Nov. 5, 1929. F. E. McCABE 1,734,176

MOLD SHAKE-OUT APPARATUS

Original Filed Sept. 19, 1925 4 Sheets-Sheet 1

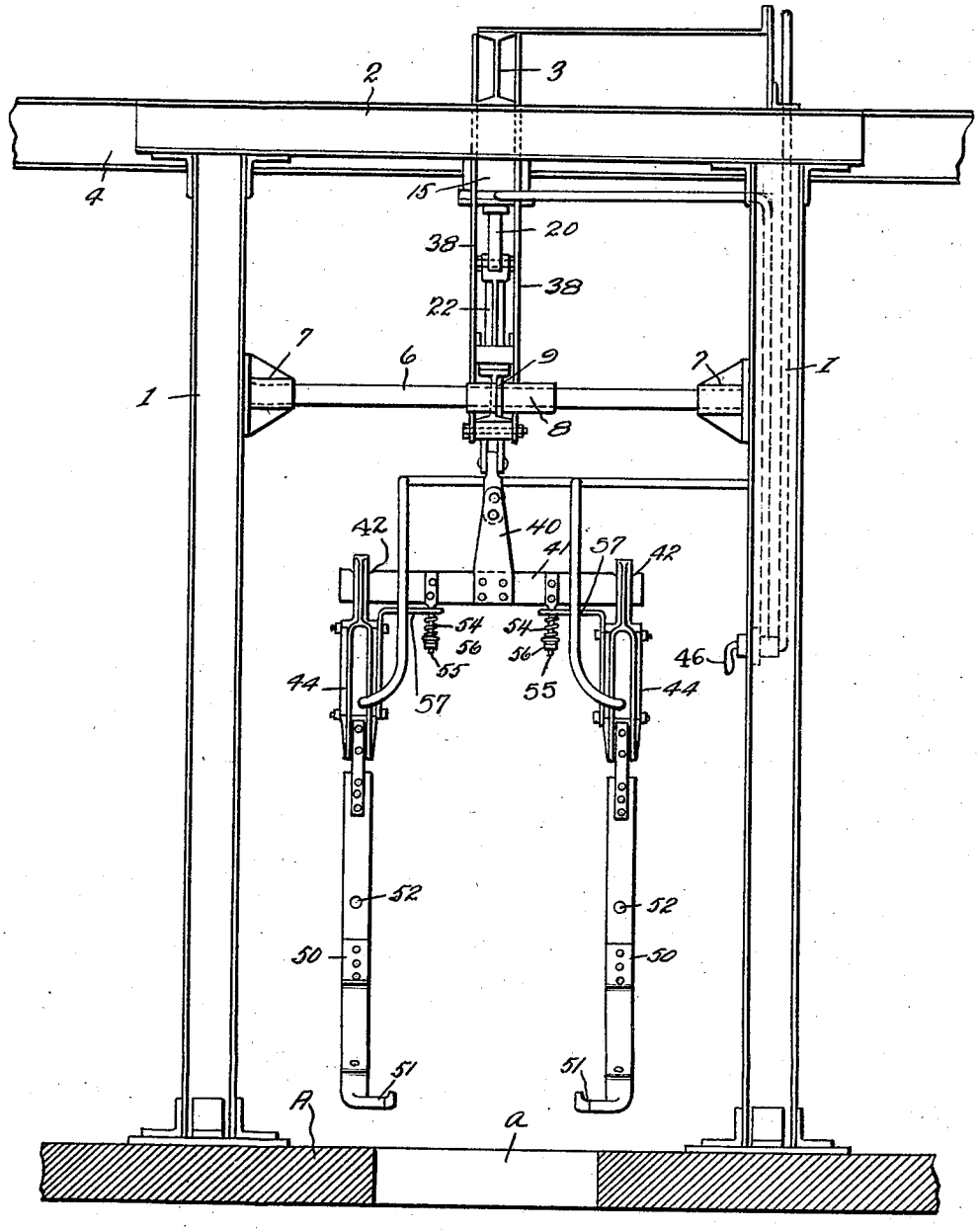


Fig. 1

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MOLD