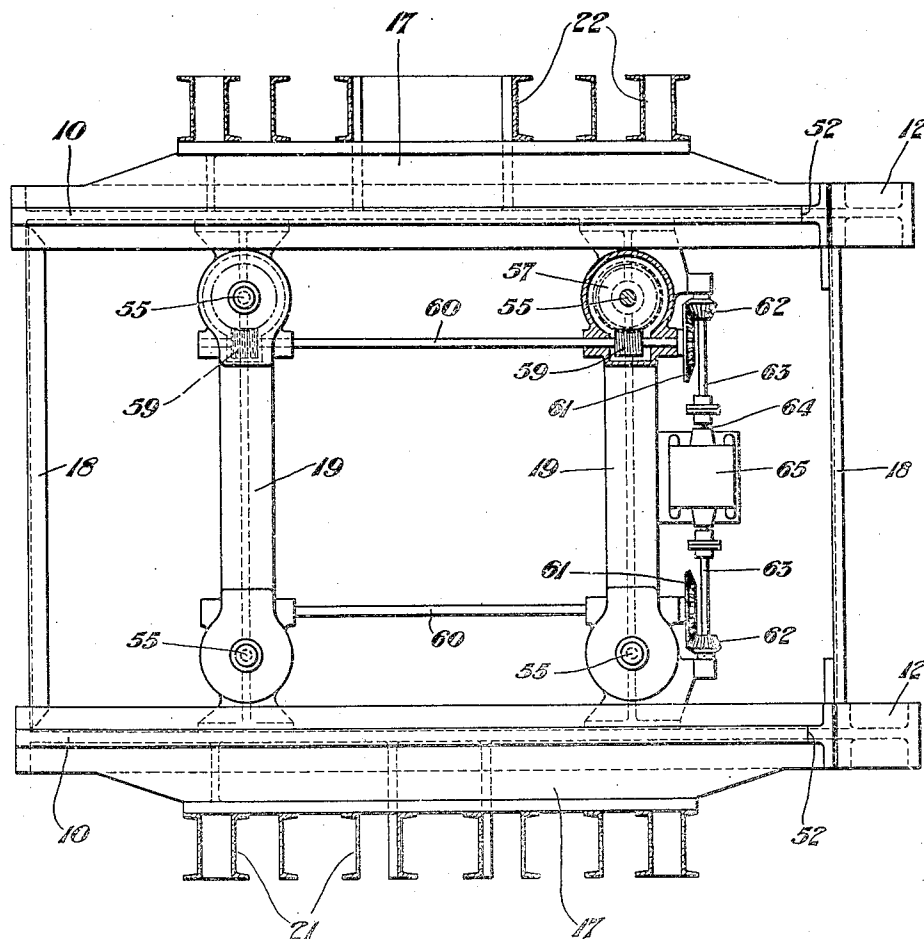
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ELECTRIC FURNACE

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6 Sheets-Sheet 4

*Fig. 4.*



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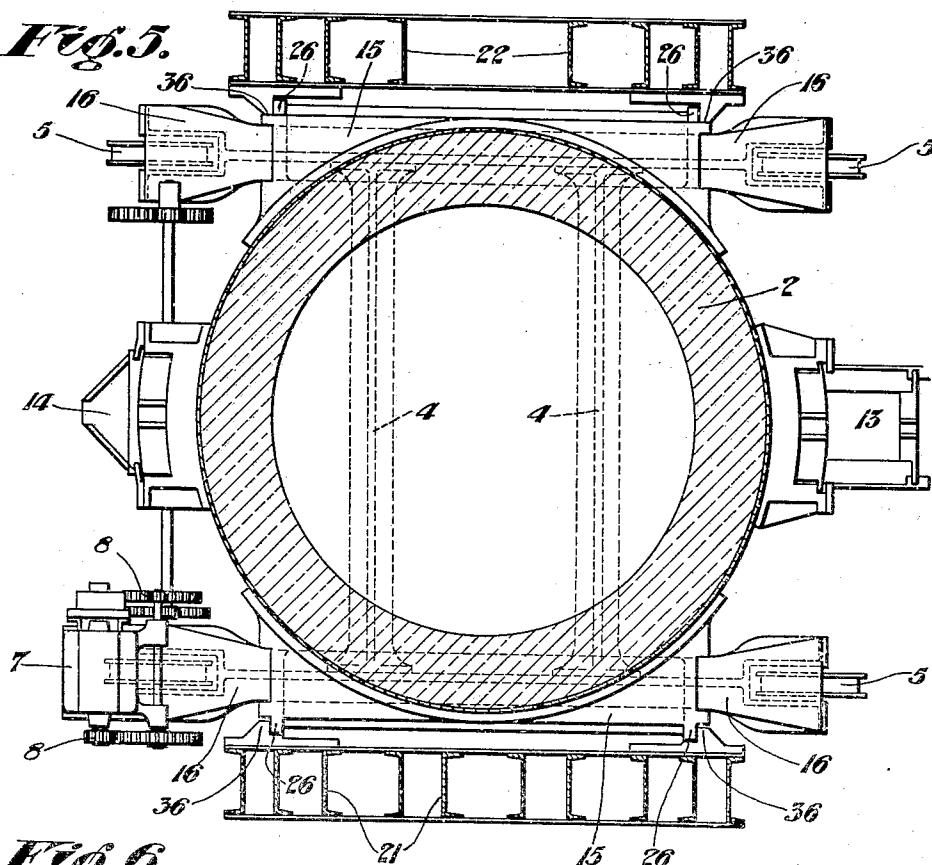
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ELECTRIC FURNACE

