M. DAVIS.

PORTABLE FURNACE.

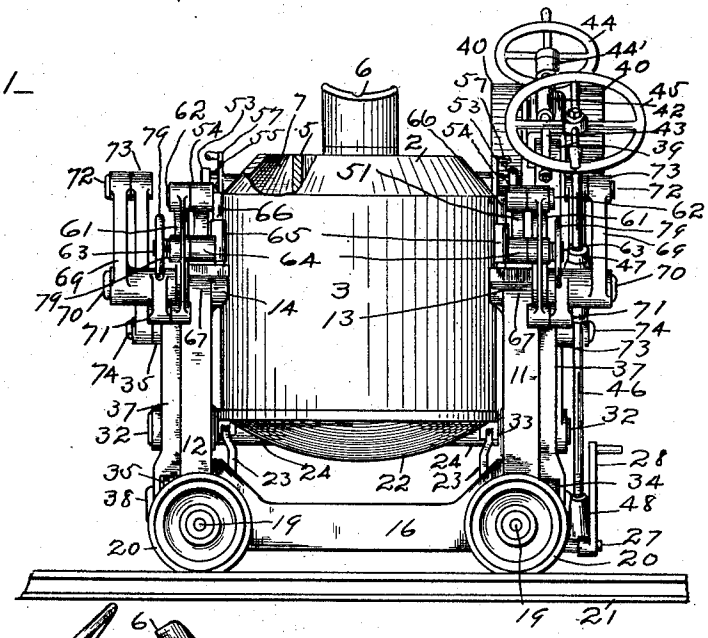
APPLICATION FILED DEC. 22, 1911.

1,025,563.

