

Feb. 20, 1951

S. J. GEDRIS
MOLDING MACHINE

2,542,243

Filed March 3, 1947

4 Sheets-Sheet 1

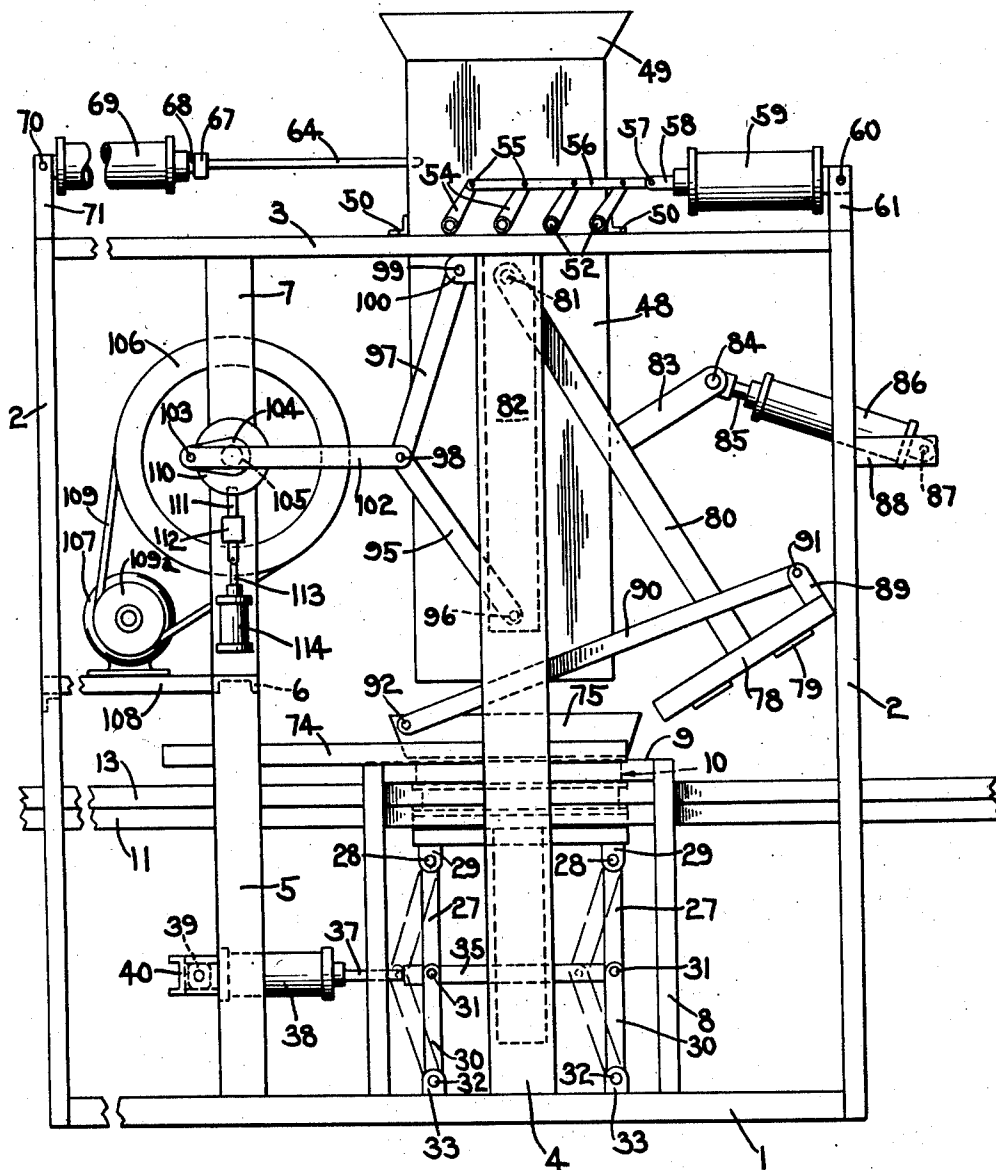


FIG. 1.

