E. C. WILEY.

MACHINE FOR JARRING SAND MOLDS.

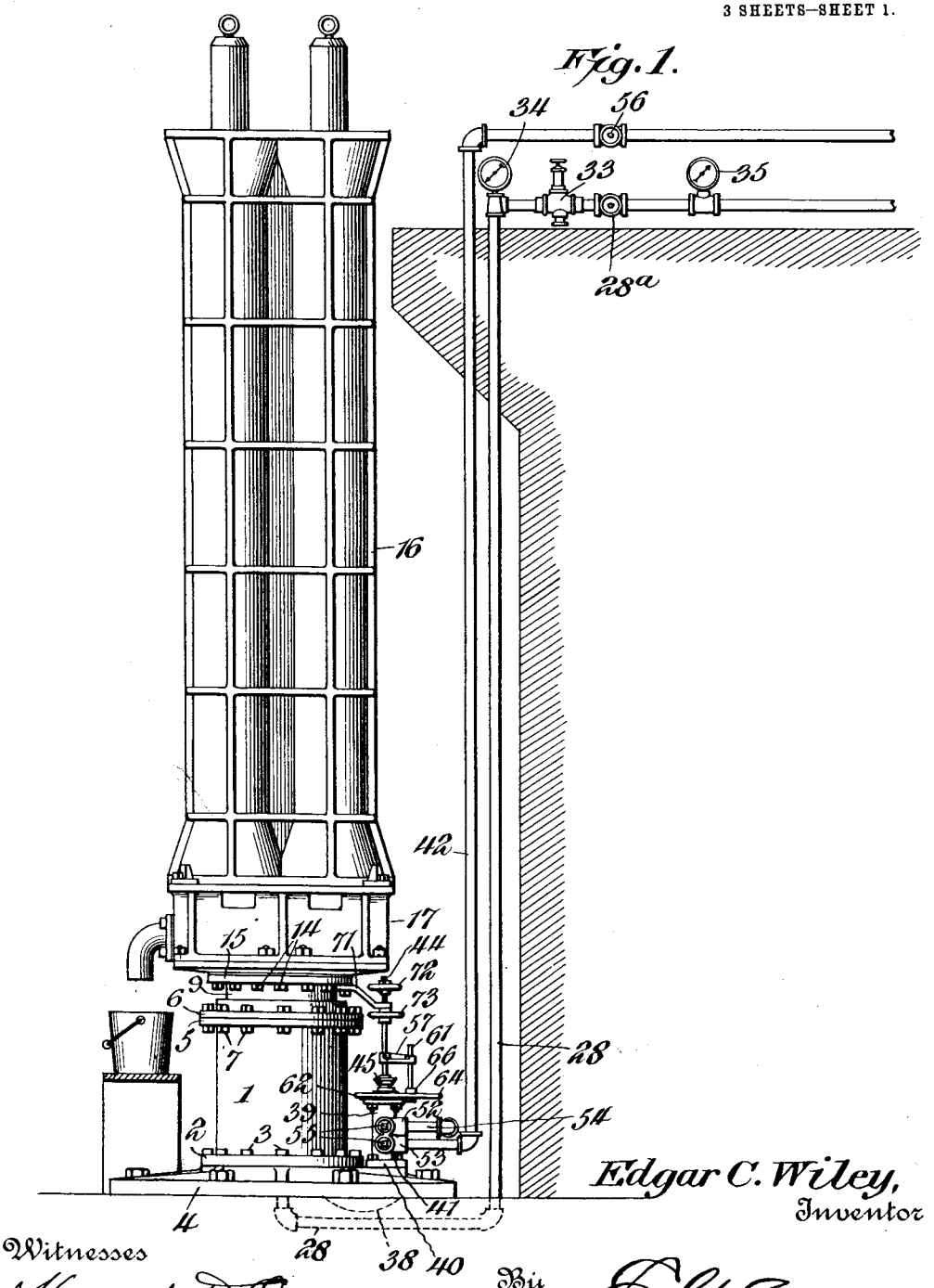
APPLICATION FILED JUNE 24, 1910.

1,039,622.

