Oct. 6, 1936. J. J. LAWLOR 2,056,199

MOLDING MACHINE

Filed Sept. 15, 1934 3 Sheets-Sheet 1

Fig. 1

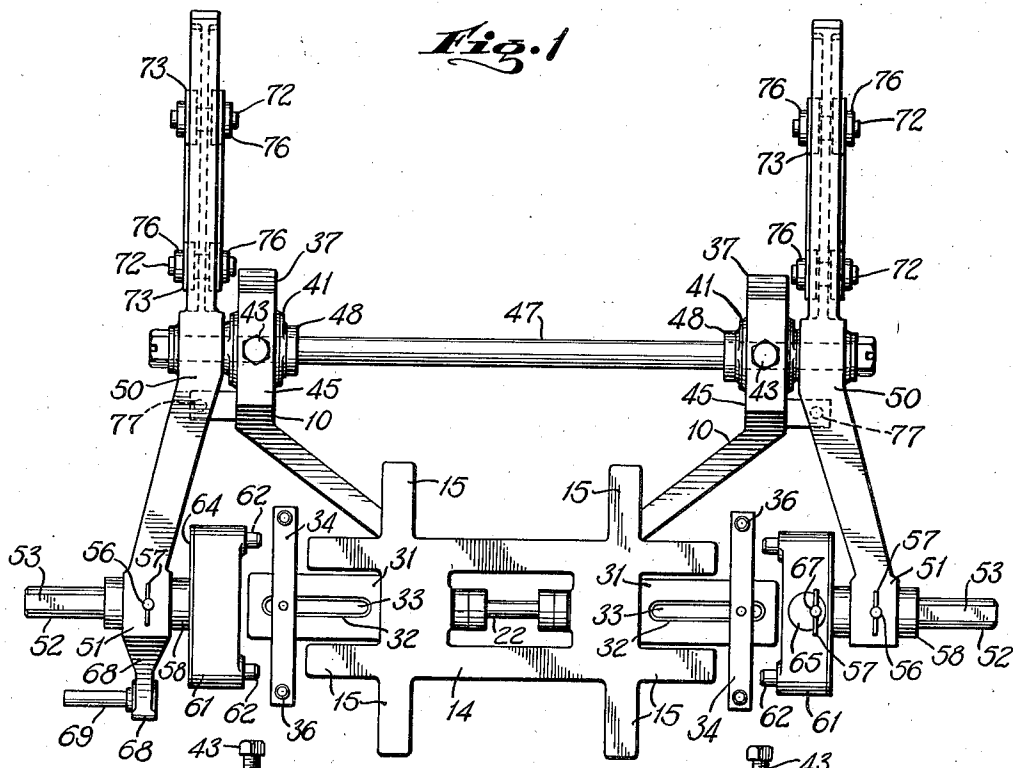
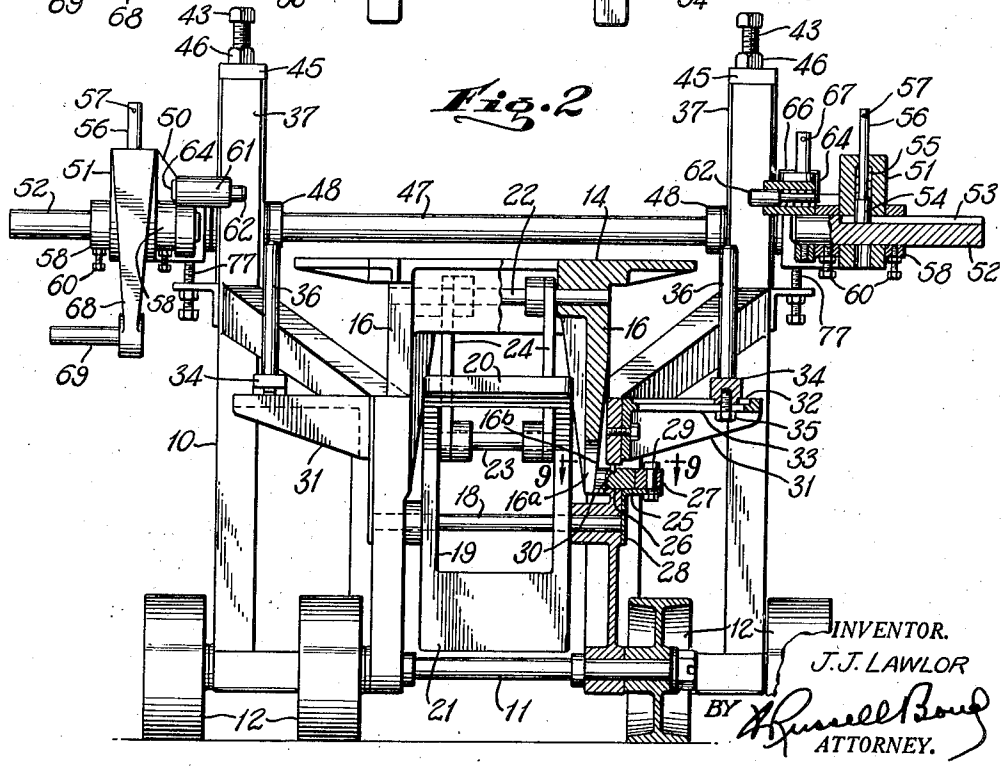