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4 Sheets-Sheet 2

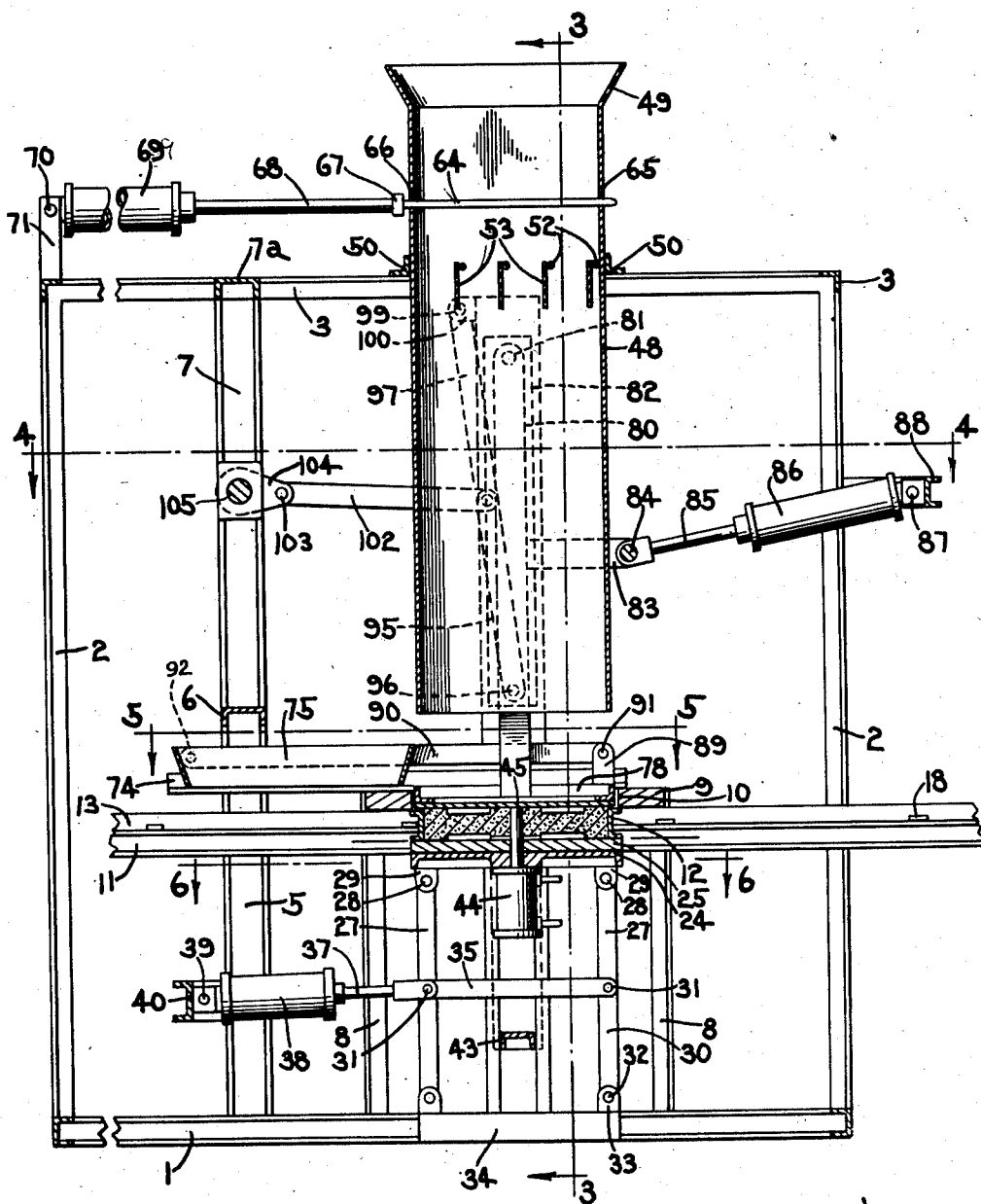


FIG. 2.

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4 Sheets-Sheet 3

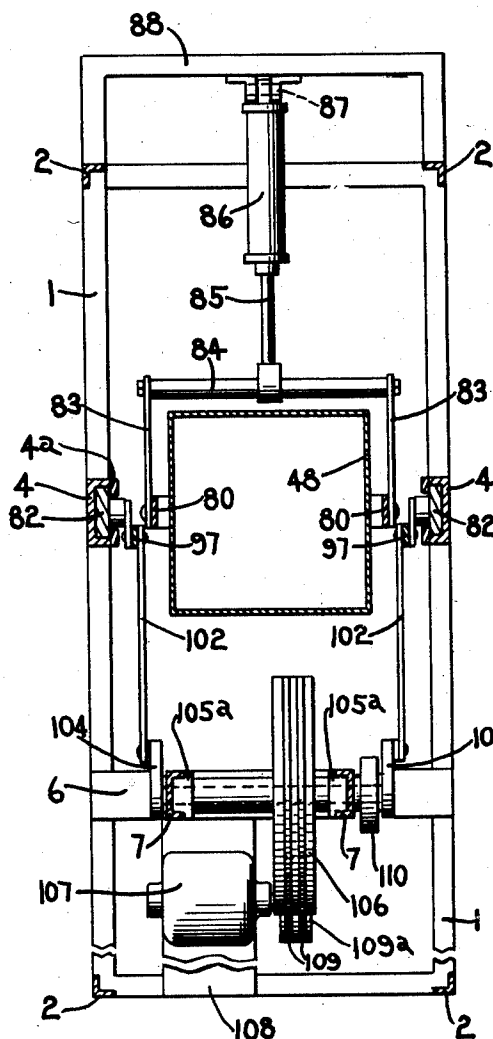


FIG. 4.