Patented Sept. 24, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

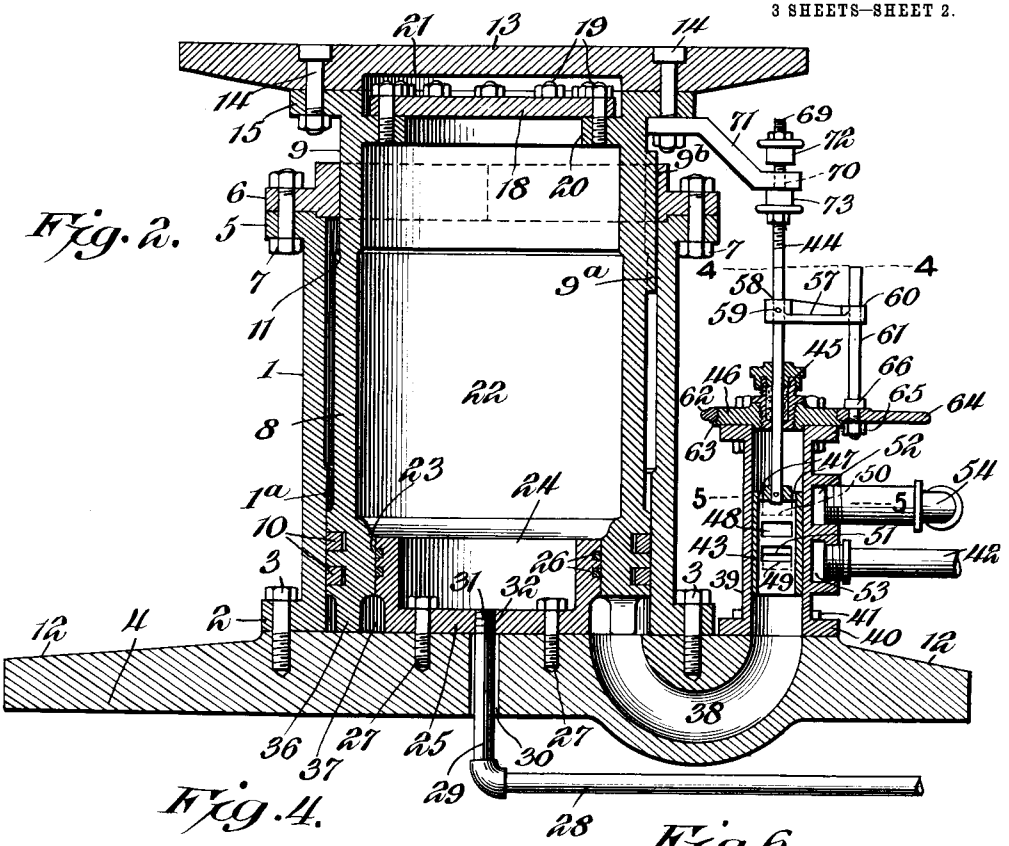


Fig. 4.

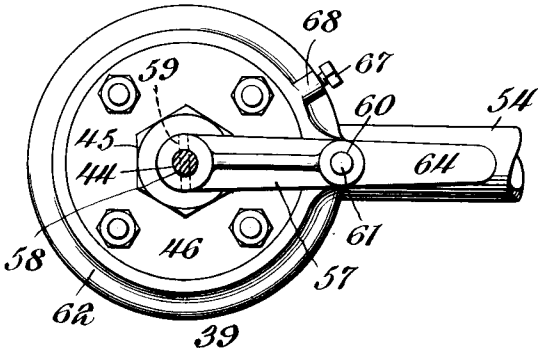
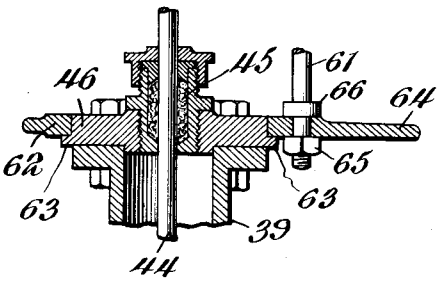


Fig. 6.



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3 SHEETS—SHEET 3.