SHAKE-OUT APPARATUS

Original Filed Sept. 19, 1925 4 Sheets-Sheet 2

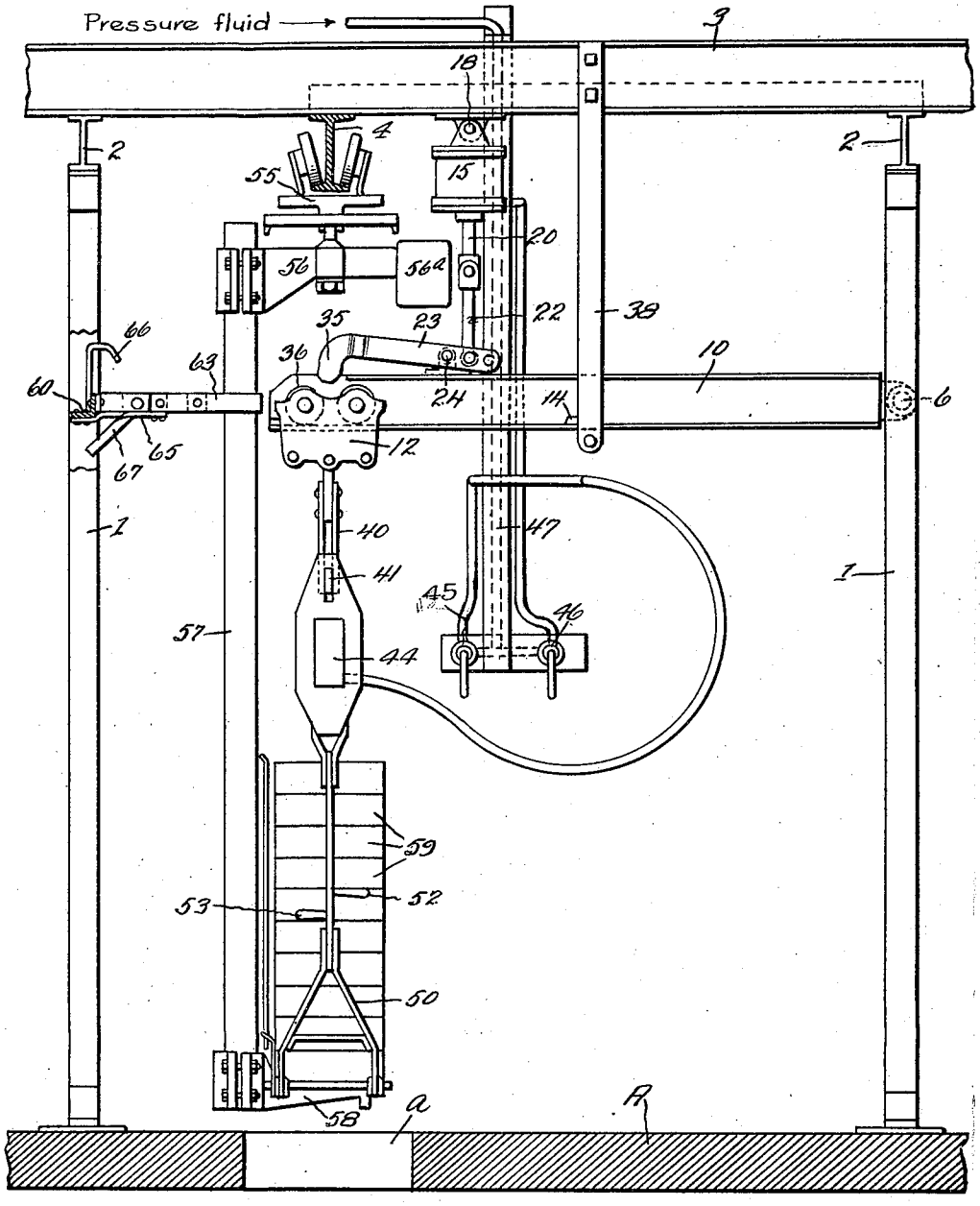


Fig. 2.

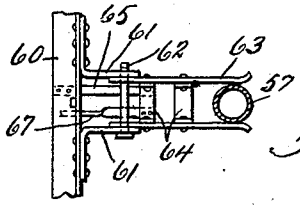


Fig. 3.