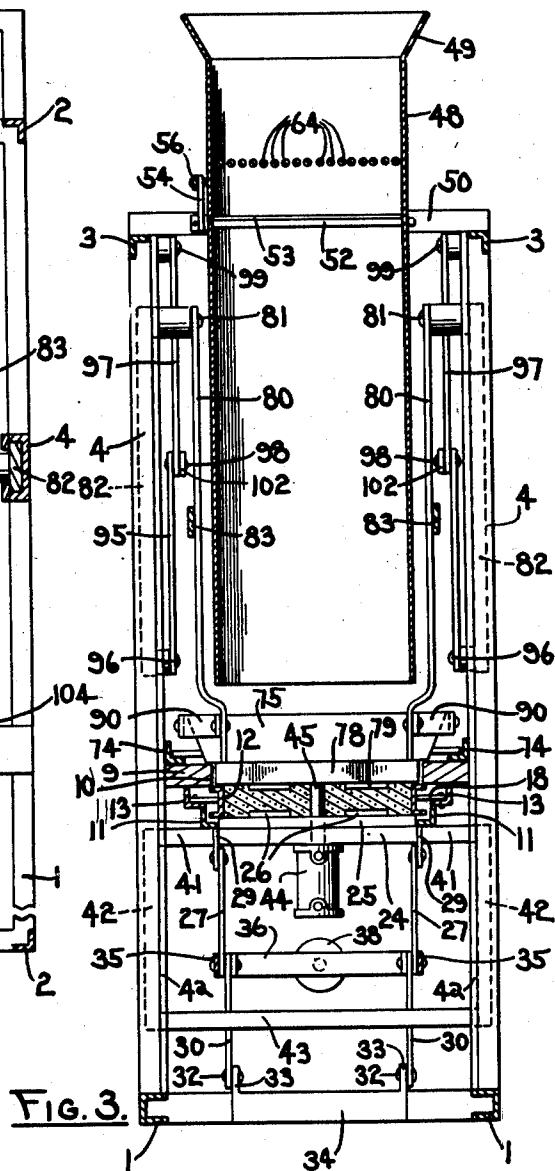


FIG. 3.

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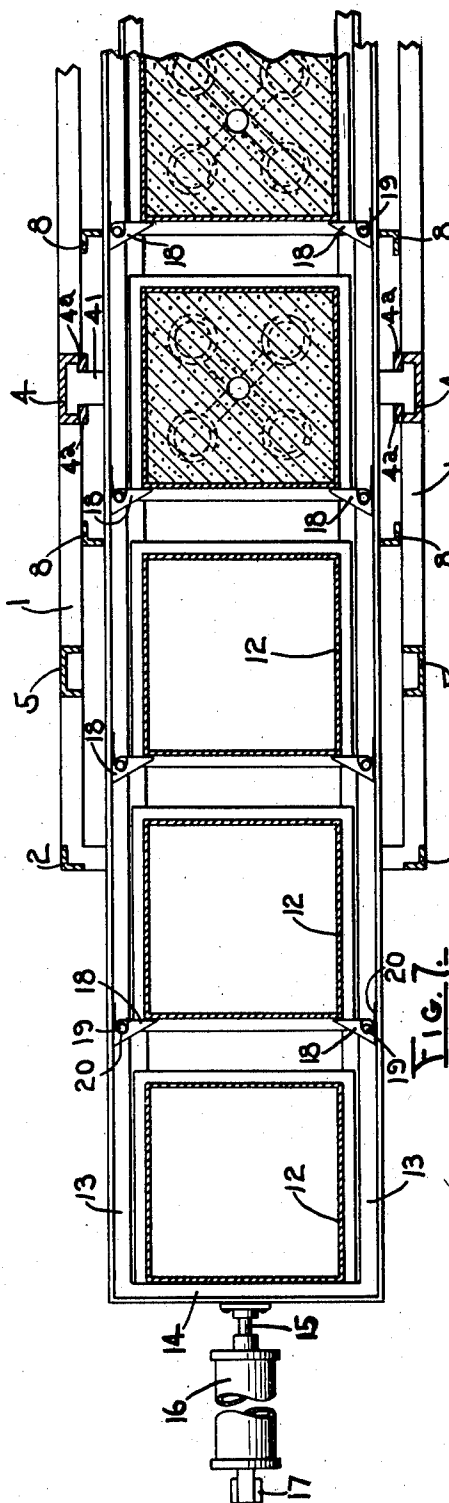


FIG. 7.

