April 14, 1925. 1,533,383

D. J. CAMPBELL

MOLDING SAND HANDLING MACHINE

Filed Nov. 13, 1922 5 Sheets-Sheet 1

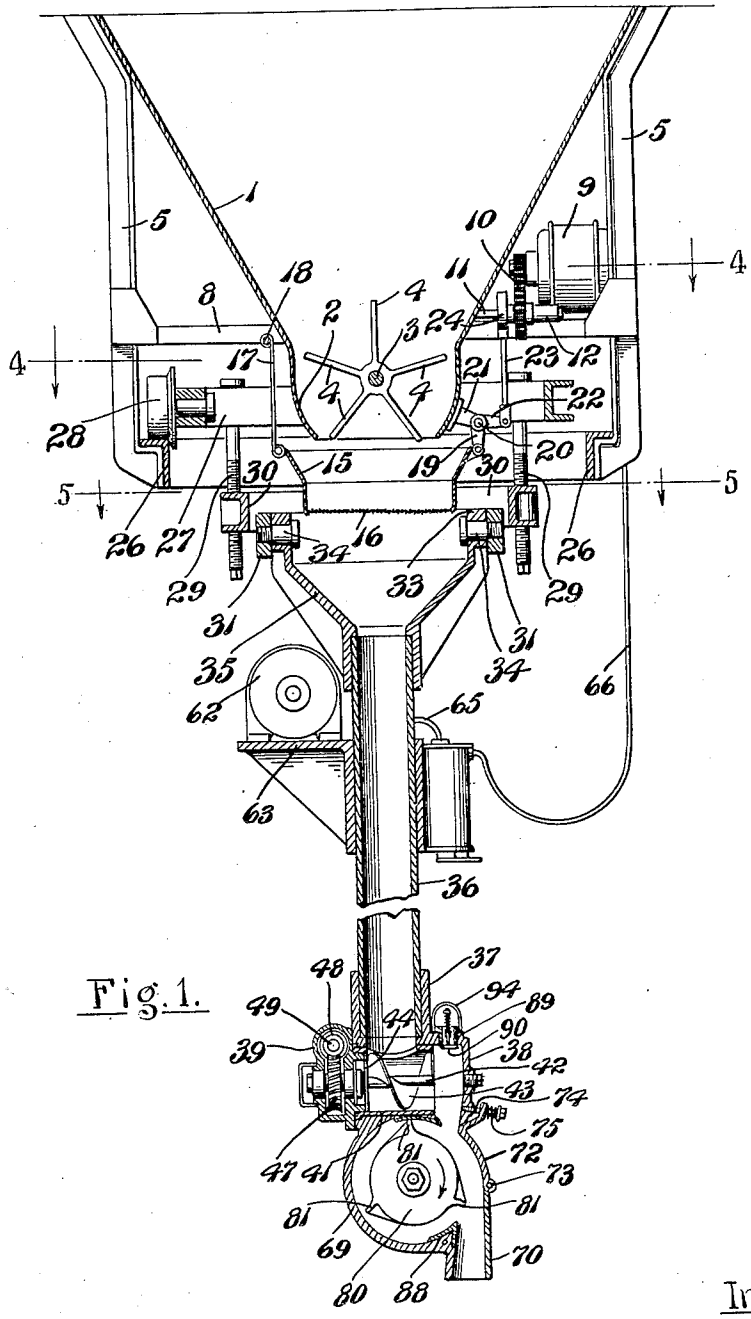


Fig. 1.