Fig. 2



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Fig. 3

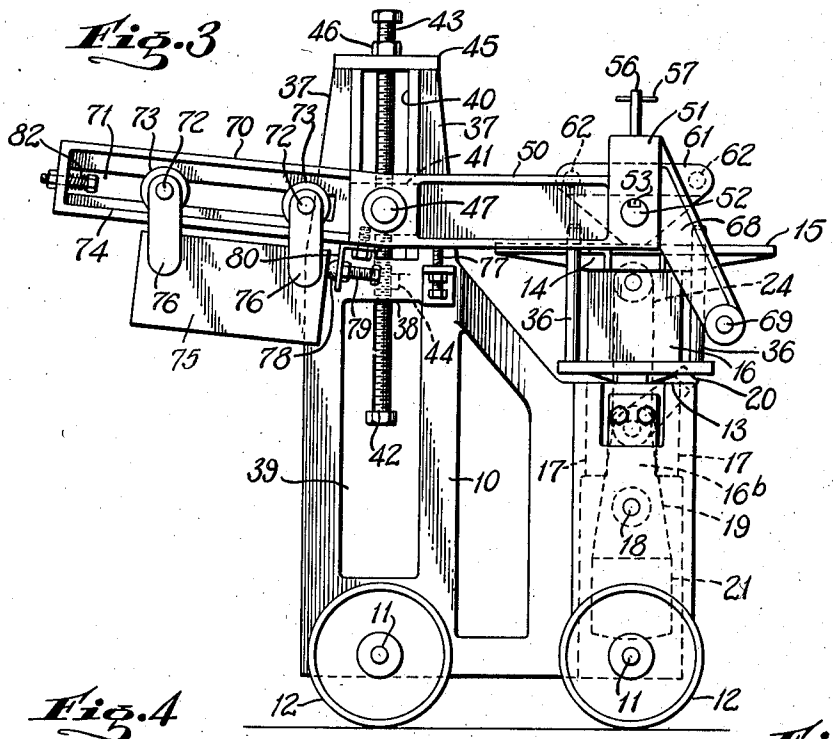


Fig. 4

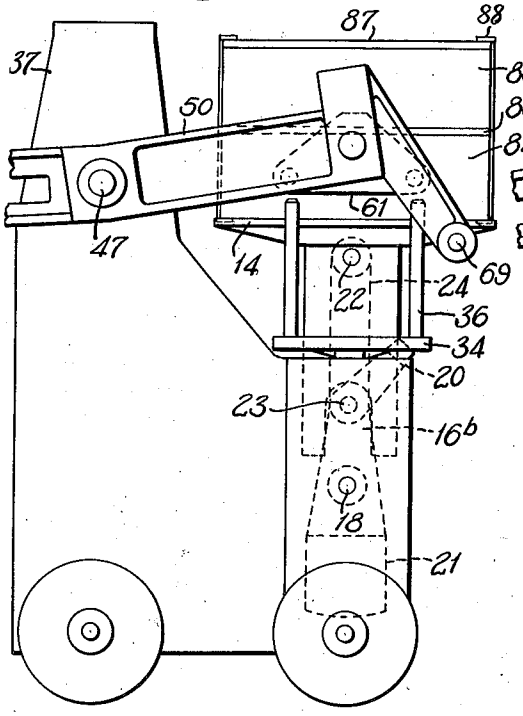
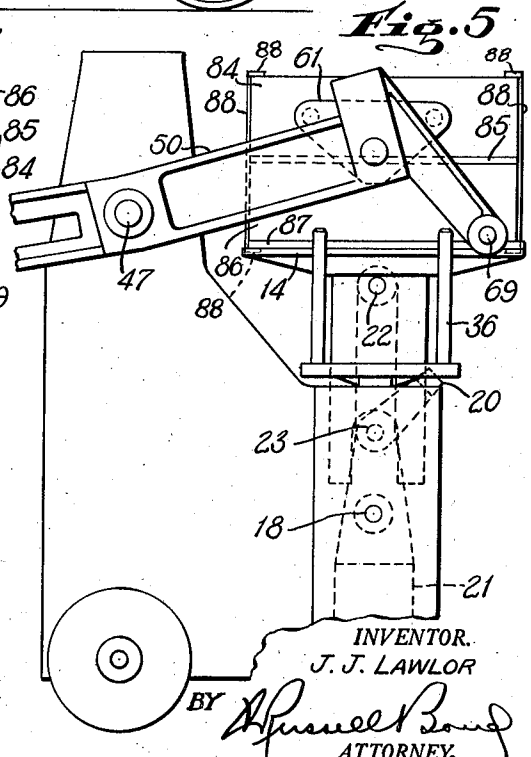