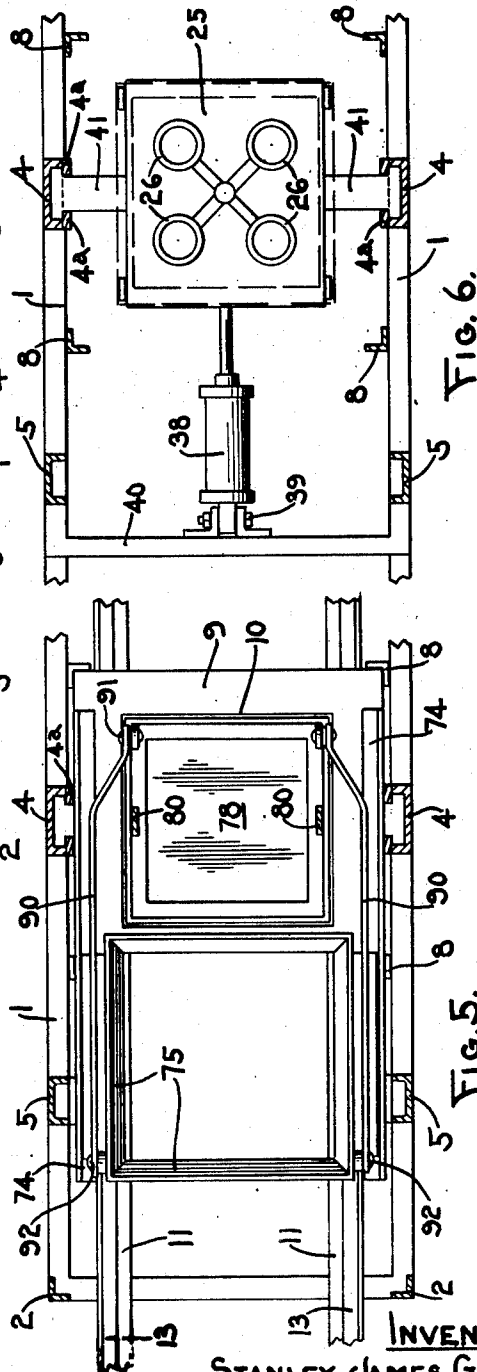


FIG. 5.

FIG. 6.

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UNITED STATES PATENT OFFICE

2,542,243

MOLDING MACHINE

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Application March 3, 1947, Serial No. 732,047

5 Claims. (Cl. 22-43)

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This invention relates to improvements in molding machines for making foundry sand molds.

The primary purpose of the present invention is to provide a machine which will automatically make foundry casting molds quickly and conveniently. Another object is to provide a machine for making sand molds which has simplicity of construction and which will speedily make sand molds.

A still further purpose of the invention is to provide a machine in which the flask is moved into position on and clamped to the pattern plate. Thereafter a measured amount of sand is first dropped and then squeezed into the flask to form the desired mold cavities, sprue and gates.

Other objects of this invention are: to provide a plate with an opening therethrough against which the flask is located, the thickness of the plate gauging the depth of the uncompressed molding sand; to provide means for connecting the strike-off and squeezing head for their simultaneous movement; to provide for guided vertical movement of the pattern plate; to provide for guided vertical movement of the squeezing head; to provide for a toggle link operation of the squeezing head for quick and powerful movement thereof.

Other purposes and objects of the present invention will become apparent during the following description taken in connection with the accompanying drawings, in which,

Fig. 1 is an elevational view of a molding machine of my invention.

Fig. 2 is a vertical longitudinal sectional view through the machine as shown in Fig. 1.

Fig. 3 is a vertical transverse sectional view through the molding machine taken along lines 3-3 in Fig. 2.

Fig. 4 is a horizontal sectional view through the molding machine taken along line 4-4 of Fig. 2.

Fig. 5 is a fragmentary horizontal sectional view through the strike-off and squeezing mechanism taken along the line 5-5 of Fig. 2.

Fig. 6 is a fragmentary horizontal sectional view showing the pattern and pattern plate in plan view, the section being taken along line 6-6 in Fig. 2.

Fig. 7 is a horizontal sectional plan view through the molding machine showing the conveying mechanism for moving the flasks into and out of the machine.

In all of the foregoing figures the sectional views are looking in the direction of the arrows indicated.

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Like reference characters refer to like parts in the different figures of the drawings.

Referring to the details of the drawings and particularly to Figs. 1 and 2, the molding machine is provided with a framework comprising a lower rectangular frame 1 having the vertical frame members 2 secured to the corners and extending upwardly therefrom, the horizontally located rectangular frame 3 secured between the uprights 2. The pair of vertical supporting members 4 are secured between the base frame 1 and the upper frame 3. Other frame members 5 are secured to the base frame 1 and extend upwardly therefrom having the horizontal frame members 6 secured therebetween at their upper ends. The vertical frame members 7 are secured between the horizontal frame members 6 and the horizontal frame member 7a secured within the frame member 3.

A plurality of vertical supporting members 8 are secured to the base frame 1 and at their upper ends support the horizontal plate 9 having a rectangular opening 10 (Figure 2) vertically therethrough.