Inventor
Donald J. Campbell
By Frank E. Liverance, Jr.
Attorney

April 14, 1925. 1,533,383

D. J. CAMPBELL

MOLDING SAND HANDLING MACHINE

Filed Nov. 13, 1922 5 Sheets-Sheet 2

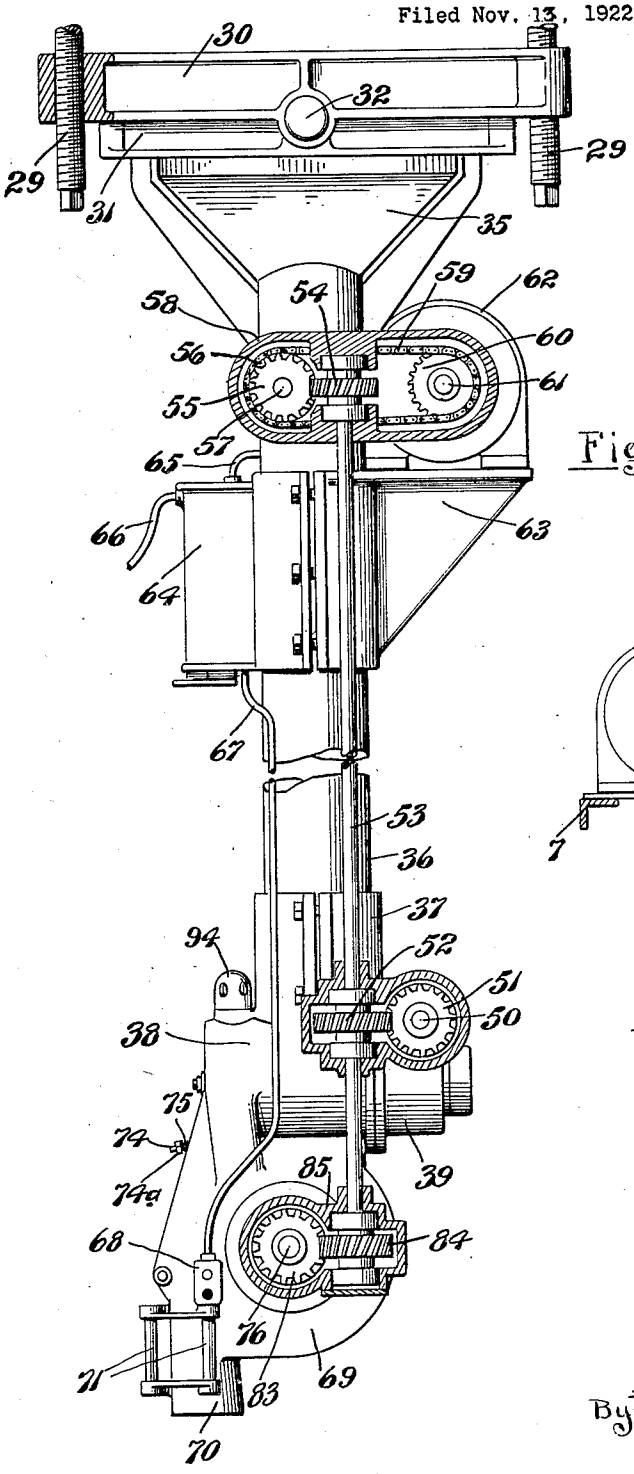


Fig. 2.

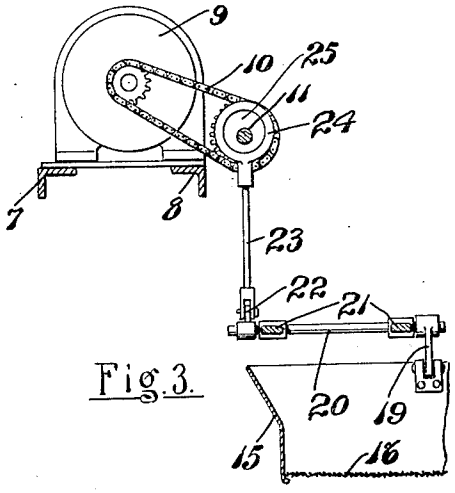


Fig. 3.

Inventor
Donald J. Campbell
By Frank E. Livernois, Jr.
Attorney.