Fig. 5



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Fig. 6

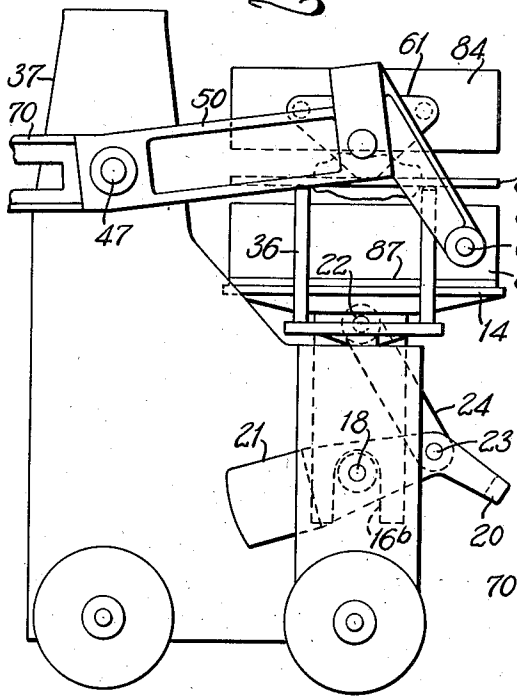


Fig. 7

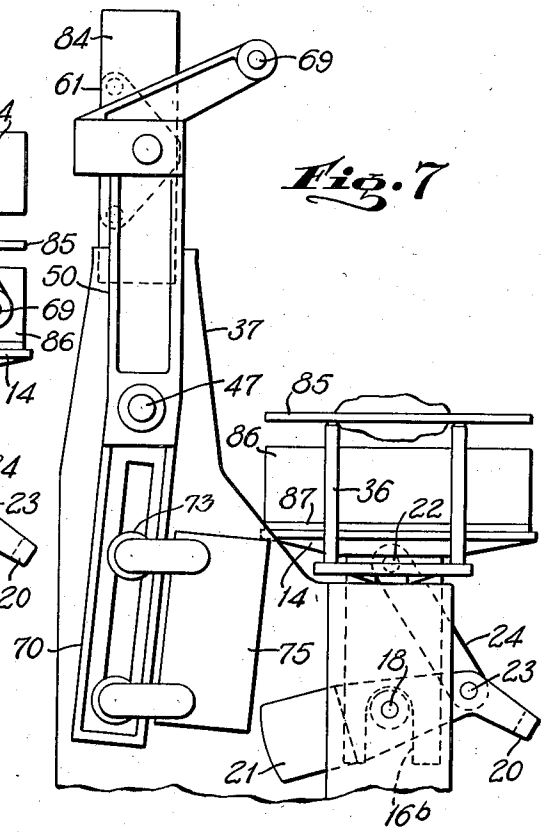


Fig. 8

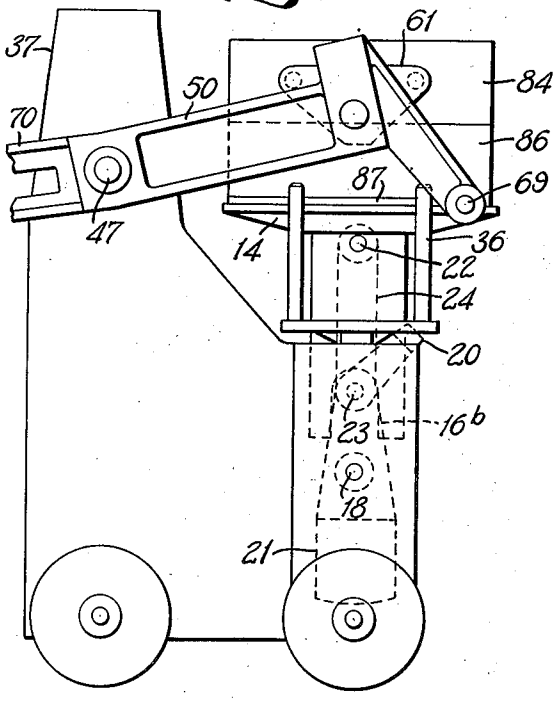
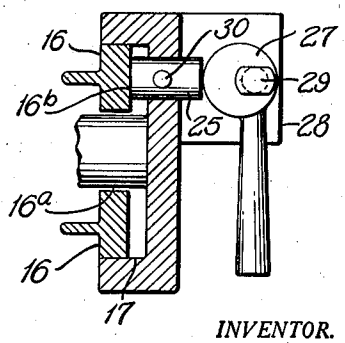


Fig. 9



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Patented Oct. 6, 1936 2,056,199

UNITED STATES PATENT OFFICE

2,056,199

MOLDING MACHINE

John J. Lawlor, Plainfield, N. J., assignor to General Foundry Machinery Corporation, Wilmington, Del., a corporation of Delaware

Application September 15, 1934, Serial No. 744,149

11 Claims. (Cl. 22—47)

My invention relates to machines for making molds for foundry use and the like and has for an object to provide a machine which will facilitate the handling of flasks and the forming of molds therein.

More specifically my object is to provide a machine which may be manually operated and in which the movable parts are so counterweighted that the machine may be operated by a single man, except for removing the mold from the machine.

In practice the machines may be used in pairs, with an operator for each machine, and then the two operators will assist each other in removing a mold from either machine when it is completed, but all other operations of each machine will be preformed and controlled by the individual operator of that machine.

I prefer to use a separate flask for each mold. This avoids the necessity of jacketing the molds and also does away with the necessity of using sand strips, because the cope is provided with bars fitted therein which serve to retain the sand in the mold, and as a consequence there is no settling of the sand after the pattern plate has been removed and the cope is closed on the drag. It is, therefore, an object of my invention to provide a machine in which the flask members may be readily secured and removed so that the operator may disconnect the flask from the machine and replace it with another, in a minimum of time.

Another object of my invention is to so arrange certain operating parts that after the cope has been rammed the flask sections may be separated and the pattern drawn carefully under perfect control of the operator.

Another object of my invention is to provide sliding counterweights to aid the operator in lifting and lowering the cope.

Another object of my invention is to provide bumpers for the sliding counterweights which will prevent jarring that might injure the mold.

Still other objects of my invention will appear in the following description of a specific embodiment of my invention and the novelty and scope of the invention will thereafter be pointed out in the claims.