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MOLD SHAKE-OUT APPARATUS

Original Filed Sept. 19, 1925 4 Sheets-Sheet 3

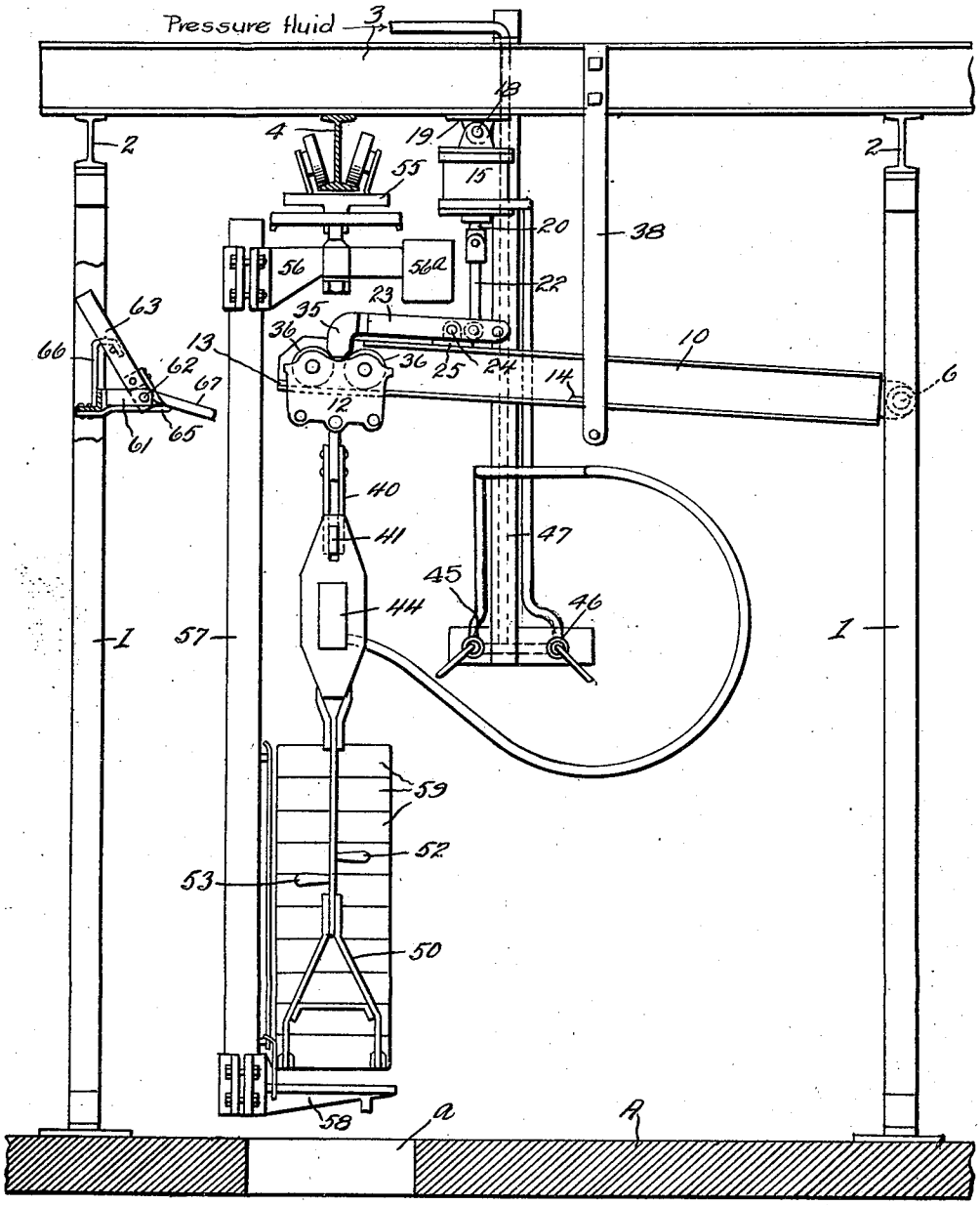


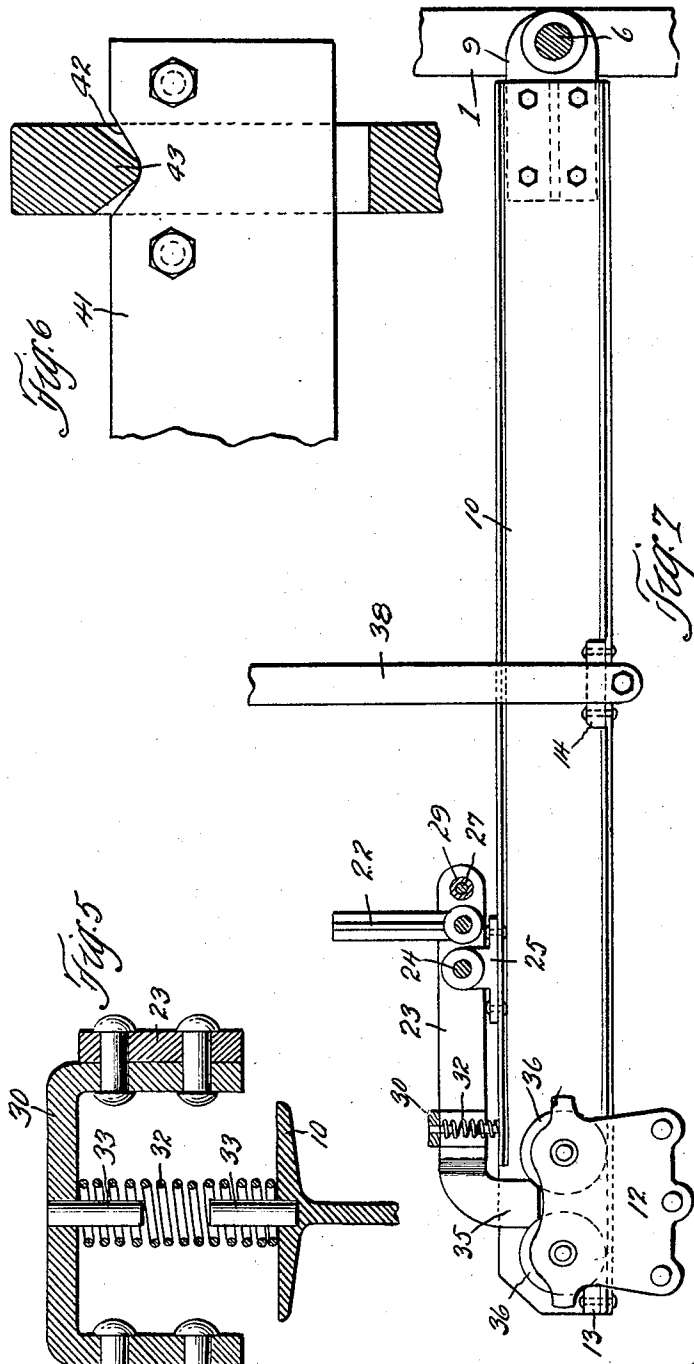
Fig. 4

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MOLD SHAKE-OUT APPARATUS

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UNITED STATES PATENT OFFICE

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MOLD-SHAKE-OUT APPARATUS

Original application filed September 19, 1925, Serial No. 57,333. Divided and this application filed March 25, 1927. Serial No. 178,254.

This invention relates to the art of molding and has special reference to means, known as shake-out apparatus, for discharging sand and castings from the mold flasks.

The means or apparatus is designed for use in molding systems of the class to which my former application Serial No. 57,333, filed September 19, 1925, relates, this case being a division of said former application.

Briefly, the system referred to involves a mold forming station, a mold pouring station, and a shake-out station. A track, preferably an overhead track in the nature of an I-beam, extends through or past the various stations, and mold carriers are adapted to be moved along said track for conveying the flasks through the stations, the flasks being filled and the molds formed at the first mentioned station, and poured at the second mentioned station. During their passage from the second mentioned or pouring station to the third or shake-out station, the castings cool sufficiently to permit of their being discharged at the latter station. Here the flasks are lifted from the carrier by mechanical means, the carrier is shifted to one side, and the flasks are jarred or vibrated through the medium of the lifting means and as a consequence thereof the sand and castings are dislodged from the flasks and precipitated to suitable separating means below that serves to divide the castings from the sand.

The general objects of the present invention are to provide an efficient shake-out apparatus that is relatively simple of construction, is very durable, and is practically immune from disorder, is especially convenient of operation and by which the removal of the sand and castings from the flasks is expedited thereby to contribute to the speed and economy of production and the smooth running and continuous operation of the system as a whole.

Another object is to provide a shake-out apparatus by means of which a stack of molds may be readily lifted from the carrier and jarred for the purpose aforesaid, and by means of which the empty flasks may, with equal ease, be replaced upon the carrier in correct position for their return to the molding station.