April 14, 1925. 1,533,383

D. J. CAMPBELL

MOLDING SAND HANDLING MACHINE

Filed Nov. 13, 1922 5 Sheets-Sheet 3

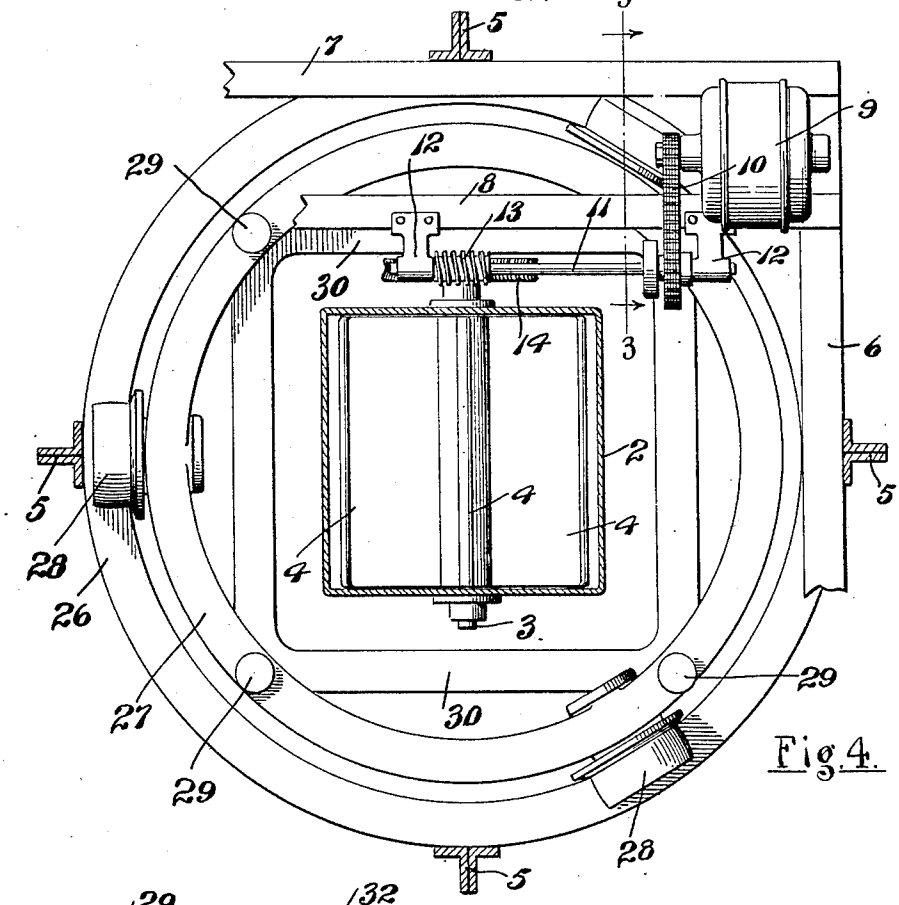


Fig. 4.

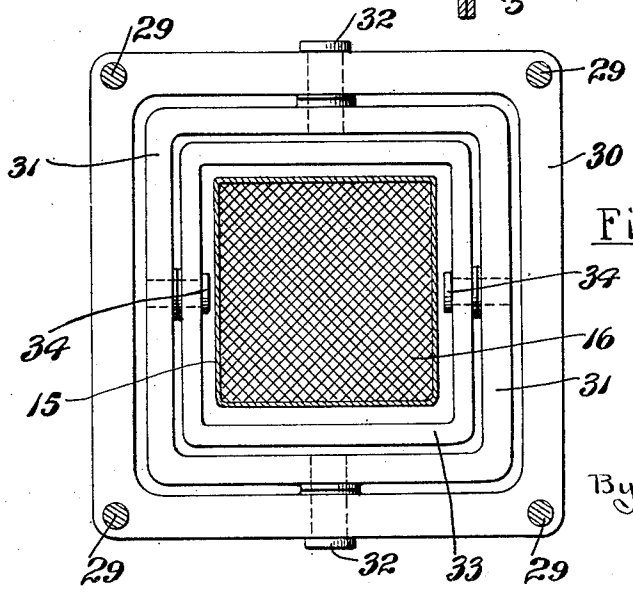


Fig. 5.

Inventor
Donald J. Campbell
By Frank E. Liverance, Jr.
Attorney.