In the accompanying drawings:

Figure 1 is a plan view of my improved molding machine;

Fig. 2 is a front elevation of the same shown partly in section to illustrate certain details;

Fig. 3 is a side elevation of the machine;

Figs. 4 to 8 inclusive are somewhat diagrammatical views, showing successive positions of the flask sections and pattern plate in the machine; and

Fig. 9 is a view in section of a detail, the section being taken on the line 9—9 of Fig. 2.

The main frame of my machine comprises a pair of side frame members 10, connected at the bottom by spacer bars 11. The latter, as shown particularly in Fig. 2, extend through the side frame members and provide axles for wheels or rollers 12 on which the machine is supported. The frame members are angled inwardly toward the forward end of the machine, where they are of reduced height to form shoulders or steps 13 on which a table 14 may rest when in lowered position. The top of the table is of the form shown particularly in Fig. 1, being provided with pairs of arms 15 which extend forwardly, rearwardly and laterally. The body of the table is formed with a pair of depending extensions 16 which are adapted to slide in guideways 17 formed in the frame members 10.

Secured to the frame members 10 immediately below the table is a transverse shaft 18 upon which is pivoted a tilting frame 19. The latter is of substantially rectangular form, consisting of a pair of side arms connected at the top by a cross arm 20 which serves as a handle for the frame, and connected at the bottom by a heavy counterweight 21. Mounted in the frame 19 is a transverse pintle rod 23, and a corresponding pintle rod 22 is mounted in the extensions 16. Links 24 journaled at opposite ends on these pintle rods serve to connect the table to the tilting frame. The tilting frame is angled outwardly from the pintle rod 22, as shown by broken lines in Fig. 3, so that the handle 20 will clear the links 24 and also will be in position where it may be readily seized by the operator. The extensions 16 are formed with slots 16a, as shown in Figs. 2 and 9, to clear the shaft 18 and its mountings.

When the table is in raised position, the shaft 18, and the pintle rods 22 and 23 lie in a common vertical plane and the table is thus held on dead center in its raised position. However, to insure perfect steadiness of the table during the raming operations that are to be preformed on the flasks supported by the table, I provide a locking device for the table. This device also serves to control the drawing of the pattern, as will be explained hereinafter, and for convenience I call it a "draw control". The draw control comprises a draw pin 25 (Figs. 2 and 9) which is slidable in a bearing 26 in one of the frame members 10. The draw

pin is adapted to engage the extension 16 on that side of the machine and may be forced inward against said extension 16 by an eccentric 27 journaled on a bracket 28 secured to said frame member. The eccentric is provided with a control handle 29 by which the position of the pin 25 may be accurately controlled. It will be observed that said extension 16 is tapered to form a slightly inclined bearing surface 16b, as shown in Fig. 2, and that the end of the pin 25 is correspondingly tapered to fit against said surface. Because of the taper of the surface 16b, the table cannot descend without wedging the draw pin outward or toward the right, as viewed in Figs. 2 and 9, and such movement of the pin may be very accurately controlled by means of the eccentric 27. It is desirable to keep the pin 25 from turning in its bearing and consequently the pin is formed with a key 30 which fits a key-way in the bearing 26.

Secured to the frame members 10 and extending outwardly therefrom immediately below the step 13 are two brackets 31. Each bracket is formed with a slideway 32 in its upper surface extending outwardly from the frame members and with a central slot 33 in the slideway. Fitted to slide in these ways are transverse bars 34 which are held to the brackets by means of bolts or screws 35 passed through said slots. Extending vertically from each bar are two pins or fingers 36 which, as will be explained more fully hereinafter, are adapted to support the pattern plate during a certain operation of the machine. By reason of the slots 33 the pins may be adjusted toward or from the table 14 and may pass outside the lateral arms 15 of the table to support the pattern plates of small molds.

