No. 716,750. Patented Dec. 23, 1902.

A. PATTERSON.

MACHINERY FOR CHARGING STEEL OR LIKE FURNACES.

(Application filed Aug. 9, 1902.)

(No Model.) 6 Sheets—Sheet 1.

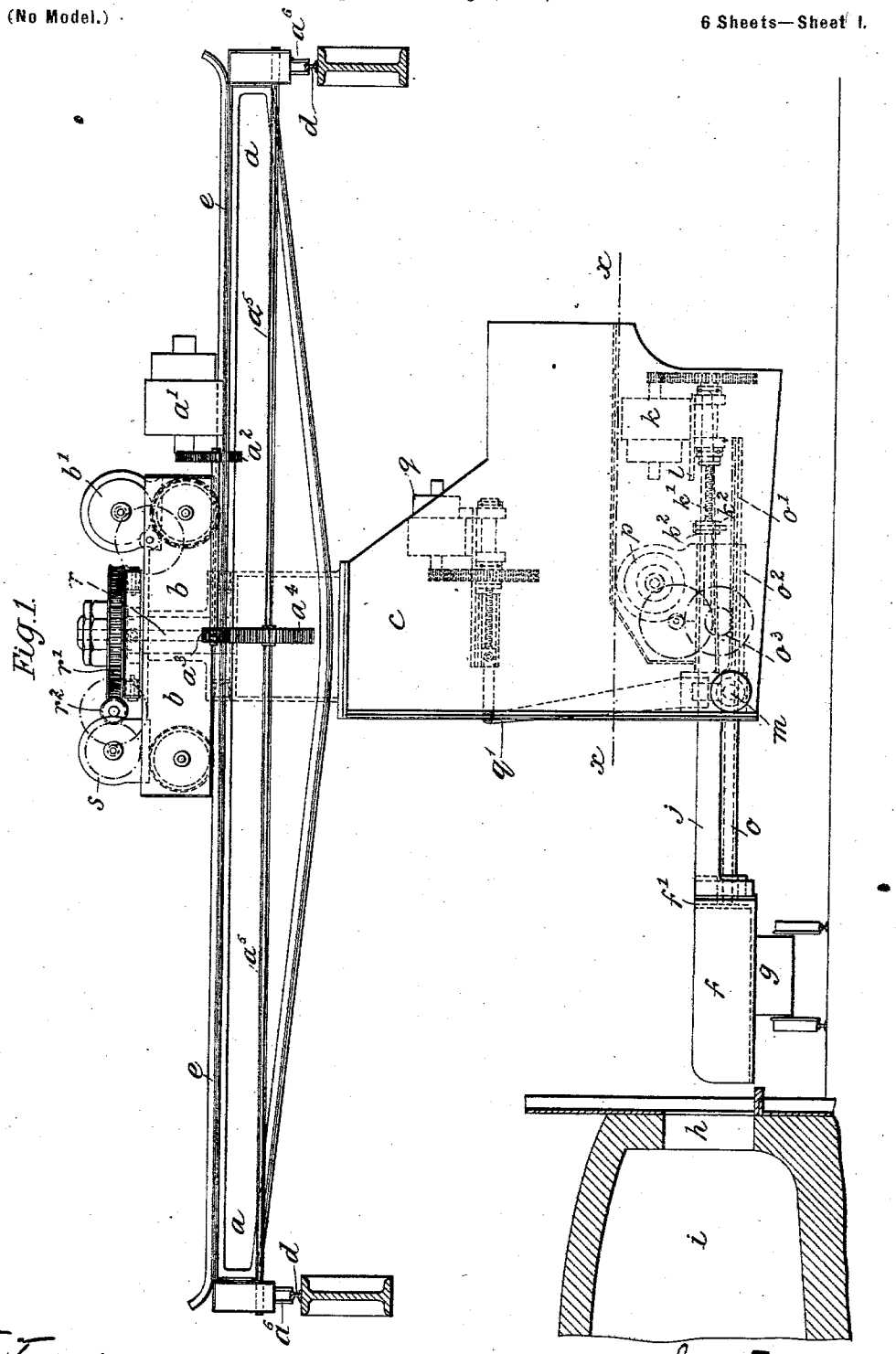


Fig. 1.

Witnesses,
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Fig. 2.