April 14, 1925. 1,533,383

D. J. CAMPBELL

MOLDING SAND HANDLING MACHINE

Filed Nov. 13, 1922 5 Sheets-Sheet 4

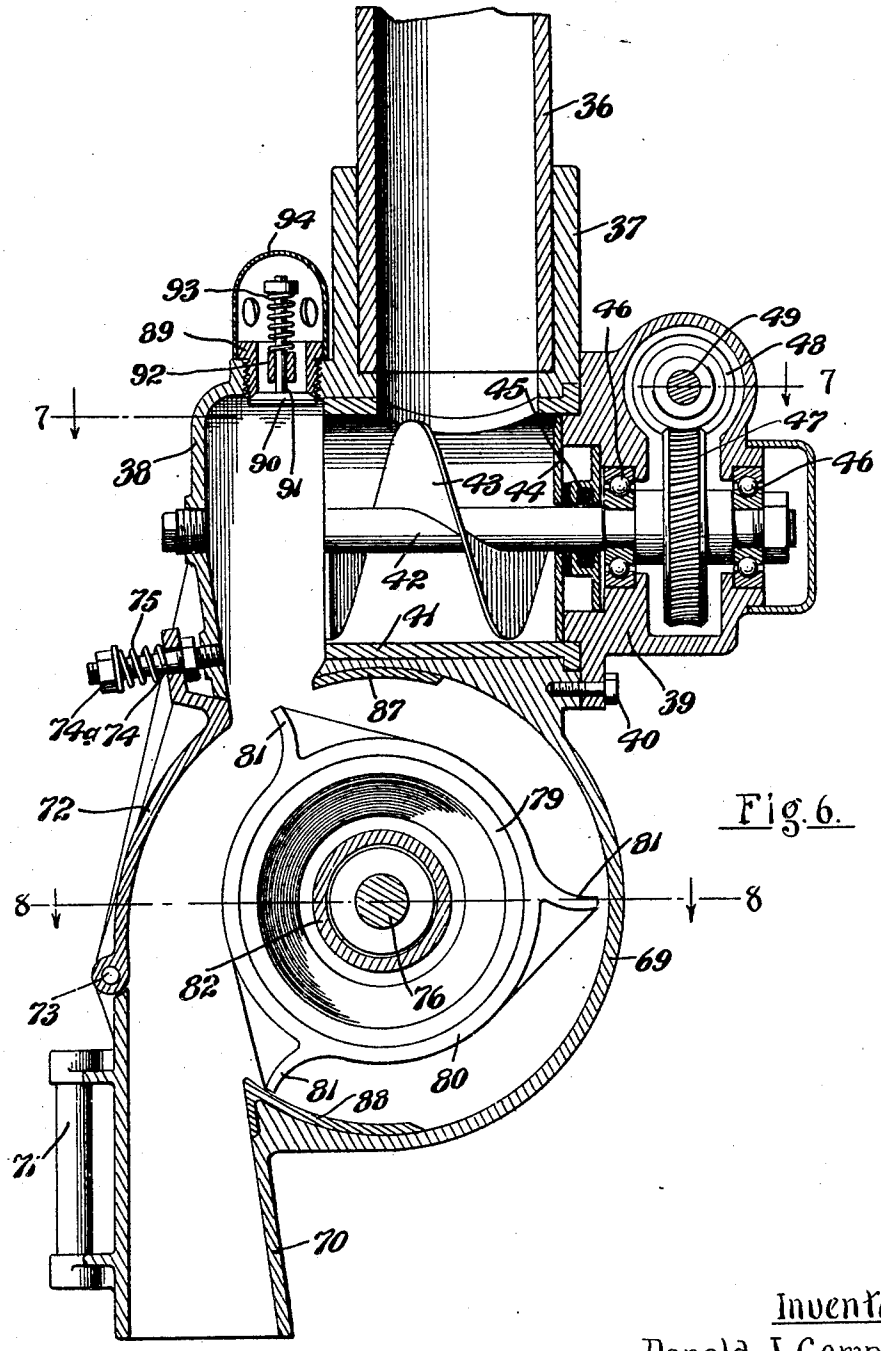


Fig. 6.

Inventor
Donald J. Campbell
By Frank E. Liverance, Jr.
Attorney.

April 14, 1925. 1,533,383

D. J. CAMPBELL

MOLDING SAND HANDLING MACHINE

Filed Nov. 13, 1922 5 Sheets-Sheet 5

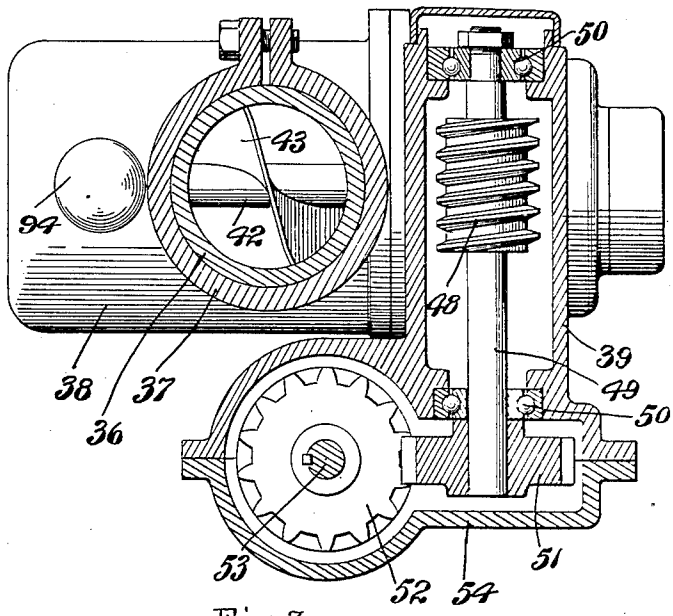


Fig. 7.