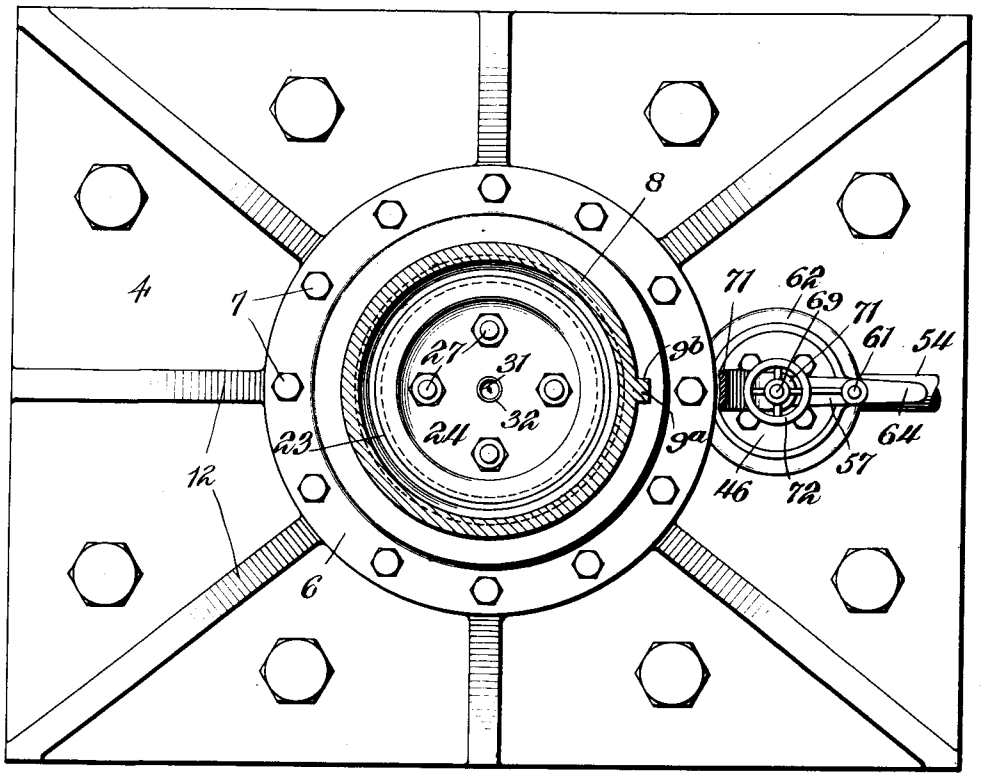

Fig. 3.

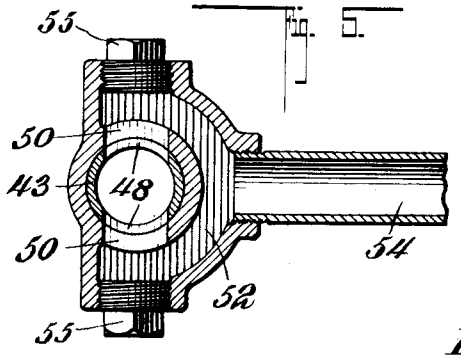

Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

EDGAR CLARENCE WILEY, OF LYNCHBURG, VIRGINIA, ASSIGNOR OF ONE-HALF TO LYNCHBURG FOUNDRY COMPANY, OF LYNCHBURG, VIRGINIA.

MACHINE FOR JARRING SAND MOLDS.

1,039,622. Specification of Letters Patent. Patented Sept. 24, 1912.

Application filed June 24, 1910. Serial No. 568,735.

To all whom it may concern:

Be it known that I, EDGAR C. WILEY, a citizen of the United States, residing at Lynchburg, in the county of Campbell and State of Virginia, have invented a new and useful Machine for Jarring Sand Molds, of which the following is a specification.

The invention relates to machines for jarring sand molds.