Each frame member 10 is formed at the rear of the machine with a pair of vertical extensions or arms 37 which rise considerably above the step 13. The arms 37 are connected at the bottom by a transverse cross bar 38. Integral with the frame member and below the bar 38 there is an opening 39 to clear and provide ready access to certain adjusting mechanism presently to be described. Each pair of arms 37 is formed with slideways 40 in which slides a block 41. Each block may be secured at any desired vertical adjustment by means of adjusting screws 42 and 43. The lower adjusting screw 42 is threaded through the cross bar 38 and may be held at the desired adjustment by means of a nut 44. While the upper adjusting screw 43 is threaded through a cap 45 secured to and adjoining the upper ends of the arms 37, and said screw may be held at desired adjustment by a lock nut 46. The two blocks 41 provide bearings for a shaft 47 which extends transversely therethrough. The shaft is provided with flanges 48 which bear against the inner face of the blocks 41 respectively. The shaft 47 projects beyond each block and has a pair of levers 50 mounted and keyed thereon, there being a lever at each side of the machine.

At the forward end of each lever 50 there is a trunnion bearing 51 in which slides a trunnion shaft 52, as shown particularly in Fig. 2. Each trunnion shaft is formed with a key-way 53 adapted to be engaged by a key 54 slidable in the trunnion bearing 51. A spring 55 normally presses the key into engagement with the slot 53. The key 54 is provided with a stem 56 which projects from the top of the trunnion block and is provided with a handle 57 by which the key 54 may be raised out of the slot to permit of turning the trunnion shaft in its bearing. Collars 58 are provided at each side of the trunnion bearing and may be secured to the trunnion shaft by means of screws 60 to hold the shaft at desired longitudinal adjustment and yet permit the shaft to turn when the key 54 is withdrawn therefrom. At the inner end of each trunnion shaft, there is a trunnion head 61 firmly fixed upon the shaft. Each trunnion head is fitted with a pair of trunnion pins 62 slidable therein and normally pressed toward the table 14 by means of springs 63. Each pair of pins 62 has a stem which is riveted or otherwise secured at its other end to a plate 64. The latter bears against the outer face of the trunnion head 61 and serves as a stop for the spring pressed pins. The plate 64 on one of the trunnion heads, preferably that at the right in Fig. 2, projects above the trunnion head so that it will be engaged by a cam or eccentric 65 journaled in a housing 66 carried by said trunnion head. A handle 67 projects through the housing 66 and permits of turning the eccentric so that it will bear against the plate 64 and withdraw the pins 62. One of the levers 50, preferably that at the left hand side of the machine, is provided with a bracket 68 which extends outwardly and forwardly and carries, at its outer end, a handle 69. This provides means for lifting the levers from the position shown in Fig. 3 to that shown in Fig. 7. It will be recalled that the levers 50 are keyed to the shaft, so that when one arm is raised the other will also be raised.

Each lever 50 is formed with a rearwardly extending arm 70 provided with a longitudinal slot 71 therein to receive shafts 72 on which rollers 73 are journaled. The arms are formed with flanges 74 on which the rollers 73 are adapted to run. Immediately below each arm 70 there is a weight 75 which is connected by links 76 to the shafts 72 of the rollers. The weights 75 assist in raising the trunnion heads when they are carrying a load. As the load is raised the weights 75 will slide rearward or toward the free ends of the arms 70, increasing the leverage. When the arms 50 are lowered to the position shown in Fig. 3, the weights 75 will slide forward by gravity because of a slight inclination of the flanges 74, and in their forward position the weights 75 will be over-balanced by the trunnion heads. The levers will then rest on adjustable stops 77 projecting from the frame members 10. To absorb any shock which may result from movement of the weight, bumpers 78 of flexible material are provided to limit the forward travel of the weights. Each bumper is fitted upon the end of a screw 79 which has threaded engagement with an angle bracket 80 secured to the underface of the lever 50. A lock nut on each screw 79 permits of adjusting the position of the bumpers, as desired, to counterbalance the weight carried by the forward ends of the levers. Resilient bumpers 82 are provided at the outer end of each arm 70 to absorb the shock when the weight 74 slides to the rear end of its travel.