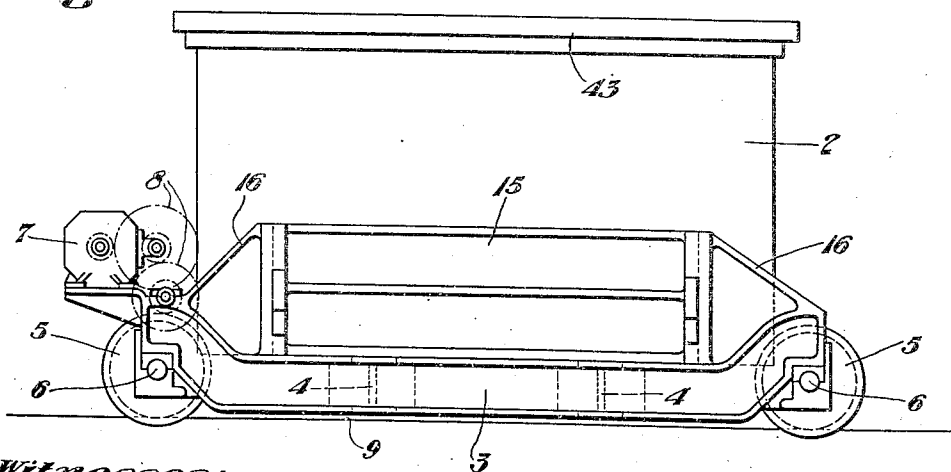
Filed Dec. 15, 1926

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**Fig. 5.**



**Fig. 6.**



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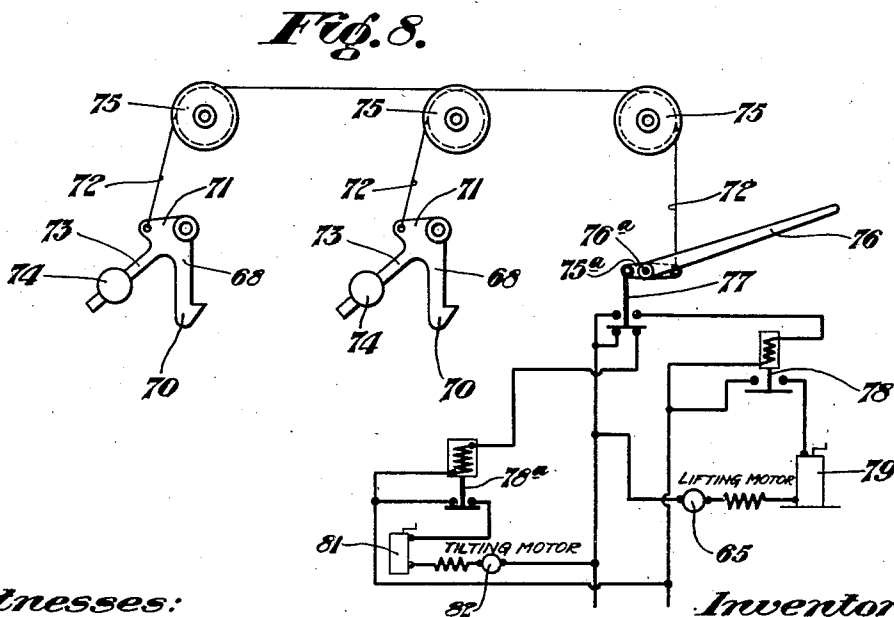
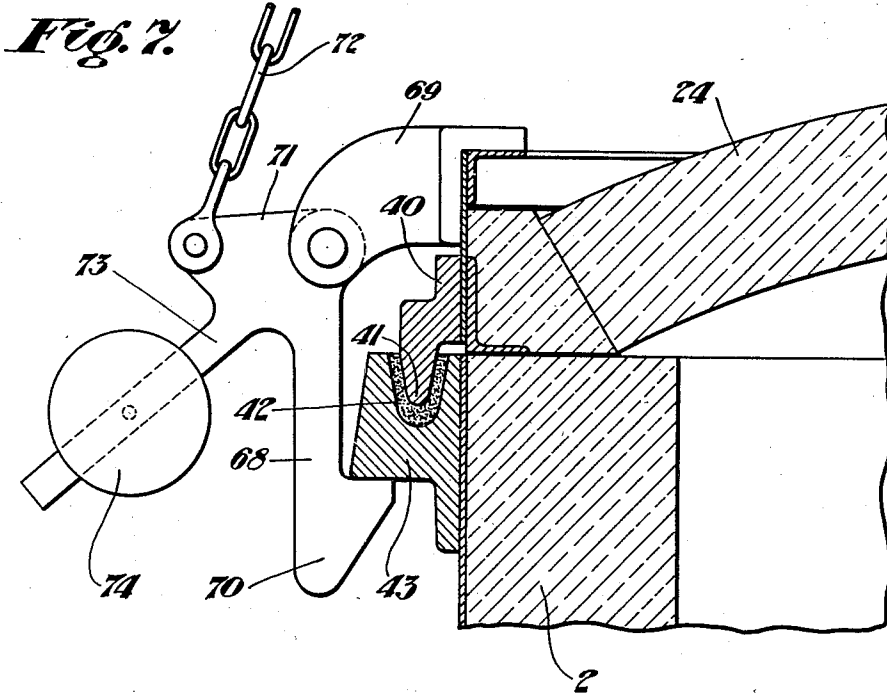
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ELECTRIC FURNACE