Means are provided for moving the flasks 12 into the machine to the molding position and out of the machine after the sand mold has been completed. The flasks being stationary during the operation of the machine, but removable therefrom when a cycle of operation is completed, they are sometimes for brevity hereinafter, and in the claims, referred to as "removable stationary flasks" and elsewhere merely as "flasks." They are of conventional construction excepting where otherwise specified or indicated. This flask moving means comprises a pair of horizontally spaced tracks 11 attached to the inner faces of the vertical supporting members 8. These tracks 11 slidably support the flasks thereon while they are being moved into the machine by a conveying mechanism comprising the spaced horizontal angular members 13. The angular members 13 are slidably movable parallel to the tracks 11. One end of the angular members 13 is attached together by means of the cross member 14 as best shown in Fig. 7, this cross member 14 being attached to the piston rod 15 of an air cylinder 16 secured to a fixed supporting member 17. A plurality of laterally opposite dogs 18 are pivotally mounted at 19 along the length of the angle members 13 with the torsion springs 20 yieldably holding each of the dogs into extended flask engaging position or in the position as shown in Fig. 7.

A horizontally located rectangular pattern supporting head 24 (Figure 2) has a pattern plate

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25 removably located thereon with the pattern and gates 26 (Figure 6) formed at the upper side thereof. Means are provided for moving the head 24 vertically to clamp a flask between the pattern plate and the rectangular, stationary plate 9. This means for moving the pattern supporting head vertically comprises a set of toggle links 27 (Figure 2) pivotally attached at their upper ends at 28 to the brackets 29 secured to and extending downwardly from the head 24. The toggle links 27 are pivotally attached at their lower ends at 31 to other toggle links 30 which in turn are pivotally mounted at 32 to the upwardly extending ears 33 formed as part of the supporting base 34 secured to the floor on which the machine is supported. The set of links are adapted to move together by providing a link 35 pivotally attached at its ends at 31 at the juncture of the toggle links 27 and 30.

Means are provided for moving the toggle links 27 and 30 either to a straight line position or to the angular position as shown in broken lines in Fig. 1. This is accomplished by providing a cross head 36 pivotally attached at 31 between the toggle links 27 and 30. This cross head is attached to the piston rod 37 of an air cylinder 38 pivotally mounted at 39 to the supporting frame 40 secured between the vertical frame members 5. On actuation of the air cylinder 38, the toggle links 27 and 30 may be moved to the position shown in broken lines, in which position, the flask may be slidably moved over the pattern and pattern plate. On opposite actuation of the air cylinder 38 the toggle links 27 and 30 are moved to the straight line position, thus moving the pattern and pattern plate upwardly, lifting the flask from the track 11 and forcing the flask tightly against the underside of the horizontal plate 9.

Means are provided for holding the head 24 in a horizontal position at all times by providing the narrow outward extensions 41, to the outer ends of which are attached the slides 42, held in spaced relationship at their lower ends by means of the stretcher 43 secured therebetween. The side frame members 4 are of channel shape and are machined to form ways to slidably receive the slides 42. Narrow plates 4a are attached to the inner faces of the side frame members 4 to hold the slides 42 slidably therewithin.

Means are provided for forming a sprue vertically through the sand mold by attaching the air cylinder 44 to the underside of the head 24 with the piston rod 45 thereof extending upwardly through the head 24 and the pattern plate 25 into the interior of the mold flask. This piston rod 45 is formed the desired size and shape of the sprue to be formed within the sand mold. On actuation of the air cylinder 44 in one direction, the sprue former 45 is moved downwardly to withdrawn position below the surface of the pattern plate 25. On opposite actuation of the air cylinder 44 the sprue former 45 is moved to upwardly extended position to form a sprue vertically through the completed sand mold.

With the flask 12 clamped between the underside of the stationary plate 9 and the pattern plate 25 a measured amount of sand is dropped into the flask through the opening 10 in the plate 9. This is accomplished by providing the vertically located rectangular chute 48 which extends upwardly from a position closely adjacent the plate 9. The upper end of the chute 48 is flared outwardly at 49 for the reception of molding sand therein. Means are provided for dropping

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a measured amount of sand into the flask by providing the plurality of rods 52 extending across and rotatably mounted in the chute 48. By rotation of the rods 52 the doors or gates 53, secured to the rods 52, are movable to open or closed position, thus closing off the section of the chute above the rods 52. These rods 52 are rotated to move the gates to open or closed position by means of the levers 54 attached in parallel relationship to the outer ends of the rods 52. The outer ends of the levers 54 are pivotally attached at 55 to the actuating bar 56. This bar 56, in turn, is pivotally attached at 57 to the piston rod 58 of an air cylinder 59 pivotally secured at 60 to the upwardly extending frame member 61. On actuation of the air cylinder 59 in an outward direction, the gates 53 are moved to open position as shown in Fig. 2 and on opposite actuation of the air cylinder 59, that is to withdrawn position, the gates 53 are all moved to a horizontal position, closing off the upper portion of the chute 48. Angle members 50 supported on frame members 3 hold the chute in position.