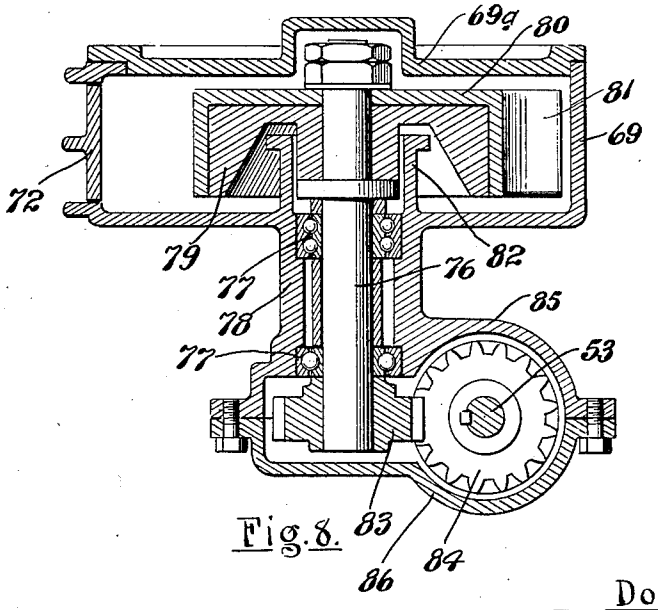


Fig. 8.

Inventor
Donald J. Campbell
By Frank E. Liverance, Jr.
Attorney.

Patented Apr. 14, 1925. 1,533,383

UNITED STATES PATENT OFFICE.

DONALD J. CAMPBELL, OF MUSKEGON HEIGHTS, MICHIGAN.

MOLDING-SAND-HANDLING MACHINE.

Application filed November 13, 1922. Serial No. 600,687.

To all whom it may concern:

Be it known that I, DONALD J. CAMPBELL, a citizen of the United States of America, residing at Muskegon Heights, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Molding-Sand-Handling Machines; 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 relates to molding machines wherein sand is projected from the machine in small quantities and at very short intervals from the machine into any convenient flask and around the pattern thereof. Essentially the machine consists of a rapidly rotating sand throwing wheel coupled with means for continuously feeding the sand at uniform rate thereto, means being used for what is a practically continuous measured supply of the sand to the sand throwing wheel. To accomplish this a novel organization of mechanisms is supplied, including certain novel arrangements of parts, and associations and combinations of operating elements for the complete and practical embodiment of the invention for attaining the ends stated, as well as many others not at this time specifically outlined, but which will appear as understanding of the invention is had from the following description, taken in connection with the accompanying drawings, in which,

Fig. 1 is a vertical section through the machine of my invention.

Fig. 2 is a side elevation of the machine with parts in section to disclose covered mechanism.

Fig. 3 is a fragmentary elevation and section on the line 3—3, of Fig. 4, showing the sand riddling or shaker mechanism of the machine.

Figs. 4 and 5 are horizontal sections on lines 4—4, and 5—5, of Fig. 1, respectively, looking downwardly as indicated by the arrows.

Fig. 6 is an enlarged vertical section through the lower end portion of the machine where the sand throwing wheel is mounted, and

Figs. 7 and 8 are horizontal sections on lines 7—7 and 8—8, of Fig. 6, looking downwardly as indicated.

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

In the construction of the molding machine, a bin 1 for the containing of molding sand is supported in any suitable manner from overhead, having downwardly converging sides at the lower portion of which the same are formed into partly cylindrical form with an outlet opening to the bin at the lower edges of said sides, said curved partly cylindrical portions being indicated at 2. A shaft is rotatably mounted across and between the other vertical sides of the bin, from which a plurality of equally spaced vanes project. The shaft and vanes are located between the parts 2, as shown in Fig. 1.

Supporting irons 5, preferably of angle formation, indicated at 5, depend from the overhead support and extend at their lower ends to slightly below the lower end of the bin. At a distance above their lower ends a supporting frame is horizontally positioned and connected thereto, including bars 6 and 7, with a bar 8 paralleling the bar 7, as shown in Fig. 4. A variable speed electric motor 9 is secured on this frame near one end of the bars 7 and 8. The shaft of this motor drives a belt 10 which passes around and drives a shaft 11 mounted in bearings 12 attached to the bar 8, on which shaft a worm 13 is fixed which meshes with a worm wheel 14 fixed on the end of the shaft 3. It is obvious that when the motor 9 is running, shaft 3 with attached vanes 4 is turned at relatively low speed and measured quantities of sand are taken from the bin and delivered from the lower end thereof at intervals, or as fast as the shaft 3 turns the vanes across the lower end of the bin to bring the sand between any two vanes to the opening at the lower end of said bin.