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6 Sheets-Sheet 6



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# UNITED STATES PATENT OFFICE.

JAMES L. BERNARD, OF BEAVER, PENNSYLVANIA.

## ELECTRIC FURNACE.

Application filed December 15, 1926. Serial No. 154,962.

This invention relates to electric furnaces, and has for its object the provision of a novel form of furnace in which the body may be withdrawn from beneath the roof for the purpose of charging or repairing the furnace.

Another object is to provide a furnace of this type with a novel form of joint between the roof and furnace body, whereby a seal will be automatically formed when the furnace roof and body are brought together, and the furnace body and roof will be held against lateral movement relative to each other.

Another object is to provide a novel means for locking the furnace body and roof together.

A further object is to provide a furnace having the novel design, construction and combination of parts hereinafter described and illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a side elevation of a furnace constructed in accordance with this invention, the body being shown in its lowermost position, and the charging, slagging and pouring positions being shown in broken lines.

Figure 2 is a front elevation.

Figure 3 is a plan view of the furnace.

Figure 4 is a sectional plan on the line IV—IV of Figure 2.

Figure 5 is a sectional plan on the line V—V of Figure 2.

Figure 6 is a side elevation of the furnace body.

Figure 7 is an enlarged detail of the joint formed between the furnace body and roof.

Figure 8 is a diagrammatic view illustrating the control circuit interlocked with the latch operating mechanism.

Referring more particularly to the drawings, the numeral 2 designates the furnace body, which is mounted on a suitable buggy consisting of side frames 3 connected together with cross channels 4, and provided with flanged wheels 5 on axles 6. An electric motor 7 is mounted on the buggy and connected by gearing 8 with the rear axles of the buggy for driving the same. The buggy is adapted to travel along a track 9 and onto the track section 10 carried by a tilting base or cradle 12.

The furnace body 2 is provided with the usual pouring spout 13, and slagging spout

14 together with the usual hearth fire brick lining, and doors (not shown).

Guide castings 15 are secured to the sides of the furnace body 2 and are grooved to engage with vertical guides 16, which are cast integral with and on top of the buggy side frames 3, and serve to hold the body 2 in proper position on the buggy, while permitting the body to be raised and lowered.

The tilting cradle 12 consists of side beams or rocker castings 17 connected together by channel members 18 and jack castings 19. A framework consisting of side frames 21 and 22 extending upwardly from the cradle 12 and joined by cross members 23 forms a housing for the furnace body to enter and support the furnace roof 24 and electrodes 25.

Lugs 26 are cast integral with the guide castings 15 and are adapted to engage with other lugs 36 mounted on the side frames 21 and 22 when the furnace body is raised to engage the roof, so as to lock the furnace body in position during the melting, slagging and pouring operations.