Patented May 7, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



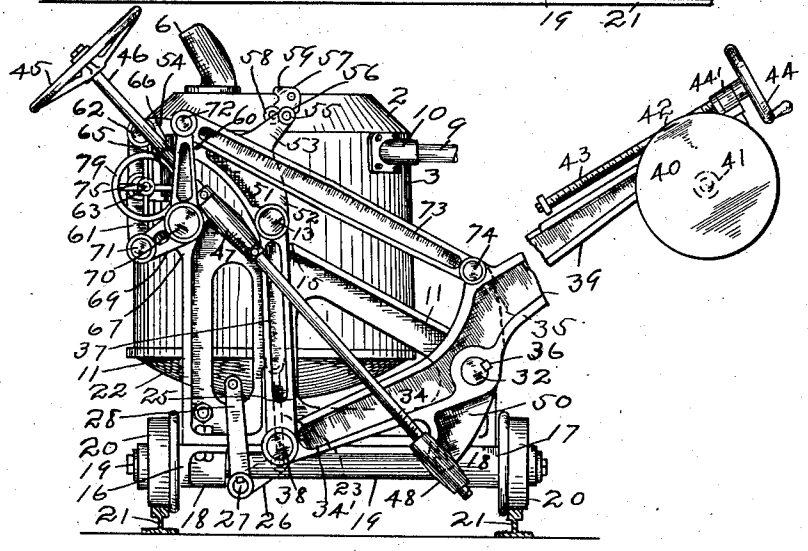


Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

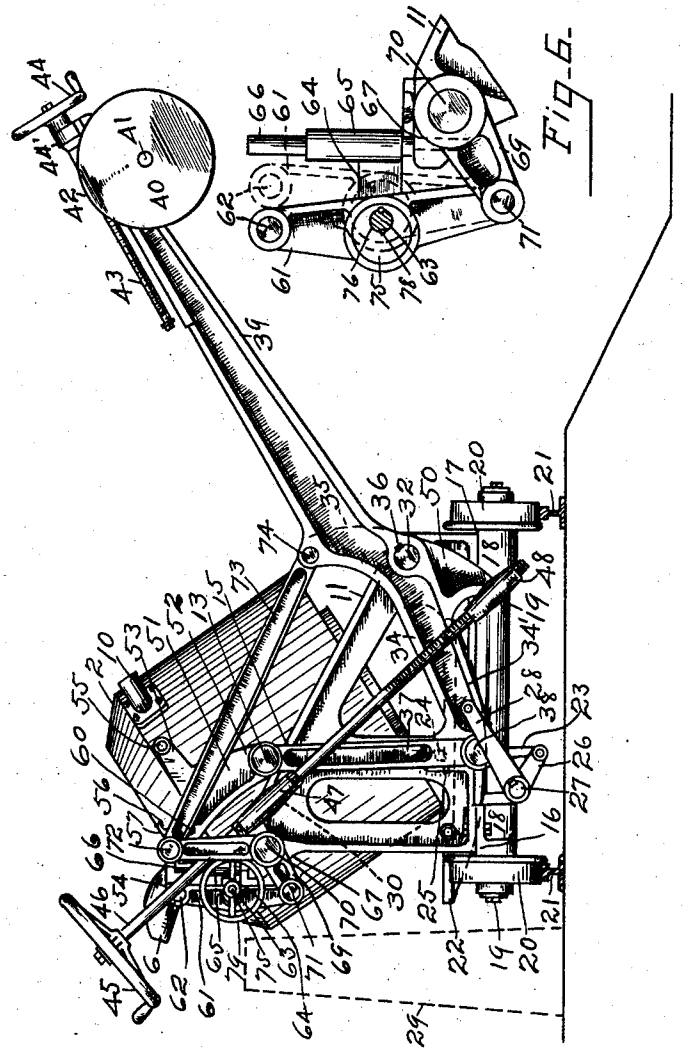

Fig. 5.

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3 SHEETS—SHEET 3.

Fig. 5.

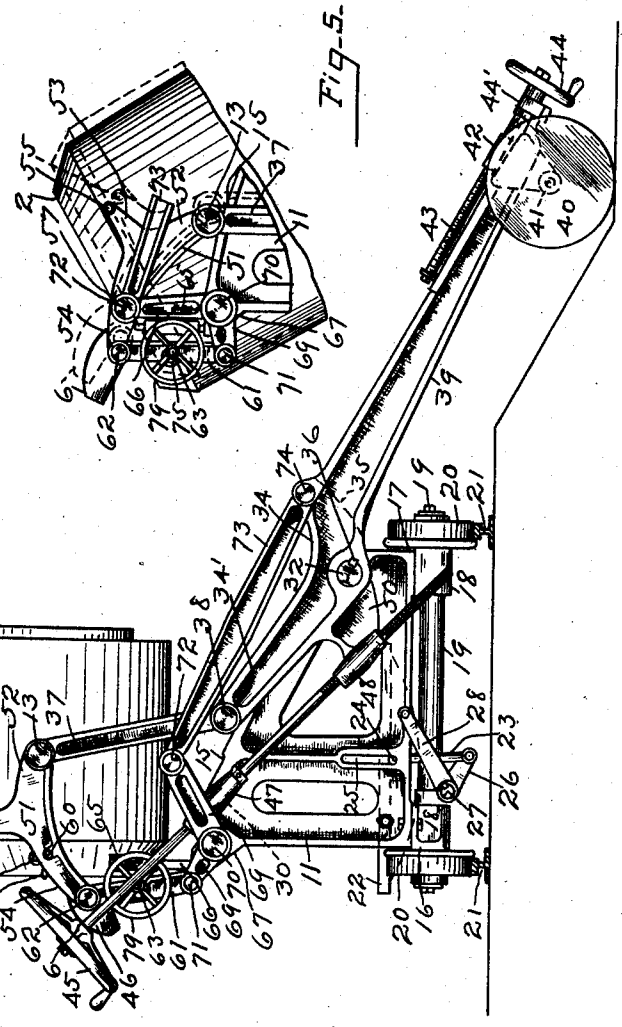

Fig. 4.

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PORTABLE FURNACE.

1,025,563. Specification of Letters Patent. Patented May 7, 1912.

Original application filed July 13, 1911, Serial No. 638,296. Divided and this application filed December 22, 1911. Serial No. 667,302.

To all whom it may concern:

Be it known that I, MERRILL DAVIS, a citizen of the United States, residing at Watertown, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Portable Furnaces, of which the following is a specification.

This invention relates to improvements in portable furnaces or crucibles, designed for use in melting various kinds of metals, and the invention relates particularly to a tiltable and rotatable furnace adapted for pouring the molten metal directly into the molds.

The object of the invention is to provide a novel, simple and convenient furnace of the class, which is capable of being fired by gas, oil, coke or other suitable fuel, and the firing controlled by either natural or mechanical draft, and a particular object is to provide adjustable means for varying the center at which the pouring spout may be held for pouring the metal into the molds.