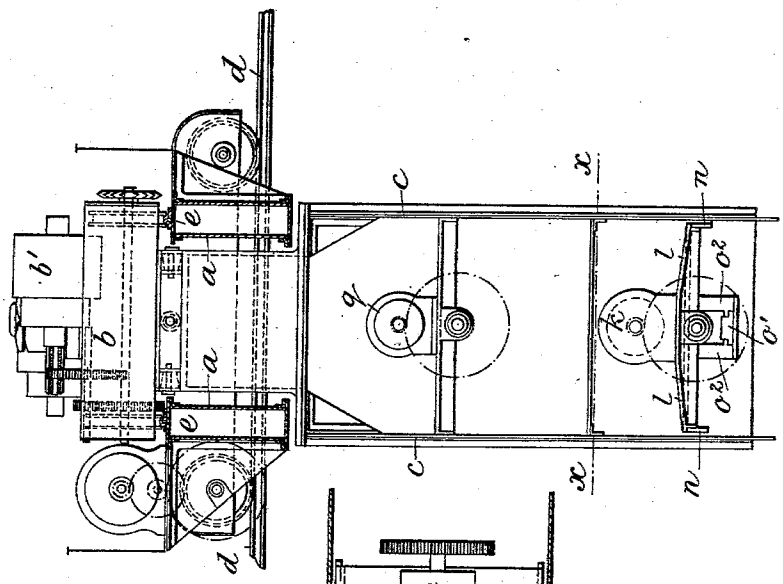
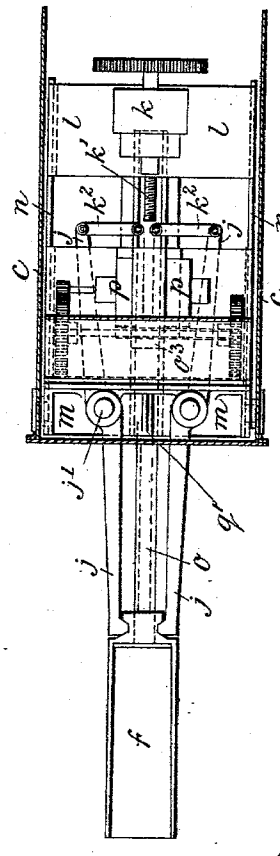


Fig. 3.



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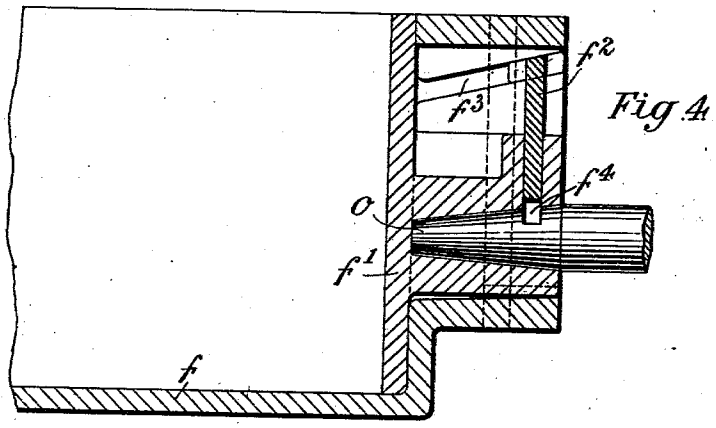


Fig. 4

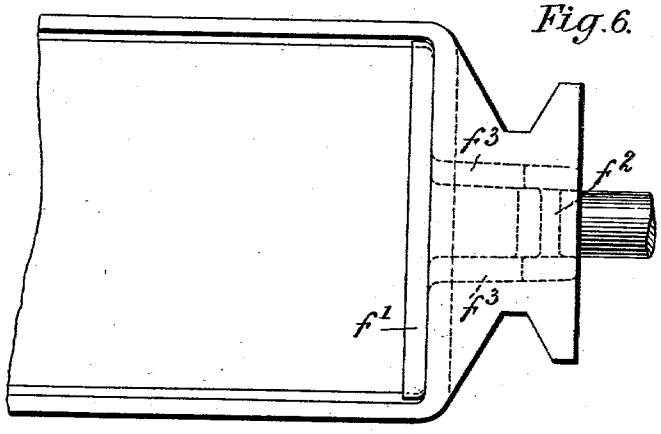


Fig. 6.