The means for measuring the sand within the chute 48 also comprises a plurality of rods 64 each extending through an opening 66 in one side of the chute 48 and adapted to move across the width of the chute into other openings 65 to close off the chute and support any molding sand located thereabove. The rods 64 are all secured to the cross head 67 (Figure 2) attached to the outer end of the piston rod 68 of the air cylinder 69. The cylinder 69 is pivotally attached at 70 to the upwardly extending frame members 11. With the gates 53 in closed position, the rods 64 may be moved to withdrawn position on one action of the air cylinder 69 whereupon any sand above rods 64 will drop downwardly onto the closed gates 53. Upon opposite action of the air cylinder 69, the rods 64 are moved across the width of the chute 48 and into the openings 65. The gates 53 are thereafter opened by action of the air cylinder 59 allowing only the sand below the rods 64, or a measured amount of sand, to drop downwardly through the chute 48 into the mold flask 12 and opening 10 in the fixed plate 9. Thus, when the amount of sand needed to make a completed mold has been determined this measured amount of sand may be dropped by the described action of the gates 53 and of the rods 64.

After sand is dropped from the chute 48 into the flask 12 and opening 10 of plate 9, means are provided for striking off the sand to the proper depth to give the resulting mold the proper density after being tamped or squeezed. This is accomplished by providing the spaced horizontal tracks 74 secured to the inner faces of the frame members 4 and frame members 5. The strike-off 75 of rectangular form and having downwardly and inwardly converging sides, as best shown in Fig. 2, is slidably received on the tracks 74 and is movable to a position over the flask or to a withdrawn position to one side of the flask.

After the sand has been delivered into the flask and opening 10 and has been struck off by the strike-off 75, a squeezing head 78 is moved to a position over the flask to squeeze the sand therein. This squeeze head 78 is provided at its underside with the patterns 79 and has connected thereto the upwardly extending supporting arms 80 at each side thereof. The arms 80 are pivotally connected at 81 to the slides 82. These slides 82 are slidably received in the frame members 4,

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with the cover plates 4a slidably holding them therein. Means are provided for moving the squeeze head 78 about the pivot 81 to a position withdrawn from or to a position over the flask, by providing the supporting arms 80 with the spaced arms 83 extending at a right angle to the supporting arm 80. A rod 84 extends between these spaced arms 83 to which is pivotally connected the piston rod 85 of an air cylinder 86. The air cylinder 86 is pivotally connected at 87 to a supporting frame 88 attached to the upright frame members 2.

Means are provided for coordinating the movement of the strike-off 75 and squeeze head 78 into and out of their position over the flask such that each is positioned over the flask when the other is withdrawn. This is accomplished by providing a pair of spaced upwardly extending ears 89 attached to the squeeze head 78 with the links 90 pivotally attached at 91 to the ears 89 and pivotally attached at 92 to the strike-off 75. When the squeeze head 78 is moved to its withdrawn position the strike-off 75, by means of links 90, is moved to a position over the flask, but when the squeeze head is moved to the position over the flask, the strike-off 75 is moved to withdrawn position by the links 90.

After the squeeze head 78 by action of the air cylinder 86, is moved from withdrawn position to a position over the flask 12 with the uncompressed sand therein, means are provided for forcibly lowering the squeeze head 78 to squeeze or compress the sand within the flask. This means comprises a pair of links 95 pivotally attached at their lower ends at 96 to the lower ends of the slides 82 and another pair of toggle links 97 pivotally attached at 98 to the free ends of the toggle links 95 and at their upper ends pivotally attached at 99 to the brackets 100. The brackets 100 are secured to the upper ends of the frame members 4. Means are provided for quickly and powerfully moving the toggle links 95 and 97 from their angular position as shown in Fig. 1, to an in line position, as shown in Fig. 2, thus moving the squeeze head 78 into squeezing position. This means comprises the horizontal connecting bar 102 pivotally attached to the junction of the toggle links 95 and 97 at the pivot point 98 and at its other end pivotally connected at 103 to the crank 104. The crank 104 is rotatably mounted on the shaft 105 which in turn is rotatably mounted in the bearing 105a (Figure 4) secured to the vertical frame members 7. A fly wheel 106 is attached to the shaft 105, driven through the pulley 109a and belts 109 by the motor 107 which is secured to the platform 108. A one revolution clutch 110 is secured to the crank 104 and means are provided for tripping the clutch 110 including the trip bar 111 (Figure 1) slidably received in the guide block 112 attached to the piston rod 113 of an air cylinder 114. The air cylinder 114 is secured to the frame member 7. During operation of the machine, the motor 107 is operated continuously, imparting rotary motion to the fly wheel 106 and the shaft 105. The rest position of the toggle links 95 and 97 is shown in Fig. 1 and on actuation of the air cylinder 114 retracting the trip bar 111, the one-revolution clutch operates imparting one revolution from the fly wheel 106 to the crank 104, which motion moves the toggle links 95 and 97 from the rest position, or angular position, to the straight line position, as shown in Fig. 2, and back to the angular position, as shown in Fig. 1. This movement of the toggle

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links 95 and 97 moves the squeeze head from its rest position downwardly to squeeze position and again upwardly to its rest position.