Below the lower end of the bin a sand riddle is mounted, comprising an open frame 15 of sheet metal, across the bottom of which a screen 16 is secured. The riddle, at one side, is suspended by links 17 attached thereto from a rod 18 carried by said frame. At its opposite side an arm 19 is pivotally connected thereto, said arm being secured at its opposite end to a rod 20, rotatably mounted in the outer ends of short brackets 21 which are secured to and project from one side of the sand bin. A second arm 22 is fixed to the rod 20 and to

its outer end one end of a rod 23 is pivotally connected, at its other end connecting with an eccentric housing 24 which passes around an eccentric 25 on the shaft 11. The rotation of the shaft 11, reciprocates the rod 23, with a consequent rocking of shaft or rod 20 and a continuous back and forth shaking of the riddle, whereby the sand delivered from the bin to the riddle is sifted or riddled, dropping through the screen 16, as is evident.

A ring or circular track 26 of metal having an angle iron cross section is secured to the lower ends of the supporting irons 5 in horizontal position on which a second ring 27 is mounted, wheels 28 rotatably mounted on and extending from the sides of the second ring bearing on the track 26. A plurality of headed rods 29, threaded at their lower portions pass through the ring 27 and extend a distance below the same, the threaded portions passing through the corners of a frame 30 of rectangular outline which is thus supported below the ring 27 and adjustably mounted with respect thereto.

Within the frame 30, a second frame of similar outline but smaller is located, indicated at 31 and at its opposite sides is mounted on studs 32 carried by the frame 30. A third rectangular frame 33 is located within the second frame 31 and has studs 34 passing through two opposite sides into the sides of said frame 31. Studs 32 and 34 are located at right angles to each other so that it is apparent that the mechanisms carried by and suspended from the inner frame 33 have practically a universal pivotal movement at the upper end due to this form of mounting described and best shown in Fig. 5.

The frame 33 is located directly below the riddle, and in fact in the adjustment of the outer frame 30 upwardly, said riddle may extend downwardly within the said frame 33. An integrally formed funnel-like downward extension to the frame 33 is made, having converging sides, as indicated at 35, at its lower end joining with the upper end of a relatively long hollow tube 36 through which the sand delivered from the riddle passes. While the tube is shown as of substantially uniform diameter, it may be tapered and gradually enlarged toward the bottom, if desired, so that sand entered at the upper end will freely fall and will not clog or be stopped in the tube in its downward movement.

The lower end of the tube 36 enters into an upwardly projecting sleeve 37 cast on a housing 38, and said sleeve is clamped to the tube. The housing 38 is hollow and in it a short conveyer of the screw type and mechanism to operate it is housed, one end of the housing being open for the reception of the conveyer, being afterward closed by an additional housing member 39 which houses driving mechanism and which is secured to the housing 38 by cap screws 40.

A sleeve 41 is located horizontally in the housing 38 below the lower end of the tube 36, openings being made for sand passage from the tube thereto. A shaft 42 extends lengthwise of the sleeve and into the additional housing 39, on which a short screw conveyer 43 is mounted. This conveyer does not extend to the end of the housing 38 at one end, a passage being left through which sand drops to be thrown outwardly by the sand projecting wheel. A plate 44 is located across the sleeve 41 at or adjacent its opposite end, shaft 42 passing therethrough, and suitable packing 45 is located against the plate to preclude sand passage to the bearings 46 in housing 39 in which the shaft 42 is mounted.

A worm wheel 47 is fixed on the shaft 42 and is in engagement with a worm 48 on a shaft 49 disposed above and at right angles to the shaft 42, said shaft being mounted in bearings 50 as shown in Fig. 7. At one end of the shaft a gear 51 is secured which meshes with a second gear 52 secured on a vertical shaft 53 located alongside of the tube 36. It is apparent that when shaft 53 is driven, the conveyer 43 is turned at comparatively slow speed so as to carry the sand dropped into the tube 36 away and deliver it to the outlet passage in the housing 38 for passage to the rotating sand throwing wheel.

Shaft 53 extends nearly to the upper end of the tube 36 and at its upper end is provided with a gear 54 which is in driving engagement with a gear 55. Gear 55, together with a sprocket wheel 56 is fixed on a shaft 57 mounted within a housing 58 which is used to house the mechanism at the upper end of the shaft 53 and into which said shaft enters from below. A chain 59 passes around the wheel 56 and also around a second wheel 60 which is secured within the housing 58 on the shaft 61 of an electric motor 62 which furnishes the motive power for driving the mechanism just described.