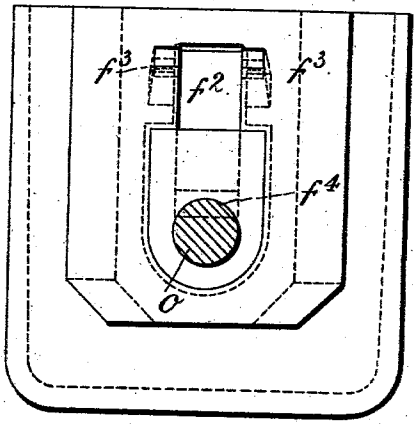


Fig. 5.

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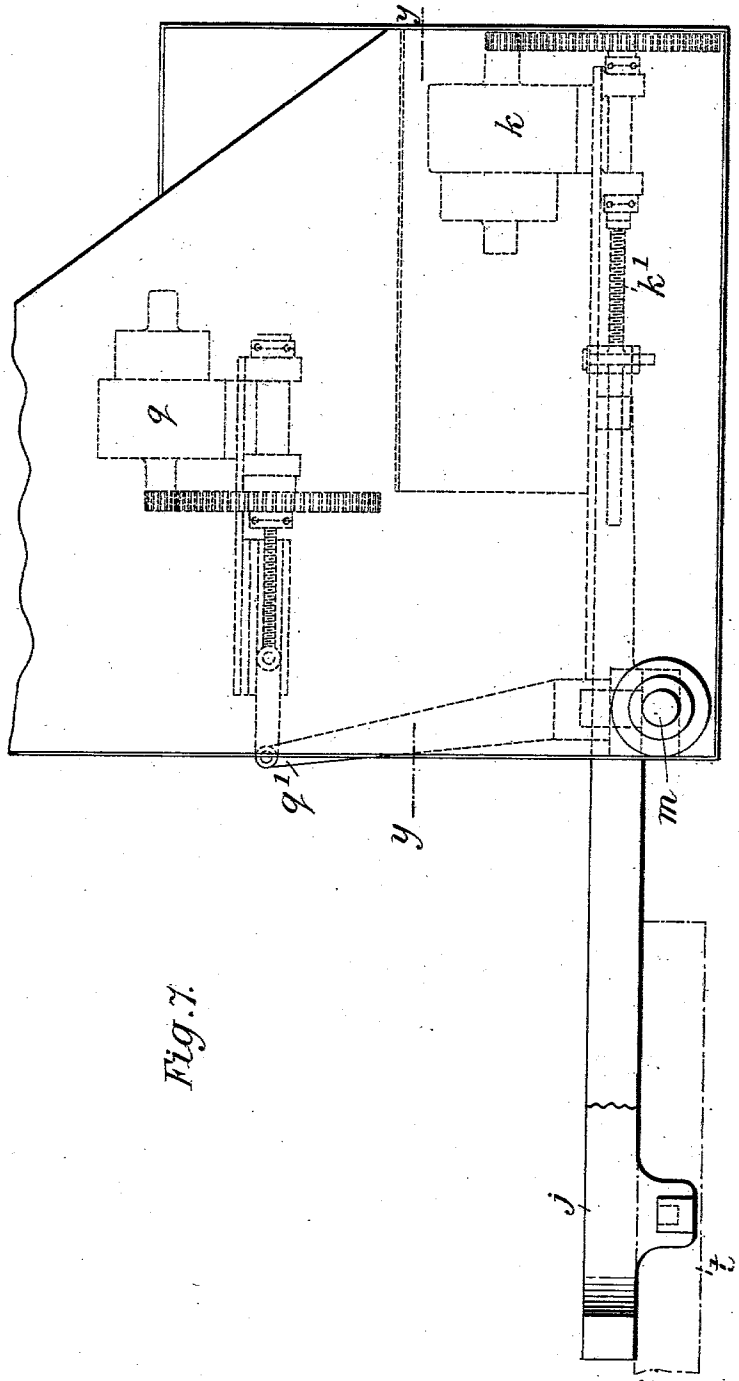


Fig. 1.