While I have referred to the table 14 as being raised by a counterweighted tilting frame, it will be evident that this frame and the members 24 constitute the links of a toggle which the counterweight tends to hold in alinement. The toggle is "broken" or flexed by pulling the handle 20, and then the more the toggle flexes the greater will be the leverage exerted by the counterweight. In other words, increased toggle leverage exerted by the table as it descends will

be compensated by increased counterweight leverage, thus resisting acceleration of the table.

In operation, the machine must first be adjusted to the length of the flask that is to be used therein. The cope section of the flask is first placed on the table 14 in inverted position. The levers 50 are then swung down and the handles 57 raised to permit of inverting the trunnion heads to the position shown in Fig. 4. The trunnion heads must then be adjusted so that the trunnion pins 62 will enter sockets formed in opposite ends of the cope section. This is done by loosening the screws 60 and sliding the trunnion shafts 52 inward or outward, as may be required. After this adjustment has been made the shafts 52 are locked in place by means of the screws 60 and then the trunnion shafts will need no further adjustment. Thereafter, to attach a cope section to the trunnion heads it is merely necessary to operate the handle 67 to withdraw the right hand trunnion pins and then, after the cope section has been set in proper position on the table with the left hand trunnion pins engaging the sockets of the cope section, the handle 67 is turned back to normal position permitting the right hand trunnion pins to engage the sockets on the right hand end of the cope section. By reason of the spring backing for the pins 62 in each of the trunnion heads ample allowance is made for slight variations that may occur in the size of different flask sections.

With a cope section 84 inverted and fitted in the trunnion heads and resting on the table which is in raised position, as shown in Fig. 4, the next operation is to place a pattern plate 85 on the cope section, and then to place the drag section 86 of the flask in inverted position, on the pattern plate. It will be understood that the various sections of the flask and the pattern plate are provided with the usual means for centering the parts. For any material variation in size of pattern plate the fingers 36 must be adjusted in their guide slots so that they will pass under the projecting pattern plate and in this adjustment they may be secured permanently as long as the same pattern plate is to be used.

The operator now fills the drag with sand and carefully rams the sand around the pattern projecting therein. This done a bottom board 87 is placed over the drag section and secured thereto as well as to the cope by means of clamps 88. The method of securing the bottom board to the flask will vary with different makes of flasks, but any of the well known means for this purpose may be employed. After the drag has been rammed and the bottom board applied, the operator, by seizing the handle 69, raises the flask clear of the table 14 and then the flask will turn over by gravity on the trunnion shafts 52 as an axis, by reason of the greater weight of the filled drag section over that of the empty cope section. When the flask has turned over the keys 54 will snap into the key-ways 53 and hold the trunnion heads against oscillating. Fig. 5 shows the position of the flask after it has been turned over and redeposited on the table. The latter remains in its raised position, while the operator fills the cope with sand and rams the sand tightly about the portion of the pattern projecting therein.

The next operation is to draw the pattern. The clamps 88 are released. Then the draw handle 29 is operated to permit gradual withdrawal of the draw pin 25 and at the same time the handle 20 is pulled forward to swing the pintle rod 22 off dead center. The table will then move downward by gravity under control of the draw handle 29. As the table is lowered the pins 36 will engage the pattern plate and lift it off the drag, as shown in Fig. 6. The cope is then lifted clear of the pattern plate by operating the handle 69 to raise the levers 50 and the parts will then assume the position shown in Fig. 7. The pattern plate which is resting on the pins 36 is now removed and the table is again raised by lifting the handle 20 of the tilting frame. After locking the table in raised position by means of the draw handle 29, the cope is lowered upon the drag by pulling down on the handle 69. The parts are then in the position shown in Fig. 8, and the handle 67 is operated to withdraw the trunnion pins 62, after which the completed mold in its flask may be lifted off the machine, thus completing the operation of making the mold.

The fingers 36 are not only readily adjustable for different sizes of mold but are also readily removable so that they may be replaced with others of different height, in order to allow for variations in depth of the pattern; for it will be evident that when drawing the pattern, the pattern plate must be lowered sufficiently for the cope to clear said pattern as the levers 50 are swung upward.

While I have described a specific embodiment of my invention it will be understood that many variations can be made in the form, structure, and arrangement of parts without departing from the spirit and scope of my invention as described in the claims.