The motor is carried by a bracket support 63 which is connected to the tube 36 together with a control box 64 for controlling the electric currents for running the motors 9 and 62. The electric connections from the control box to motor 62 are encased in a cable 65, those to the motor 9 in a cable 66, and a third cable 67 leads from the box to a circuit closing and breaking switch 68 which is mounted at a side of a housing 69 depending from and integral with the housing 38 and in which the sand projecting wheel is mounted. The switch is conveniently positioned above one of the handles 71 on the housing 69 so as to be readily operated when the operator of the machine has grasped

the handle to swing it to a desired position. The housing 69 has an outlet 70 through which the sand passes and the handles are positioned vertically alongside the outlet as shown.

Housing 69 is practically of cylindrical form except for outlet portion thereof. One end is furnished by a detachable plate 69ª, which is removable for assembly and for inspection or repair of the mechanism within the housing. Above the outlet 70, a curved sector or part of the curved sides of the housing is made separate from the remainder, as indicated at 72, being pivotally connected thereto at 73, its upper end having an opening for the passage of a bolt 74 which is attached to and projects from the end of the housing 38 and at the outer end of which a nut 74ª is carried, a spring 75 around the bolt being interposed between the nut and end of the part 72 serving to normally hold it in closed position, but yielding at times when necessary to avoid breakage, as will be later described.

A shaft 76 extends into the housing 69 at one side thereof, being mounted in bearings 77 located in a laterally extending sleeve 78 to the housing 69. A head 79 is fixed on the end of shaft 76 within the housing 69 and the same is covered with a member 80 at its outer end and around its curved sides, from which member a number of equally spaced fingers 81 project which are the full width of the head 79 and the member 80 thereover. The head 79 has an annular recess in its uncovered end into which a sleeve 82 cast integral with the housing 69 projects serving as a guard against sand coming to the bearings 77.

Shaft 76 has a gear 83 at the end thereof opposite to that at which the head 79 is attached with which another gear 84 has engagement. The gear 84 is fixed on shaft 53 and is housed, together with the gear 83 in a housing 85 at the end of the sleeve 78, the housing having a removable side 86, as shown in Fig. 8, for assembly, inspection or repair of the gearing just described. Shaft 53 is continued below the housing 38 and enters housing 85 from above. The ends of the fingers 81 come nearly to the curved walls of the housing 69 and at the sand inlet to the housing 69 a plate 87 is secured on the inner side of the housing, and a similar plate 88 is secured substantially opposite at the sand outlet, the ends of the fingers 81 coming closely adjacent the same in their rotation.

The passage for the sand from the conveyer 43 to the sand throwing wheel and located at the end of the housing 38 is given an air inlet at its upper end, an opening being made through said housing 38 into which a sleeve 89 is threaded, the inner end of which is formed as a seat for a valve 90 attached at the lower end of a valve rod or stem 91 which passes upwardly through a collar 92 located in the sleeve, the rod at its upper end being equipped with a head between which and the collar 92 a coiled spring 93 is placed, the normal tendency of which is to close the valve. This valve mechanism is covered with a sheet metal shell 94, having openings in its sides for air passage, as shown in Figs. 2 and 6.

In the use of this machine, the handles 71 are grasped and the lower end of the apparatus swung over the flask to be filled, so as to direct the sand to any part thereof and around the pattern. The circuit is closed by operating the switch at 68, whereupon both motors 62 and 9 start with a feeding of the sand from the bin 1 to the tube 36 and a riddling of the sand before passage to said tube, and a feeding of the sand in tube 36 to the sand projecting or throwing wheel by which it is thrown outward through the outlet 70 into the flask and around the pattern. There is a continuous and steady supply of sand to the conveyer feed member 43 and the sand is supplied in uniform and continuous amount to the wheel 80, the fingers taking small quantities in rapid succession and throwing it into the flask. Owing to the high speed of rotation of the wheel 80, a vacuum is likely to be produced in the sand inlet passage from the conveyer to the wheel and the air valve 90 opens under the outside pressure of air which enters at the upper part of the passage and helps in moving the sand downward to the sand throwing wheel. The operator moves the lower end of the apparatus over the flask to different positions as desired to fill the same and compact the sand around the pattern, continuing until the flask is filled, whereupon the switch at 68 is operated to stop the motors and any further projection of the sand.