The various features and parts of the invention will be understood from the detailed description which follows, and by reference to the accompanying drawings, which form a part of this specification, and in which:—

Figure 1 is a front elevation of the complete device; showing the furnace in erect position ready for charging and firing; Fig. 2 is a right side elevation of the same; Fig. 3 is a right side elevation; showing the furnace tilted forward for skimming the metal; also showing the first step in the pouring operation; Fig. 4 is a similar elevation; showing the furnace elevated for pouring its contents into the mold; Fig. 5 is a view; showing the mechanism for adjusting the furnace for varying the pouring center; Fig. 6 is an enlarged detail view, partly in section; showing the eccentric for varying the pouring center.

In the drawings, 2 represents a furnace for melting metals of various kinds, consisting of a cylindrical outer body or jacket 3, which may be made of any suitable material, and may be lined in any suitable manner for withstanding a high degree of heat, and a crucible or melting-pot 5, having a pouring spout 6, arranged at one side of the mouth of the jacket 3. The crucible may be positioned and held in any suitable manner, but it is preferably arranged concentrically in the body 3, so as to provide a combustion chamber 7, which surrounds the crucible. Any suitable fuel, as gas, coke or oil may be employed for heating the furnace, and the firing may be effected by natural draft applied in the usual manner, or by mechanical draft applied by means of a pipe 9, and a suitable blower (not shown). The pipe 9 is preferably detachably connected to the jacket 3 by means of a thimble or sleeve 10. When coke or other solid fuel is employed for heating the furnace, it is placed in the chamber 7, and burned there under forced draft, as explained.

The self-contained furnace 2 is pivotally mounted between vertically arranged frame sections 11 and 12, and is rendered tiltable and rotatable when supported by the frame in the usual manner, by means of oppositely facing side-trunnions 13 and 14, the said trunnions being rigidly secured to the jacket 3. When the furnace stands upright, which is the charging and firing position, the weight of the furnace and certain of the operating parts is borne by the frame sections 11 and 12, and at this time the trunnions 13 and 14 rest in shallow recesses or bearings 15, which are formed in the sloping upper edges of the said sections. While the furnace is in the upright position as shown in Figs. 1 and 2, and supported by the frame sections 11 and 12, it may be tilted or rocked partly forward and then backward to and from the positions shown in Figs. 1 and 3, by hand, without disturbing any of the other operating parts of the device. The frame sections 11 and 12 may be mounted upon a truck bed, which comprises side rails 16 and 17, which are provided with perforated lugs 18, to receive the axles 19, upon which are journaled wheels or rollers 20, the axles preferably being rigidly held in the boxes 18, and the wheels turning on the axles. The complete machine when mounted upon the truck, is portable or movable from one place to another by means of a pair of track-rails 21.

22 represents a vertically movable pan-like bottom, which is supported concentrically beneath the furnace, and above the truck frame, by a pair of levers 23, the upper ends of which pivotally engage trunnions 24 which are carried by, and project from, the

opposite sides of the pan 22. The ends of the trunnions 24 play in, and are guided by, vertical slots 25, which are formed in the frame sections 11 and 12, directly below the bearings 15. The lower ends of the levers 23 are pivoted to crank-arms 26 carried by a rocking shaft 27, which may be journaled in a suitable manner to the frame sections 11 and 12, and to one end of which is attached a hand-crank 28, by means of which the pan 22 is raised and lowered (see Figs. 2, and 3). The pan 22 is employed for closing the usual draft openings in the bottom of the furnace 2, during the charging and firing intervals, and also aids in holding the furnace rigidly in upright position. Before tilting the furnace on the trunnions 13 and 14, the bottom 22 must be dropped to its lowest position, so as to permit the lower end of the furnace to swing freely in the frame.

I am aware that tiltable and rotatable melting furnaces have long been in use. Under constructions heretofore devised I have found that the forwardly projecting parts of the frame may interfere with or strike the molds adjacent to the one into which the metal is being poured, and that a fixed and unvarying pouring center tends to limit the machines to but one line of casting, and in order to render furnaces of the class more universal and practical for general casting work, it is desirable and necessary to provide means for adjusting and varying the pouring center, so as to adapt the furnaces for pouring molten metal into a mold, or into a group or gang of molds, wherein the receiving vents cannot always be located at a common distance from the furnace, or at the same relative distance from the pouring center fixed by the aforesaid journals. To that end, I have eliminated from previous structures the feature of a fixed or constant pouring center, and substituted therefor a variable axis about which the furnace may be rotated, together with a series of novel operating parts, which are controlled by simple adjusting means, whereby the tip of the pouring spout may be readily and quickly brought into, and temporarily held at, any desired center or point, and the furnace thereafter rotated around the said axis while discharging the contents of the crucible into the molds. The details of construction and operation of the elevating, rotating and adjusting parts will now be described.