Other and more detailed objects will appear as I proceed to describe the invention by reference to the accompanying drawings wherein Fig. 1 is a front elevation of the shake-out apparatus; Fig. 2 is a side elevation of the same in position to lift a stack of molds from a carrier; Fig. 3 is a detail of means for positioning and holding the carrier while the molds are being transferred to and from the shake-out apparatus; Fig. 4 is a view, similar to Fig. 1, showing the shake-out apparatus sustaining a stack of molds as in a position to jar the sand and castings therefrom; and Figs. 5, 6, 7 and 8 are details, on an enlarged scale, of the apparatus.

The structural framework of the apparatus is comprised of posts 1 that are connected together at their upper ends by transverse members 2 which, in turn, are tied together by a longitudinal member 3. One or more shake-out apparatus or units are employed at the shake-out station of the system, the number depending upon the size or capacity of the system. For the present purpose, the illustration of one of the shake-out units is sufficient. Extending through the unit is a branch of the track along which the mold carriers travel, the same preferably being in the nature of an I-beam and designated 4. In the floor A, directly below the point where the track 4 crosses the member 3 is an opening *a* through which the sand and castings are adapted to be precipitated to suitable separating means (not shown) that is situated below said opening.

Supported by and between the right hand pair of posts 1, as the apparatus is viewed in Figs. 2 and 4, a suitable distance below the corresponding cross member 2, is a shaft 6. This shaft has its ends journaled in socket members 7 (Fig. 1) that are applied to the posts, and at about its longitudinal center has secured to it the hub portion 8 of a fulcrum bracket 9 (see Figs. 1, 7 and 8). Secured to the bracket 9 is a rail 10 which is shown as an I-beam, and adapted to travel along the outer end portion of this rail is a trolley 12. The movement of the trolley is

arrested in an outward direction by a stop 13 and in an inward direction by a stop 14. The rail 10 is adapted to be swung through a limited movement on the axis of the shaft 6 by means of a pressure fluid motor 15. This motor is preferably comprised of a cylinder and piston, the cylinder being pivotally connected at 18 to a hanger 19 that is carried by the member 3, while the rod 20 of the piston (not shown) is connected at its lower end, through a link 22, with the inner end of a rocker frame 23 that is fulcrumed at 24 to a bracket 25, secured to the upper side of the rail 10. As best shown in Figs. 7 and 8, the rocker frame 23 is made up of side plates 26 that are connected together at their rear ends by a bolt 27, and are spaced apart by a tubular spacer 29 that is carried by said bolt. At their forward ends, said plates are connected together and spaced apart (as best illustrated in Fig. 5) by a U-shaped member 30. A compression spring 32 is interposed between the member 30 and the top of the rail 10 and is held in place by pins 33, 33 that are carried by the rail and the member 30. The spring 32 tends to elevate the forward end of the rocker frame 23, which action is assisted by the weight of the parts connected to the rear end of the frame. The forward downturned ends 35 of the side plates of the frame depend on opposite sides of the web of the I-beam (whereof the rail 10 is constituted), the top opposed flanges of said beam being cut away adjacent the forward end of the rail to accommodate said downturned ends. Said ends are adapted to be projected between the rollers 36 of the trolley 12 to secure the trolley against movement along the rail. The rail 10 is sustained in its lowest position by a bail 28 which hangs from the member 3.

Swung by means of a clevis 40 from the trolley 12 is a cross beam 41 which has notches 42 formed in its upper side adjacent its ends (see Fig. 6). Reposing within these notches are so-called knife edge bearings 43 that are incorporated in vibrator structures 44. These structures involve pressure fluid actuated vibrating devices of standard construction, and the supply of pressure fluid thereto and to the motor 15 above referred to is controlled by valves 45 and 46 that are supported on a bracket 47 suspended from the upper frame structure, suitable conduits, omitted to avoid confusion of lines, leading the pressure fluid from a suitable source past said valves to the motor and vibrators. Bails 50 are secured to and hang from the vibrator structures 44 and at their lower ends are forked, and the branches of the forks terminate in hooks 51. Handles 52 and 53 project from the opposite sides of the bails 50. The purpose of these handles is to provide means for swinging the bails 50 away from each other against the action of springs 54 which tend to swing the lower ends of the bails inwardly. These springs are supported upon studs 55 that depend from the beam 41 and are threaded at their lower ends for the application of nuts 56, the upper ends of the springs bearing upon angle brackets 57 that are secured to the inner sides of the vibrator structures 44.