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

1. In a molding machine, a table mounted to move vertically, means for actuating said table, a wedge for checking movement of the table, and means for gradually releasing said wedge to permit controlled movement of the table.

2. In a molding machine, a frame, a table vertically slidable therein, means for raising the table when empty but yielding to the weight of the table when loaded, a wedge carried by the table, a friction device adapted to bear against said wedge as the table descends, and means for controlling the effectiveness of said friction device and thereby controlling descent of the table.

3. In a molding machine, a frame, a table vertically slidable therein, means for raising the table when empty but yielding to the weight of the table when loaded, a pair of cooperating wedges carried by the frame and table respectively, one of the wedges being moved laterally by engagement with the other as the table descends, and means for controlling movement of the laterally movable wedge and thereby controlling the descent of the table.

4. In a molding machine, a frame, a table vertically slidable in said frame, a toggle mechanism supporting the table and adapted when the links of the toggle are alined to hold the table in raised position, said toggle mechanism including a lever arm, a counterweight carried by said arm, means for flexing the toggle mechanism out of alinement to permit descent of the table, the counterweight being so disposed with respect to the toggle mechanism as to exert increased leverage thereon as the toggle flexure increases, and a brake carried by said frame for retarding descent of the table.

5. In a molding machine, a frame, a table vertically slidable in said frame, a toggle mechanism supporting the table and adapted when the links of the toggle are alined to hold the table in raised position, said toggle mechanism including a lever arm, a counterweight carried by said arm, means for flexing the toggle mechanism out of alinement to permit descent of the table, the counterweight being so disposed with respect to the toggle mechanism as to exert increased leverage thereon as the toggle flexure increases, a wedge adapted to prevent lowering of the table, and means for gradually releasing the wedge to control the rate of descent of the table.

6. In a molding machine, a table mounted to move vertically, a frame mounted on a horizontal axis and adapted to swing about said axis and above the table, trunnion members journaled in the frame on opposite sides of the table, means for attaching a flask to said trunnion members, a counterweight having a tendency to lift the flask, said counterweight being movable by gravity along the frame to increase said tendency as the flask is raised.

7. In a molding machine, a table mounted to move vertically, a frame mounted on a horizontal axis and adapted to swing about said axis and above the table, trunnion members journaled in the frame on opposite sides of the table, means for attaching a flask to said trunnion members, a counterweight having a tendency to lift the flask, said counterweight being movable by gravity along the frame to increase said tendency as the flask is raised, and yielding stops for limiting the travel of the counterweight along the frame.

8. In a molding machine, a table mounted to move vertically, a frame mounted on a horizontal axis and adapted to swing about said axis and above the table, trunnion members journaled in the frame on opposite sides of the table, means for attaching a flask to said trunnion members, a counterweight having a tendency to lift the flask, the counterweight being movable by gravity along the frame to increase said tendency as the flask is raised, a stop for limiting the travel of said counterweight along the frame, and means for adjusting the position of said stop.

9. In a molding machine, a table adapted to support a flask, a frame mounted to oscillate on a horizontal axis, trunnions carried by the frame on the forward side of the axis, means for attaching the flask to the trunnions, said frame having an extension on the other side of the axis and providing a track, a counterweight mounted to move by gravity along said track, the track being slightly forwardly inclined when the flask is resting on the table whereby the counterweight will move by gravity toward said axis.

10. In a molding machine, a frame mounted to operate on a horizontal axis, trunnions carried by the frame on the forward side of the axis, means for attaching a flask to the trunnions, a stop against which the frame rests when in lowered position, the frame having an extension on the other side of the axis providing a track, a counterweight mounted to travel by gravity along said track, said track being slightly forwardly inclined when the frame engages the stop, whereby the weight will move forward toward said axis, and an adjustable stop for limiting forward movement of the counterweight.

11. In a molding machine, a frame mounted to swing vertically, trunnions journaled in the frame, means carried by said trunnions for engaging the flask, an arm extending from the frame, and a counterweight movable by gravity along said arm to automatically vary the leverage of said counterweight as the frame is swung.

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