The furnace roof 24 is suspended within the furnace framework consisting of side frames 21 and 22 by flexible suspension members 38 and is provided with openings through which electrodes 25 pass into the furnace.

The roof 24 is provided around its bottom edge with a casting 40 having a flange 41 which is adapted to engage in a groove 42 in a casting 43, secured around the top of the furnace body 2, when the furnace body is raised to engage the roof. The groove 42 is adapted to be filled with sand so as to form a seal when the flange 41 enters the groove 42 and to aid in preventing any side-wise movement of the roof when the furnace is tilted.

On each side of the roof 24 are fastened guide castings 45, engaged with lugs 46 secured to the side frames 21 and 22. The castings 45 and lugs 46 serve to hold the roof in its proper position to register with the furnace body, and at the same time allow the roof to move vertically as required to insure a secure seating of the roof on the furnace body.

Racks 47 are cast integral with the rocker castings 17 and are adapted to mesh with racks 48 on convex foundation castings 49, set on a concrete foundation 50 and con-

nected together by channels 51 to maintain alinement.

Bumper blocks 52 are bolted or otherwise secured to the rocker castings 17 to stop the buggy on which the furnace body is mounted and center the furnace body with the roof 24.

The cradle 12 is connected by a rod 53 with a crank 54 which may be operated by any suitable electric motor operated means (not shown except for the motor which is indicated in the diagram of Figure 8 and designated by the numeral 82) to tilt the furnace.

The furnace body is adapted to be raised off the buggy and into sealing engagement with the roof by jacks 55 mounted on the jack castings 19, and adapted to engage castings 56 secured to the bottom of the furnace. The screw jacks 55 are provided with worm-wheel nuts 57 carried on anti-friction thrust bearings 58 and in mesh with worms 59 on shafts 60. The shafts 60 are provided with bevel gears 61 which are meshed with pinions 62 on drive shafts 63 coupled to the armature shaft 64 of a motor 65.

The electrodes 25 are supported by electrode holders 66 supported on the side frame 21, and are adapted to be raised and lowered by suitable mechanism indicated at 67. The mechanism 67 may be of any standard and well-known design and, therefore, is not shown in detail.

After the furnace body 2 is raised into sealing engagement with the furnace roof, the body and roof are adapted to be locked together by bell crank latch members 68 pivotally mounted on brackets 69 secured to the roof and having one arm 70 offset to form a latch portion adapted to engage under the casting 43 on the body 2, while the other arm 71 is connected to a chain, or other flexible operating member 72. The arm 71 is provided with an extension 73 carrying a counterweight 74 normally urging the latches into latching position.

The latches 68 are arranged in pairs on either side of the pouring spout 13 and slagging spout 14, and each of the latches are connected to chains or cables 72 which pass over sheaves 75, and are in turn connected to levers 75<sup>a</sup> on an operating shaft 76<sup>a</sup>. A hand lever 76 is keyed or otherwise mounted on the shaft 76<sup>a</sup> which carries the levers 75<sup>a</sup> and is adapted to be rocked to rotate the shaft 76<sup>a</sup> and rock the levers 75<sup>a</sup>, thereby operating the latches 68.

One of the levers 75<sup>a</sup> has its forward end operatively connected to an electric switch 77. The switch 77 is a double acting switch and is adapted to close a circuit to the coil of a solenoid operated switch 78 in one position, and a second circuit to the coil of a second solenoid operated switch 78<sup>a</sup> in its other position, so that when the lever 76 is

operated to rotate the shaft 76<sup>a</sup> and rock levers 75<sup>a</sup> to release the latches 68, the circuit to the coil of switch 78 will be closed and when the lever 76 is operated to move the latches into locking position the circuit to the coil of the switch 78<sup>a</sup> will be closed. Closing of the circuits to the coils of the switches 78 and 78<sup>a</sup> causes said switches to be closed. Closing of the switch 78 completes a circuit through the controller 79 to the furnace raising and lowering motor 65, while closing of the switch 78<sup>a</sup> completes a circuit through the controller 81 to the tilting motor 82.

From the above, it will be readily seen that the switch 77 serves as an interlock and prevents the lowering of the furnace body until the latches 68 are released, and also prevents the tilting of the furnace body until the latches 68 are in locked or engaged position.