After the sand has been squeezed into the flask 12, the flask is lowered onto the spaced tracks 11 and the pattern is stripped from the flask by the lowering of the pattern plate 25 by action of the air cylinder 38 moving the toggle links 27 and 30 to their angular position. Each flask as it is completed and lowered onto the tracks 11, is moved horizontally along the angular conveyor members 13.

In the operation of the molding machine, flasks are placed one at a time on the left end of the supporting tracks 11, as shown in Fig. 1. Each flask 12 is moved intermittently along the tracks by the oscillating motion of the conveyor members 13, having the conveyor dogs 18 thereon, by the actuation of the air cylinder 16. Each of the flasks 12 is moved to a position over the pattern plate while the pattern is held in a lowered position. The pattern is held in this lowered position by the angular positions of the toggle links 27 and 30 movement of which is controlled by the air cylinder 38. After a flask is thus moved over the pattern plate and under the stationary plate 9 in line with the opening 10 therethrough, the air cylinder 38 is oppositely actuated to bring the toggle links 27 and 30 to an in line position, raising the pattern plate, lifting the flask from the tracks 11, and clamping the flask between the pattern plate and the underside of the stationary plate 9.

With a flask thus clamped in line with the opening 10 through the stationary plate 9, and with the strike-off 75 in a position over the opening 10 and with the squeezing head 78 moved to withdrawn position, a measured amount of sand is dropped downwardly through chute 48 into the flask 12 and opening 10 onto the pattern plate 25 and pattern 26 to fill the flask 12, opening 10 and extend slightly above the surface of the stationary plate 9.

This measured amount of sand is deposited into the flask by first actuating the air cylinder 59 to move the gates 53 to their horizontal, closed positions. The plurality of rods 64 are thereafter withdrawn from across the opening of chute 48 by the actuation of air cylinder 69, allowing sand in the chute to drop downwardly against the closed gates 53. The rods 64, on opposite actuation of the air cylinder 69, are extended across the width of the chute 48 and into the openings 65. The gates 53 are thereafter moved to their vertical, open position, on opposite actuation of the air cylinder 59, allowing the measured amount of sand below the rods 64 to drop downwardly into the flask 12 and opening 10.

After this measured amount of sand is delivered, the air cylinder 86 is actuated moving the strike-off to a withdrawn position and moving the squeezing head 78 to a position directly over and in line with the opening 10 in plate 9. During its movement from the position over the flask to withdrawn position, the strike-off 75 removes all the sand in excess of the amount necessary to squeeze into the flask.

With the squeezing head 78 in effective position over the flask, and with the flywheel 106 in rotation, the one revolution clutch 110 is operated by the withdrawal of the clutch operating pin 111 by actuation of the air cylinder 114. Thus, the rotative motion of the flywheel 106 is transferred to the crank 104, which operates the toggle links 95 and 97 from their angular position to an

in line position and back to angular position. During the movement of the toggle links 95 and 97 from their angular position to in line position, the slides 82 and consequently the squeezing head 78, are forcibly and quickly moved downwardly. This downward movement of the squeezing head 78 forces the squeezing head downwardly into the opening 10 to a position in close proximity to the upper face of the flask 12, thus squeezing the sand into the flask and forming the mold cavities in the upper and lower face of the sand therein. During the movement of the toggle links 95 and 97 from their in line position to their angular position, the squeezing head 78 is moved quickly to its upper, withdrawn position above the surface of the stationary plate 9. On opposite actuation of the air cylinder 86 the squeezing head 78 is swung forwardly to its withdrawn position, while the strike-off 75 is moved from its withdrawn position to the position over the opening 10 in the stationary plate 9 for the guiding of sand into a subsequently positioned flask.

After the sand has been squeezed in the flask, the air cylinder 38 is oppositely actuated, moving the toggle links 27 and 30 to their angular positions, thus lowering the pattern plate, depositing the flask onto the tracks 11 and stripping the pattern plate and pattern from the underside of the flask and sand mold therein. The pattern plate is lowered sufficiently that the pattern is below the under surface of the flask resting on the tracks 11.

Each flask 12, after the sand mold has been squeezed therein is moved along the tracks 11 by actuation of the conveyor 13 operated by air cylinder 16.