The furnace 2, as explained, is normally supported in its upright position, by the trunnions 13 and 14, when the latter are seated in the bearings 15 of the frame sections, and while in the latter position, the furnace may be tilted, by hand, either forward or backward, for the purpose of charging, firing, skimming, or cleaning the crucible, as well as for pouring the molten metal into ladles or like receptacles. After the furnace has been charged and fired sufficiently to melt the metal, it may be trundled along on the tracks 21 until it comes opposite a mold, as 29. As soon as the furnace is brought opposite a mold, and before the metal is poured, it is usual to skim the metal in the crucible. To do this properly, the furnace is tilted forwardly on the trunnions 13 and 14, from the position shown in Figs. 1 and 2, to that shown in Fig. 3. This is also the first step in the pouring operation. The furnace will then be held in the inclined position, principally by gravity, but also partly by a pair of catches which will later be described.

The elevating mechanism consists of the following parts: 32 represents a rocking shaft which is journaled in bearings 33 formed in the rear-end portions of the frame sections 11 and 12, the said shaft projecting beyond the said sections at each end to receive elevating levers 34 and 35, which are rigidly connected to said shaft by keys 36. The levers 34 and 35 are substantially bell-cranks, and their forward ends or arms pivotally connect with like links or rods 37, by pins 38. The upper ends of the links 37 are pivotally connected to the outer ends of the trunnions 13 and 14 of the furnace. The lever 34 is provided with a relatively long rearwardly projecting arm or extension 39, upon which is adjustably mounted counterweights 40, which are pivoted by a pin 41, to a guide 42, which is reciprocable on the said arm, by means of a screw 43, which is journaled in a lug 44′ carried by the end of the arm 39, and a hand-wheel 44. The screw 43 connects in the usual manner to a threaded portion of the guide 42 for operating the same. The counterweights 40 are provided for balancing the weight of the furnace, for lightening the work and strain of elevating and lowering the furnace.

The elevating of the furnace during the pouring intervals, is accomplished by hand-power, by means of a hand-wheel 45, which is fixed rigidly on one end of a screw 46. The rod or screw 46 is journaled to a projection 30 of the frame section 11, by a sleeve or part 47, which holds the screw from longitudinal movement, while the threaded free end of the screw 46 pierces a swivel-nut 48, which is pivoted by a pin 49 to a depending lug or arm 50 of the lever 34. The turning of the hand-wheel 45 in the right direction, swings the end 34′ of lever 34 upwardly, thereby rocking shaft 32 and the lever 35 in the direction for raising the links 37, for breaking the connection between the trunnions 13 and 14 and the frame, and elevating the furnace for pouring the metal into the molds. By the use of the screw 46, the elevating of the furnace

may be effected in a steady, gradual and easy manner, and likewise with safety and positiveness.

To properly support and control the furnace during the elevating and pouring operations, I provide the following co-acting parts: 51—51 represent like levers, each having three arms, as 52, 53 and 54, the arms 52 being bored out for affording bearings to receive the trunnions 13 and 14 of the furnace, and these levers are positioned between the furnace and the links 37, as best seen in Fig. 1. The arms 53 of levers 51 extend upwardly and rearwardly and are fitted at their free ends with inwardly projecting pins or studs 55, which are adapted to be engaged by hooks 56 of a pair of like catches 57, for locking and holding the furnace in the upright position shown in Figs. 1 and 2. The anchor-shaped catches 57 are pivoted to the opposite top sides of the furnace by means of pins 58. When the furnace is tilted forwardly for skimming, and for placing the furnace in the first pouring position, the opposite hooks 59 of the catches 57 may be thrown into engagement with pivot-pins 60 carried by arms 54 of levers 51, for locking and holding the furnace in the inclined position shown in Fig. 3. In the present device, there are no other supports provided for the top of the furnace, while the latter is in the inclined or elevated and pouring positions, than the catches 57, and the pins 60 carried by the levers 51. The arms 54 of the levers 51 are pivotally connected to corresponding vertically disposed double-levers or walking-beams 61, by pins 62. The beams 61 are pivoted between their ends by pins 63, to arms 64 of like guide-blocks 65, which are held in place by, and are movable vertically upon, a pair of studs or guide-rods 66, which are rigidly set in overhanging portions 67 of the frame sections 11 and 12. 69 represents like bell-crank levers, which are pivoted to the overhanging portions 67 of the frame by pins 70, the short arms of said levers being pivoted to the lower ends of the levers or beams 61 by pins 71; while the upper ends of the longer arms of the levers 69, are pivoted by pins 72, to like links or bars 73, which extend rearwardly and downwardly on the opposite sides of the furnace, and their rear ends connect in a pivotal manner to the levers 34 and 35, by pins 74.