The operation of the furnace is as follows—

Starting with the furnace body 2 in the charging position, as shown in broken lines at C in Figure 1, the charge is placed on the hearth; the motor driven buggy is then operated to move the furnace body onto the cradle 12 directly under the suspended roof 24. The motor 65 will then be energized to operate the jacks 55 and raise the furnace body into sealing engagement with the roof 37. The elevated furnace body 2 and roof 37 will be locked against movement relative to the cradle 12 by the lugs 26 and 36. The weight of the furnace body and roof is carried by the jacks 55.

The electrodes 25 will then be lowered to melt the charge, and after the charge is melted, the electrodes are raised and the cradle 12 is rocked to slag and then in the reverse direction to pour the melted charge. After the metal has been poured, the cradle will be returned to normal position, the latches 68 will be released, the jacks lowered and the furnace body 2 and buggy run off the cradle to charging position.

While I have shown and described one specific embodiment of my invention, it will be understood that I do not wish to be limited thereto, since various modifications may be made without departing from the scope of my invention as defined in the appended claims.

I claim:

1. An electric furnace comprising in combination, a tilting base having track members thereon, a wheeled carriage movable on the track members of said tilting base, a supporting frame on said tilting base, a furnace roof suspended from said frame, a furnace body adapted to be supported on said wheeled carriage for movement into and out of said frame, a plurality of jacks on said tilting base adapted to raise said furnace



body into contact with said roof, and means on said frame for guiding said furnace body.

2. An electric furnace comprising in combination, a tilting base having track members thereon, a wheeled carriage movable on the track members of said tilting base, a supporting frame on said tilting base, a furnace roof suspended from said frame, a furnace body adapted to be supported on said wheeled carriage for movement into and out of said frame and free to move vertically relative thereto, elevating means on said tilting base for raising said furnace body into contact with and lowering said furnace body out of contact with said roof, and means on said frame for guiding said furnace body and roof.

3. An electric furnace comprising in combination, a tilting base having track members thereon, a wheeled carriage movable on the track members of said tilting base, a supporting frame on said tilting base, a furnace body adapted to be supported on said wheeled carriage for movement into and out of said frame, a furnace roof suspended from said frame and free to move vertically relative thereto, elevating means on said tilting base for raising said furnace body into contact with and lowering said furnace body out of contact with said roof, and means for detachably locking said furnace body and roof together.

4. An electric furnace comprising in combination, a tilting base having track members thereon, a wheeled carriage movable on the track members of said tilting base, a supporting frame on said tilting base, a furnace body adapted to be supported on said wheeled carriage for movement into and out of said frame, a furnace roof suspended from said frame and free to move vertically relative thereto, elevating means on said tilting base for raising said furnace body into sealing contact with and lowering said furnace body out of contact with said roof, and means on said frame for guiding said furnace body and roof.

5. An electric furnace comprising in combination, a tilting base having track members thereon, a wheeled carriage movable on the track members of said tilting base, a supporting frame on said tilting base, a furnace body adapted to be supported on said wheeled carriage for movement into and out of said frame, a furnace roof suspended from said frame, electrodes supported on said frame and movable vertically into and out of said furnace through said

roof, a plurality of power operated jacks on said tilting base adapted to raise said furnace body into sealing contact and lower said furnace body out of contact with said roof, and means on said furnace body adapted to associate with other means on said frame to guide said furnace body.

6. An electric furnace comprising in combination, a tilting base having track members thereon, a wheeled carriage movable on the track members of said tilting base, a supporting frame on said tilting base, a furnace body adapted to be supported on said wheeled carriage for movement into and out of said frame, a furnace roof suspended from said frame, a grooved flange extending outwardly from the upper edge of said furnace body, the groove of said flange being adapted to contain sand, a sealing flange projecting downwardly from said roof, and means on said tilting base adapted to raise said furnace body and cause said sealing flange to enter and seal in the sand in said groove flange on said body.

7. In an electric furnace, a furnace body, a furnace roof separate from said body, said furnace body being movable vertically, power means for moving said furnace body, means for locking said furnace body and roof together, and means for releasing said locking means, said releasing means being interlocked with said power means for moving said furnace so as to compel the operation of said releasing means prior to the operation of said furnace moving means.

8. An electric furnace, comprising in combination, a tilting base, power means for tilting said base, a furnace body on said base, a furnace roof separate from said body, said furnace body being movable vertically, power means for moving said furnace body vertically, means for locking said furnace body and roof together, and means for moving said locking means into locked and unlocked positions, and means for interlocking said last named means with said power means for tilting said base and said power means for moving said furnace body, so as to render said power means for tilting said base operative only when said locking means are in locked position and to render said power means for moving said furnace body operative only when said locking means are in unlocked position.

In testimony whereof, I have hereunto signed my name.

JAMES L. BERNARD.