Witnesses,
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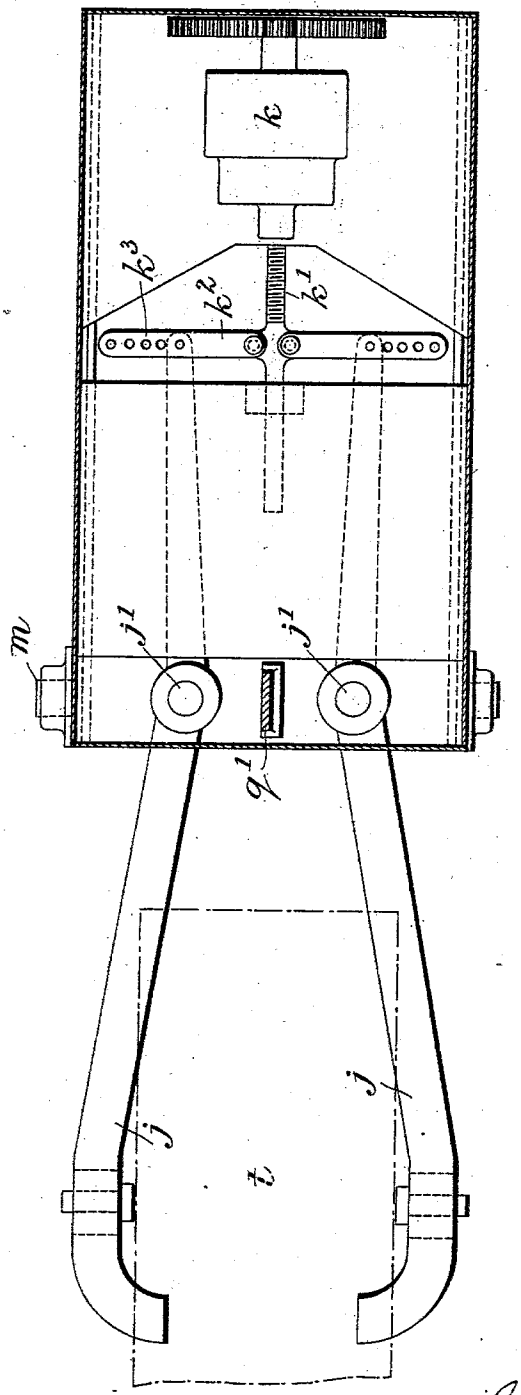


Fig. 8.

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(No Model.) 6 Sheets—Sheet 6.

Fig. 9.

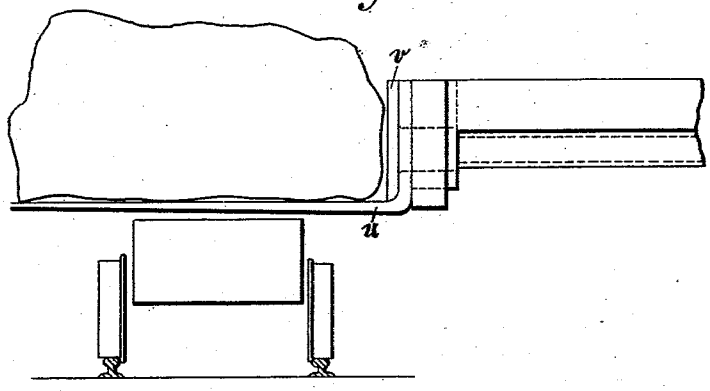


Fig. 10.

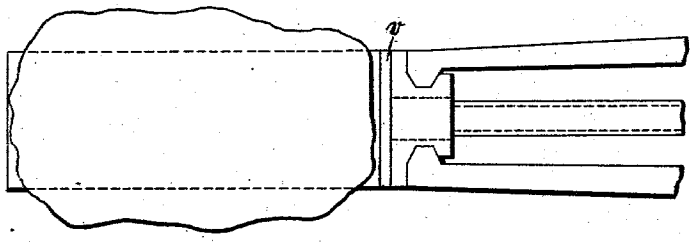
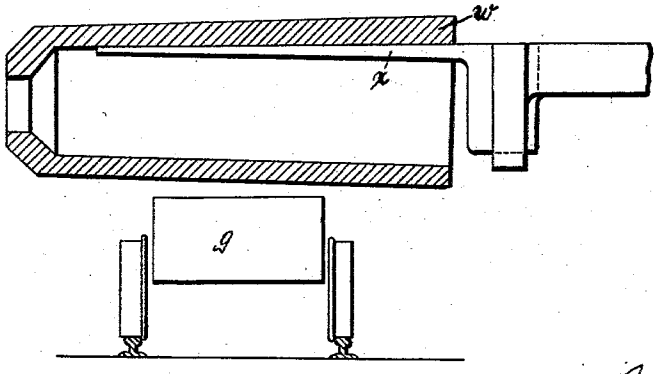


Fig. 11.