The molds are delivered to the shake-out apparatus on carriers which travel upon the track 4, one of such carriers being shown in each of Figs. 2 and 4. The carrier comprises a trolley 55, the wheels on the opposite sides of which bear upon the lower flanges of the track, and suspended from the trolley is a head 56 to one end of which is secured the upper end of a tubular column 57 having a flask sustaining platform 58 fastened to its lower end which projects from the column in the same direction as the head. A weight 56^a is applied to the end of the head opposite that from which the column 57 depends and serves to counterbalance the weight thereof. A stack of mold flasks 59 are shown as supported upon the platform 58 in Fig. 2. In Fig. 4 the mold flasks are shown as sustained by the shake-out apparatus, as will hereinafter be more fully explained.

In presenting the mold flasks in transferring relation to and from the shake-out mechanism it is essential that the carrier be positioned directly in line with the rail 10. To this end I employ a positioning fork that is illustrated in detail in Fig. 3 and shown, also, in Figs. 2 and 4. The positioning fork is supported from an angle bar 60 that is sustained by and between the left hand pair of posts 1, as the apparatus is viewed in Figs. 2 and 4. Between angle brackets 61 that are applied to the angle bar 60 is pivotally supported, as on a cross pin 62, the inner end of a fork 63 that is designed to embrace the column 57 of a mold carrier. The fork 63 is shown as a built-up structure comprised of side plates that are connected together and spaced apart by cross members 64. The fork is adapted to be swung from effective position, wherein it is sustained by a stop 65 (Fig. 2), to ineffective position, wherein it is held by a second stop 66 (Fig. 4), by means of a handle 67.

In order that the operation of the apparatus may be clearly understood, it may be explained that a carrier containing a stack of flasks from which the sand and castings are to be discharged is brought into a position opposite the rail 10 and the positioning fork 63 is swung down to embrace the column 57 of the carrier. It will be understood that at the time the carrier is brought into this position, the trolley 12 is in its rearmost position and against the stop 14. An operator, standing in front of the carrier grasps the handles 52 of the bails 50 and separates the bails in opposition to the action of springs 54 and pushes the structure forwardly until the movement of the trolley is arrested by the

stop 13. He then releases his hold on the handles 52 which allow the springs 54 to swing the bails inwardly toward each other and project their hooks 51 beneath hook receiving portions of the bottom flask, the flasks being especially designed for use in my molding system and incorporating means for guiding the hooks 51 into operative relation to the parts wherewith they cooperate, as will be seen by reference to my aforesaid application Serial No. 57,333. The operator next opens the appropriate one of the valves 45 or 46 to admit pressure fluid to the cylinder of motor 15, thereby to elevate the piston therein and through the intervention of the rod 20 and link 22, rock the frame 23 and project its forward ends 35 between the wheels of the trolley 12, locking the trolley in its outermost position, the same action of the motor, through the intervention of the frame 23, lifting the outer end of the rail 10. This results in the flasks being lifted from the mold support or platform 58 of the carrier so that the carrier, after the positioning fork 63 has been swung upwardly out of the way, may be shoved to one side thereby to remove the mold support from beneath the suspended molds. The operator then opens the other of the aforesaid valves which permits the passage of motive fluid to the vibrating devices incorporated in the structures 44 from which the bails 50 are suspended, causing the molds to be jarred vigorously enough to dislodge the sand and castings from the flasks so that the sand and castings from all the flasks are precipitated through the opening 5 in the floor A to suitable receiving means or separating apparatus therebelow.

Having thus described my invention, what I claim is:—

1. In mold shake-out apparatus, the combination of means for grappling and holding against tilting the lowermost flask of a stack of mold flasks and for lifting said stack from a support and for sustaining it with the interiors of the superposed flasks in register, and further means for vibrating the lifting and sustaining means thereby to dislodge the sand and castings from all of the flasks and precipitate those from the upper flasks through the openings of the lower flasks.

2. In mold shake-out apparatus, the combination of a frame structure, a trolley rail movably sustained by said structure, means for elevating said rail, a trolley on said rail, mold suspension means depending from the trolley, and means for vibrating the mold suspension means.

3. In mold shake-out apparatus, the combination of a frame structure, a trolley rail pivotally connected at one end to said structure, means for elevating the free end of the rail, a trolley on said rail, a beam suspended from the trolley, bails fulcrumed on the beam and depending therefrom and terminating at their lower ends in spaced mold engaging parts, means tending to swing the bails inwardly, and apparatus for vibrating the bails.