Assuming that the furnace is in the tilted position, ready for skimming, and elevating for pouring the metal into the molds, and also that the screw 46 is provided with right-hand threads, to elevate the furnace from the position shown in Fig. 3 to that shown in Fig. 4, the operator should rotate the hand-wheel 45 to the right. This will gradually effect the raising of the forward ends of the levers 34 and 35, and also the links 37, which will lift the furnace clear of the frame sections at 15. As the elevating operation continues, the weight of the top or forward end of the furnace is supported by the catches 57 and the pins 60 of the levers 51, while the bottom or rear end of the furnace is supported by trunnions 13 and 14. The trunnions 13 and 14 being positioned a considerable distance rearwardly of a transverse line drawn through the tip of the pouring spout, the natural tendency is to turn the pouring spout in an arc corresponding to the swing of the furnace on the said trunnions, thereby producing a constantly changing center which would effect the depositing of the metal at different points, instead of at the same point, as desired. In the present device I avoid this, and effect the pouring of the metal at the same point throughout an entire pouring operation, although no fixed mechanical axis is provided in line with the pouring spout.

The following will serve to explain the working of the parts: At the start of the elevating operation, as soon as the trunnions 13 and 14 become free from the bearings 15 of the frame, the upward movement of the forward arms of the bell-crank levers 34 and 35, and the links 37, forces the furnace upwardly, and at the same time, the short arms of the levers 34 and 35 pull backwardly on the links 73, which connect with the long arms of the bell-cranks 69, tilting said arms rearwardly, and lifting the short arms of the cranks 69, which elevate the walking-beams 61. The upward movement of the beams 61 carries with them the guide-blocks 65, which are slidable on the studs 66, which are fixed upon the overhanging portions 67 of the frame. The levers 51 having their forward arms 54 connected to the upper ends of the beams 61 also move upwardly to the same extent as the guide-blocks and beams, and the top or forward end of the furnace, being supported entirely by engagement of the catches 57 with the pins 60 carried by the levers 51, also moves upwardly. The upward movement of the ends 34′ of levers 34 and 35, causes a rearward movement of their vertically disposed arms which carry the rearward ends of levers or bars 73 by means of pins 74. The forward ends of bars 73 being connected by the pins 72 to the vertically disposed arms of the bell-cranks 69, will cause said arms to move in a rearward direction, corresponding to the movement of the levers 34 and 35. The bell-cranks 69 being pivotally mounted on the studs 70, their short arms which carry the lower ends of beams 61, by means of pins 71 will describe concentric upwardly and forwardly extending arcs, the centers of which are the pins 70. The centers of beams 61 being piv-

otally mounted in the guide-blocks 65, and thereby restricted to vertical movements by means of the guide-pins 66, will move upwardly in a vertical path which will cause the upper ends of beams 61, which carry ends 54 of levers 51 to describe upwardly and rearwardly extending arcs, the radius and path of which are governed by the disposition of the points or centers 62—76—71 of the beams 61. The point from which the metal is to be poured, having been decided upon, the centers 62—76—71 of beams 61 are so disposed as to cause the upper ends of said beams to describe rearwardly and vertically extending arcs, the centers of which are located on a line passing transversely through the point of the spout 6, when the furnace is tilted forwardly, as shown in Fig. 3, and the tip of the pouring spout will then be held at the point or center from which the metal is to be poured. The forward ends 54 of levers 51, thus are made to travel in arcs around the pouring point 6 (Figs. 3 and 4,) the supporting points of the furnace, during the pouring operation, comprising the trunnions 13 and 14 and the pins 60, all of which are carried by and are movable with the levers 51, must travel in relatively large arcs around the same center 6. The furnace during the pouring operations is supported at four points, namely, by the trunnions 13 and 14 and by the pins 60, all of which supports are disposed eccentric to the transverse axis or center upon which the pouring spout revolves.