The mounting of the sector 72 with a pivotal connection and with a spring yielding closure of the section is a safeguard against breakage should any chunks or pieces of foreign material in the sand come to the wheel and have a tendency to force the sector outward. The sand is riddled automatically with its taking from the bin 1 and the liability of foreign matter in the sand, or hard pieces or lumps therein is practically obviated.

The particular feature of utility in this molding machine is the steady, uniform and continuous passage of sand to the sand throwing wheel. The supply to the wheel is made by a continuous conveyer feed which is uniform, and there is always a supply for the conveyer delivered by the vanes 4 to the riddle. This insures even feed to the sand throwing wheel, without any variations in supply. The fingers engage the sand

as fed thereto, throwing small quantities of the sand in uniform, even and rapid succession into the flask.

The machine is practical, durable and efficient. The appended claims define the invention which is to be considered as comprehensive of all forms of structure coming within their scope.

I claim:

1. In a machine of the class described, a sand holding bin having a delivery opening in its lower side, means for delivering measured quantities of sand from the bin through said opening, a circular track mounted around and adjacent the lower part of the bin, a ring movably mounted on the track to move about a vertical axis, a frame supported by and below the ring, a second frame within the first frame mounted thereon to turn about a horizontal axis, a third frame within the second frame mounted to turn about a horizontal axis at right angles to the first mentioned horizontal axis, a downwardly extending extension to the third frame having converging sides, a tube connected to and depending from the lower end of said extension, a housing connected to the lower end of the tube, a screw conveyer in said housing located horizontally across the lower end of the tube, an extension to the housing below the conveyer having an outlet and an inlet into which the conveyer moves sand from the tube, and a sand throwing wheel rotatably mounted in the said housing extension and formed with outwardly projecting fingers for engaging with the sand fed thereto to throw the same outwardly through the outlet, substantially as described.

2. A construction containing the elements in combination defined in claim 1, combined with a shaft mounted alongside the tube, gearing connections between the shaft and the conveyer, gearing connections between the shaft and the sand throwing wheel, and means carried on the tube near its upper end connected with the shaft to drive the same, substantially as described.

3. In a machine of the class described, a sand holding bin having a delivery opening at its lower side, means for delivering measured quantities of sand from the bin through said opening, a motor for driving said delivering means, a tube suspended vertically below the opening in the bin, said tube at its upper end having a member with downwardly converging sides attached thereto, said member being open at its upper side, a sand riddle movably suspended between the bin and said member into which the sand is delivered, a shaft driven by the motor, means connecting the shaft and riddle to shake the riddle back and forth with rotation of the shaft, and means at the lower end of the tube for throwing the sand in small amounts and in quick succession into a flask, substantially as described.

4. In a machine of the character described, a vertically positioned tube, a housing at the lower end of the tube having a horizontal interior bore therein, a screw conveyer mounted in said bore at the lower end of the tube, said housing having an outlet at one end thereof, means carried on the housing for driving the conveyer, a second housing located below and connected with the first housing having an inlet opening communicating with the outlet of the first housing, and an outlet extending downwardly at one side thereof, a sand throwing wheel mounted in the second housing and means for driving the said wheel.

5. In a machine of the class described, a vertically positioned tube, a housing at the lower end of the tube, a short screw conveyer located horizontally across the lower end of the tube and within the housing, a second housing located below the first housing, a sand throwing wheel mounted in said second housing, said second housing having a downwardly extending outlet at one side and an inlet communicating with the chamber in the first housing in which the conveyer is located, a motor located adjacent the upper end of the tube, a shaft driven by the motor and located lengthwise of and outside of the tube, and gearing connections between said screw conveyer and sand throwing wheel and said shaft for driving the same by the shaft.

6. In a machine of the class described, a sand holding bin, means for discharging measured quantities of sand from the lower side of the bin, a sand riddle movably mounted below the lower end of the bin, an elongated tube carried below the sand riddle, a housing secured to the lower end of the tube, a short screw conveyer mounted horizontally within the housing at the lower end of the tube, a second housing below the first housing, a sand throwing wheel mounted for rotation in said second housing, there being communication between the two housings for the passage of sand, and said second housing having an outlet at one side, a motor carried adjacent the upper end of the tube means for driving the conveyer and sand throwing wheel from said motor, a second motor, and means for driving said sand discharging means and moving the sand riddle from said second motor.

In testimony whereof I affix my signature.

DONALD J. CAMPBELL.