4. In mold shake-out apparatus, the combination of a frame structure, a rail pivotally connected at one end to said structure, a trolley movable along said rail, stops on said rail for limiting the movement of the trolley, means movably carried by the rail and adapted to be projected into holding engagement with the trolley for locking it in a given position on the rail, power means for operating the last mentioned means and for swinging the rail on its pivot, and mold suspension means depending from the trolley.

5. In mold shake-out apparatus, the combination with a track and a mold carrier movable along the track, of a rail disposed at substantially right angles to the aforesaid track and extending over the course of movement of the mold carrier, a trolley shiftable along the rail between a position over said course and a position to one side thereof, mold suspension means depending from the trolley, apparatus for jarring said mold suspension means, means for lifting the free end of the rail, and positioning means arranged to cooperate with the mold carrier thereby to properly position the same with respect to the mold sustaining means.

6. In mold shake-out apparatus, the combination of a frame structure, an overhead track passing through said structure and along which a mold carrier is adapted to travel, there being incorporated in the mold carrier a column and a mold support carried by said column, a rail pivotally connected at one end to the frame structure and disposed at substantially right angles to the aforesaid track, the rail extending over the course of movement of the mold support, a trolley shiftable along the rail between a position over said course and a position to one side thereof, means movably carried by the rail for locking the trolley in the former position, mold suspension means depending from the trolley, apparatus for jarring said mold suspension means, power means for actuating the trolley locking means and for lifting the free end of the rail, and positioning means movably supported by the frame structure for engaging the column of the mold carrier thereby to properly position the mold support with respect to the mold suspension means.

7. The combination of a track, a mold carrier movable along the track, a pivotally supported rail at substantially right angles to a part of said track, means for positioning the carrier in a given relation to the rail, a trolley movable along said rail, mold suspension means depending from the trolley and which, when the trolley is at a given position on the rail, is in operative relation to molds on the carrier positioned in the aforesaid given rela-

tion to the rail, means for securing the trolley in the aforesaid position on the rail and for elevating the free end of the rail thereby to lift the molds from the mold carrier, and apparatus for vibrating the mold suspension means.

8. The combination of a track, a mold carrier movable along the track, a trolley rail disposed at right angles to said track, a trolley movable along said rail, mold suspension means depending from the trolley and which is disposed in operative relation to molds on the carrier when the trolley is in a given position on the rail and the carrier is in given relation to the rail, and means for holding the trolley in said position and for lifting the molds through the intervention of the mold suspension means.

9. The combination of a frame structure; an overhead track passing through said frame structure; a mold carrier comprising a trolley on said rail, a column depending from said trolley, and a mold support situated at the lower end of said column; a rail pivotally connected at one end to the frame structure and disposed at substantially right angles to the aforesaid track, the rail extending over the course of movement of the mold support; a trolley shiftable along the rail between a position over said course and a position to one side thereof, means movably carried by the rail for locking the trolley in the former position, mold suspension means depending from the second mentioned trolley, apparatus for jarring said mold suspension means, power means for actuating the trolley locking means and for lifting the free end of the rail, and positioning means movably supported by the frame structure for engaging the column of the mold carrier thereby to properly position the mold support with respect to the mold sustaining means.

10. In mold shake-out apparatus, the combination of a frame structure, a trolley rail movably sustained by said structure, means for elevating said rail, a trolley on said rail, mold suspension means depending from the trolley, and means effecting the dislodgment of sand and castings from molds suspended by the last mentioned means.

11. In foundry apparatus wherein stacked molds containing sand and castings are conveyed past a shake-out station on carriers supported by a track, the combination of claim 1 wherein said shake-out station is provided with means for positioning said carrier with respect to said grappling, lifting and vibrating means.

12. In foundry apparatus wherein stacked molds containing sand and castings are conveyed past a shake-out station on carriers supported by a track, the combination of claim 1 wherein said grappling and holding means is comprised of bales, and wherein means are provided for positioning said bales with respect to said molds.

13. In foundry apparatus wherein stacked molds containing sand and castings are conveyed past a shake-out station on carriers supported by a track, the combination of claim 1 wherein means are provided for moving said grappling, holding and vibrating means into and out of the path of one of said carriers and in alignment therewith.

14. In foundry apparatus wherein stacked molds containing sand and castings are conveyed past a shake-out station on carriers supported by a track, the combination of claim 1 wherein means are provided for repositioning said stack of mold flasks on said carriers.

In testimony whereof, I hereunto affix my signature.

FRANK E. McCABE.