The foregoing is substantially the construction and operation of parts forming the subject of my application filed July 13, 1911, Serial No. 638,296, of which the present is filed as a divisional application, the purpose of the present application being to cover more particularly the feature of invention which provides for the adjustment for varying the pouring axis, or, in other words, providing different centers.

To adjust the device for providing different centers within a certain range, so as to adapt the furnace for pouring the metal into molds, wherein the receiving vents vary as to distance laterally from the furnace, as well as from the tracks upon which the furnace travels, I provide the following parts: The walking-beams 61 are bored out midway between their ends to receive bushings or journals 75, (see Figs. 5 and 6) which in turn are bored eccentrically, as at 76, to receive the pins or shafts 63, to which the bushings are rigidly connected by keys 78, and the shafts 63 are fitted with hand-wheels 79, by means of which the bushings are rotated, for shifting the levers or beams 61 toward or away from the guides 65, for varying the pouring point or center of the spout 6, as described. A graduated dial or like device (not shown) may be employed in connection with the hand wheel 79, for denoting the desired variations of the pouring centers. In order to operate the eccentric bushings or journals 75, for shifting the spout 6 for pouring the metal from a new center, the furnace must first be elevated sufficiently to break or free the connections between the trunnions 13 and 14 and the frame sections 11 and 12. When the furnace is thus released from the frame the beams 61, and the several levers and cranks connected with said beams may all be shifted and adjusted relatively, in a quick and ready manner, by simply turning the hand-wheels 79, as described.

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

1. In combination, a tiltable or rotatable furnace body having a pouring spout, and a pouring axis on a transverse line through the point of the pouring spout, means for tilting the furnace body around the pouring axis, and means for adjusting the furnace body for varying the pouring axis.

2. In combination, a tiltable or rotatable furnace body having a pouring spout and a pouring axis on a transverse line passing through the tip of the pouring spout, means for rotating the furnace body around the pouring axis, and means for adjusting the pouring spout, for pouring the metal from a number of different fixed centers.

3. In combination, a furnace body journaled upon trunnions having a pouring spout and a pouring axis transversely in line with the point of the pouring spout, elevating means for tilting the furnace body around the pouring axis, and means for adjusting and setting the pouring spout for pouring the metal at different fixed points.

4. In combination, a furnace body mounted on trunnions, said furnace body being provided with a pouring spout and with pivoting parts in line parallel with a transverse axis passing through the point of the pouring spout, means for rocking the furnace body on the trunnions, independent means for lifting and tilting the furnace body upon the pivots aforesaid, and means for adjusting the point of the pouring spout for pouring the metal at different fixed points.

5. In combination, a furnace body mounted on trunnions, said furnace body being provided with a pouring spout and with pivoting parts in line parallel with a transverse line passing through the point of the pouring spout, means for rocking the furnace body on the trunnions, independent means for lifting and tilting the furnace body upon the pivoting parts, and adjustable means for varying the center from which the metal is poured.

6. In combination, a self-firing furnace, and a carriage for supporting the furnace,

the furnace mounted on trunnions and having a pouring spout, a pair of levers pivoted at one end to the trunnions, the other ends pivoted to walking-beams supported by the carriage, pivots carried by said levers and catches carried by the furnace for supporting the top of the furnace when rocked into pouring position, elevating means for tilting the furnace upon said pivots, means for elevating the walking-beams for holding the point of the pouring spout on a fixed center, and means for adjusting the walking-beams for varying the center upon which the point of the spout revolves.

7. A furnace structure comprising a furnace body mounted upon trunnions, said furnace body provided with a pouring spout and with pivoted catches in line vertically with said trunnions, pins carried by levers journaled to said trunnions, means for tilting the furnace body for bringing the catches into engagement with said pins, elevating means engaging the trunnions to lift the furnace body upon said pins as a center, and means for holding the pouring spout on an independent center during the elevating operation.

In testimony whereof I affix my signature in presence of two witnesses.

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