Having thus described my invention, what I desire to secure by Letters Patent is set forth in the appended claims:

1. In a machine for filling a flask with sand and compressing the same, the combination comprising: a stationary plate having a central opening therethrough; a vertically adjustable lower pattern plate; said stationary plate and said pattern plate adapted for holding a flask therebetween; means for vertically reciprocally moving said lower pattern plate, said pattern plate in one position forcing said flask upwardly against said stationary plate and in another position being spaced away from said stationary plate a distance greater than the height of the pattern on said pattern plate; a squeezing head pivotally mounted for lateral movement and slidably mounted for vertical movement; a strike-off element adapted for lateral movement; a sand hopper spaced a substantial distance above said flask and means associated therewith for releasing sand therefrom as a substantially compact mass; said hopper, opening in said stationary plate, and flask being vertically aligned; means for moving said strike-off element and said squeezing head; means for coordinating the movement of said strike-off element and squeezing head whereby said strike-off element and said squeezing head are alternately vertically aligned with said flask and displaced to one side thereof; said squeezing head during downward vertical movement compressing sand in the opening in said stationary plate into said flask.

2. A mold making machine having a stationary supporting frame and including, in vertical alignment, means defining a stationary chamber, a vertically adjustable lower pattern plate adapted to support a removable flask between said lower pattern plate and said stationary chamber

and a sand hopper and associated release gate spaced a substantial distance above said flask, the improvement in said machine comprising: a strike off frame and a squeezing head alignable alternately with said flask, said squeezing head being laterally removed from said flask when said sand release gate is open and when in vertical alignment being adapted for squeezing sand in said stationary chamber into said flask; a beam and vertically reciprocating slide for supporting said squeezing head; a link unit pivotally mounted on one of its ends to said squeezing head and on the other of its ends to said strike-off frame for coordinating the movements of said squeezing head and said strike-off frame; a toggle assembly having one of its ends pivotally mounted to said stationary supporting frame and the other of its ends pivotally mounted to said slide for vertically moving said squeezing head.

3. A mold making machine having a stationary frame and adapted to receive a flask, the improvement in said mold making machine comprising: a pair of flask supporting, spaced rails extending through said stationary frame; a stationary plate above said rails, said stationary plate defining a central opening therethrough; a vertically reciprocable pattern plate below said rails and vertically aligned with said stationary plate and adapted to raise a flask from said rails and clamp said flask against said stationary plate; a laterally, reciprocally movable strike-off frame above said stationary plate, vertically alignable with said pattern plate; a stationary sand hopper vertically aligned with said pattern plate; a squeezing head mounted for vertical, reciprocating movement in vertical alignment with said pattern plate; means pivotally mounting said squeezing head for lateral movement out of vertical alignment with said pattern plate; means for coordinating the lateral movements of said strike-off frame and said squeezing head whereby said strike-off frame and said squeezing head are alternately vertically alignable with said pattern plate.

4. A mold making machine having a stationary frame and adapted to receive a flask, the improvement in said mold making machine comprising: a pair of flask supporting, spaced rails extending through said stationary frame; a stationary plate above said rails, said stationary plate defining a central opening therethrough; a vertically reciprocable pattern plate below said rails and vertically aligned with said stationary plate; toggle means for moving said pattern plate vertically to raise a flask from said rails and clamp said flask against said stationary plate; a laterally, reciprocally movable strike-off frame above said stationary plate, vertically alignable with said pattern plate; a stationary sand hopper vertically aligned with said pattern plate; a squeezing head mounted for vertical reciprocating movement in vertical alignment with said pattern plate; toggle means for moving said squeezing head vertically; means pivotally mounting said squeezing head for lateral movement out of vertical alignment with said pattern plate; a bar pivotally mounted to said strike-off frame and squeezing head for coordinating the lateral movements of said strike-off frame and said squeezing head, whereby said strike-off frame and said squeezing head are alternately, vertically alignable with said pattern plate.

5. In a machine for filling a flask with sand and compressing the same, the combination comprising: a stationary plate having a central open-

ing therethrough; a vertically adjustable lower pattern plate; said stationary plate and said pattern plate adapted for holding a flask therebetween; means for vertically, reciprocally moving said lower pattern plate, said pattern plate 5 in one position forcing said flask upwardly against said stationary plate and in another position being spaced away from said stationary plate a distance greater than the height of the pattern on said pattern plate; a squeezing head 10 mounted for lateral reciprocating movement and for vertical reciprocating movement; a strike-off element adapted for lateral movement; a sand hopper spaced a substantial distance above said flask and means associated therewith for releasing sand therefrom as a substantially compact 15 mass; said hopper, opening in said stationary plate, and flask being vertically aligned; means for moving said strike-off element and sand squeezing head; means for coordinating the 20 movement of said strike-off element and squeezing head whereby said strike-off element and said squeezing head are alternately vertically aligned with said flask and displaced to one side thereof; said squeezing head during downward 25 vertical movement compressing sand in the opening in said stationary plate into said flask.

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