Witnesses:
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UNITED STATES PATENT OFFICE.

ANTHONY PATTERSON, OF CARDIFF, ENGLAND.

MACHINERY FOR CHARGING STEEL OR LIKE FURNACES.

SPECIFICATION forming part of Letters Patent No. 716,750, dated December 23, 1902.

Application filed August 9, 1902. Serial No. 119,118. (No model.)

To all whom it may concern:

Be it known that I, ANTHONY PATTERSON, a subject of the King of Great Britain, residing at Cardiff, in the county of Glamorgan, Wales, England, have invented certain new and useful Improvements in Machinery for Charging Steel or Like Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention consists in machinery for charging ore, scrap, and the like into furnaces employed in the manufacture of steel—such furnaces, for example, as Siemens steel-melting furnaces and furnaces of other kinds, such as reheating or mill furnaces.

As is well understood, it is a practice in erecting a series or installation of steel-melting and like furnaces and also reheating-furnaces to arrange the furnaces in rows and to charge them by means of machines arranged to run on the floor of the charging house or yard. The charging-machines are brought up to the charging-boxes, which are placed on trucks and carry the substance or substances to be deposited in the furnace. The charging-box is seized by the machine and advanced into the furnace, and after the box has been inverted and its contents delivered into the furnace the box is withdrawn by the machine and retired. With charging-machines thus arranged to run on the charging-floor the latter has to be kept clear of tools and other appliances or paraphernalia which would obstruct the movement of the machines. Moreover, keeping the charging-floor clear necessitates that the hand-levers of the gas and air controlling gear or mechanism and dampers appertaining to the furnaces be located in positions inconveniently or undesirably remote. Inverting the charging-boxes in the furnaces is liable to cause fouling and consequent obstruction to withdrawal.

My improved charging machinery is, according to one arrangement thereof, illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, Fig. 2 an end view, and Fig. 3 a plan on the line $x\,x$, Figs. 1 and 2.

On the overhead traversing carriage a is a trolley b, from which depends a frame c. The carriage a, which is driven by the motor a', acting through the gearing $a^2\,a^3\,a^4$, is mounted on wheels, which run on rails d, carried on girders, columns, or walls. The rails d extend lengthwise of the charging-house. The trolley b is mounted on rails e and is adapted to travel thereon transversely to the carriage a. The frame c carries motors k, p, and q. The shaft a^5, on which one pair of the traversing wheels a^6 of the carriage a are fixed, is centrally driven—that is to say, the gear-wheel a^4, centered on the shaft a^5, and by which the shaft a^5 is rotated, is situated at or about midway between the ends of the shaft. Accordingly the driving effect is exerted at each end of the shaft a^5 equally, and torsional strain on the shaft takes place equally as between the gear-wheel a^4 and the traversing wheels a^6.

The method of working the machine is as follows: The carriage a is driven along on the rails d by the motor a' until the frame c, with its motors k, p, and q, is brought opposite a charging-box f, which has been previously brought on a truck g, as heretofore, to the charging-aperture h of the furnace i, a part only of which is shown. The trolley b is by the motor b' advanced toward the furnace, and the box f, containing the material to be charged into the furnace i, is seized by a pair of grippers j, actuated by the motor k, carried on the platform l. The motor k acts upon the grippers through gearing having ball-bearings to reduce friction and also through the screw k' and toggle k^2. The platform l rests on bearings n, fixed to the rock-shaft m, which is supported in bearings in the frame c. A ram or plunger o, with a toothed rack o' formed with it, is supported in guides o^2, fixed to the under side of the platform l. The ram o is arranged to be actuated by the motor p, acting through gearing and through the pinion o^3, gearing with the rack. When the machine has been brought to the proper position for charging, the grippers j, previously open, are closed and grasp the neck of the box f. The ram o is then advanced, and its conical outer end engages in a conical socket in the pusher plate or head f', which is loose in the box f. The motor q, which is connected by the arm q' to the rock-

shaft m, is now operated, and by means of gearing fitted with ball-bearings the box f is acted upon and is lifted off the truck g by the tilting of the rock-shaft m, to which the grippers j are attached by pins j'. The trolley b is again set in motion, and the box f is thrust into the furnace i. The pusher-head f' is now advanced and pushes the contents of the box f into the furnace. Thereafter the ram o returns the pusher-head f' to the back of the charging-box f.

At Fig. 4 is shown a detail vertical section of the pusher-head f' and a part of the charging-box f. Fig. 5 is an end view, and Fig. 6 is a plan. As the pusher-head f' is advanced in the box f to eject the contents into the furnace the locking-bolt f^2, which has two T-heads working in inclined grooves f^3, provided in the neck of the box, is forced downward into engagement with a recess f^4, provided in the ram o. The pusher-head f' thus becomes locked in the ram o. On the return of the pusher-head f' the heads of the bolt f^2 re-enter the grooves f^3 and, ascending therein, withdraw the bolt out of the recess f^4 of the ram o, which latter is then unlocked.

The frame c, which, as aforesaid, depends from the trolley b, is attached to the trunnion r, on which is centered a worm-wheel r', driven by the worm r^2, and gearing actuated by the motor s. The frame c can be turned by the gearing about through angles either to facilitate charging at angles or to avoid obstacles. In cases where it is not desired to have the frame c free to turn about a pivot or on a pivot the frame c is directly attached to the trolley b and not by an intervening trunnion. The turning-gear is dispensed with.

At Fig. 7 is shown in elevation a modification. Fig. 8 is a sectional plan along the line $y\ y$, Fig. 7. This modification is for charging steel blooms, slabs, and the like into reheating-furnaces for manufacture into plates, rails, and the like. As in the previously-described machine, the frame c may be made free to turn or it may be fixed. In order to meet the requirement that the grippers j must have a greater range of movement to provide for the varying widths of the objects to be gripped, the toggle-links h^2 have holes k^3 for connection of the grippers j to enable adjustment to be effected. The drawing shows a slab t in the grasp of the grippers j.

At Fig. 9 is shown, in side elevation, a "peel" or charging instrument for charging heavy scrap. Fig. 10 is a plan of Fig. 9. Instead of a charging-box a plain table u is employed. The charge is pushed off the peel by a pusher-head v in the same way as ore and small scrap from a box, as in the arrangement first above described with reference to Figs. 1, 2, and 3.

Fig. 11 shows a charging instrument for picking up and charging into the furnace old ingot-molds w. The instrument in this case is a peel x, adapted for insertion in a mold which is deposited in the furnace, and the peel is then lowered and withdrawn. No pusher is required.

What I claim is—

1. In machinery for charging furnaces, the combination of a suspended frame, means for gripping the charging-box carried by said frame, a ram for pushing the contents of the charging-box into the furnace, and means carried by said frame for operating said ram, substantially as described.

2. In machinery for charging furnaces, the combination of a suspended frame, means for moving said frame, gripping devices carried by said frame, means for operating said gripping devices, a ram provided with a separable pusher-head carried by said frame, and means on said frame for operating said ram, substantially as described.

3. In machinery for charging furnaces, an overhead traveling carriage, a movable trolley located on said carriage, a frame suspended from said trolley, means for swinging said frame in a horizontal plane, gripping devices and means for operating them carried by said frame, a ram and means for operating said ram also mounted on said frame, substantially as described.

4. In machinery for charging furnaces, the combination of a ram, a suspended frame carrying said ram, means located on said frame for operating said ram, a separable pusher-head for said ram, and means whereby said pusher-head is locked to said ram on the forward movement of the latter, substantially as described.

5. In machinery for charging furnaces, the combination of a charging-box, a pusher-head loose in said box, a ram for operating said pusher-head, and means for locking said ram to said pusher-head, said means consisting of a bolt adapted to slide in inclined grooves and to engage in a recess in the head of the ram as the latter is advanced, substantially as described.

6. A machine for charging furnaces, comprising an overhead traversing carriage with motor for driving same, a traveling trolley mounted on the said overhead traversing carriage and operated by a motor to travel at right angles to the direction of travel of the traversing carriage, a frame depending from the trolley and carrying gripping-arms for gripping the charging-boxes, and a reciprocating ram for dislodging into the furnace the material contained in the charging-boxes; a motor for operating the said ram, a motor for operating the said grippers, and a motor for tilting the gripper-arms carried by the suspended frame, substantially as described.

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

ANTHONY PATTERSON.

Witnesses:
JOHN THOMPSON,
STEPHEN JOHN THOMPSON.