The object of the present invention is to improve the construction of that class of sand jarring machines in which the sand is packed around the pattern by jarring the support upon which the flask rests, and to provide a simple and efficient jarring machine, capable of rapidly and thoroughly packing the sand, and equipped with means for maintaining a constant pressure on a portion of the area of the piston for partially counterbalancing the load and thereby varying the effective weight of the flasks, so that the jarring effect may be varied without making it necessary to change the stroke of the engine, and at the same time be accomplished by a much smaller cylinder and a less exhaust or consumption of compressed air than heretofore.

With these and other objects in view, the invention consists in the construction and novel arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:—Figure 1 is a side elevation of a jarring machine, constructed in accordance with this invention and arranged within a pipe pit, one of the walls thereof being in section. Fig. 2 is an enlarged vertical sectional view of the jarring machine. Fig. 3 is a horizontal sectional view of the same. Fig. 4 is an enlarged horizontal sectional view on the line 4—4 of Fig. 2. Fig. 5 is a similar view on the line 5—5 of Fig. 2. Fig. 6 is an enlarged sectional view of the upper portion of the valve casing, illustrating the manner of mounting the adjusting ring.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

In the embodiment of the invention illustrated in the accompanying drawings, 1 designates a vertical cylinder, provided at its lower end with an outwardly extending horizontally disposed attaching flange 2, secured by screws 3, or other suitable fastening means to a base or bed plate 4. The vertical cylinder is also provided at its upper end with an outwardly extending horizontally disposed annular flange 5 to which a guide ring 6 is secured by bolts 7, or other suitable fastening means. The guide ring 6, which is provided with an interior diameter less than the interior diameter of the upper end of the cylinder, forms a guide for the upper portion of a vertically movable piston 8, which is also guided exteriorly at its lower end in a lower guiding portion 1^a of the cylinder. The guide ring projects inwardly from the upper edge of the cylinder, and the upper portion 9 of the piston is of slightly less diameter than the intermediate and lower portions, and the guiding ring is constructed in halves or sections to enable the parts to be assembled. In order to hold the piston against rotary movement, it is interlocked with the cylinder by means of a vertical rib 9^a, formed integral with the piston and operating in a vertical groove 9^b of the ring 6. The lower portion of the piston is provided with exterior packing rings 10, which form practically an air tight fit between the lower end of the piston and the lower portion of the cylinder. The intermediate portion of the piston is spaced from the upper portion of the cylinder, and the shoulder 11 formed by a reduction of the upper portion of the cylinder is arranged to engage the lower edge or face of the guide ring, whereby the upward movement of the piston is limited. The base or bed plate is preferably reinforced by ribs 12, located at the upper face of the base, as clearly illustrated in Fig. 3 of the drawings, but the parts may be made of any size and thickness to secure the necessary strength, and to adapt the machine to the size and weight of the flasks to be jarred.

The piston is cylindrical and is equipped at the top with a table 13, secured by an annular series of vertical bolts 14 to the exterior annular flange 15, extending hori-

zontally from the upper end of the piston. The table is adapted to support a multiple flask 16 and in practice a blacking box 17 is preferably interposed between the flask and the table. The blacking box 17 is not claimed herein, as it forms the subject-matter of a companion application, executed of even date herewith.

The upper end of the piston is closed and rendered practically air tight by a circular head 18, secured by an annular series of bolts 19 to an interiorly arranged annular flange 20, formed integral with the piston and extending horizontally from the inner face thereof adjacent to the upper end of the same. The upper face of the inner horizontal flange 20 is spaced from the upper end edge or face of the piston, and the lower face of the table 13 is also recessed at 21 to provide a space for the head 18 and the bolts 19.

The interior of the hollow cylindrical piston constitutes a pressure-receiving balancing or counter-balancing chamber 22, and the lower portion 23 of the piston is bored or machined to provide a cylindrical portion to receive a combined sealing and guiding member 24, preferably consisting of a disk or plate 25 and an upwardly extending annular flange or wall, provided with outer packing rings 26 to form practically an air tight fit between the inner face of the lower end of the piston and the combined guiding and sealing member. The plate or disk 25 is preferably secured by bolts 27 to the bed plate, but the annular sealing and guiding portion may be fixed to the base or bed plate in any other desired manner.

Compressed air is admitted to the balancing chamber 22 by means of a pipe 28, having a vertical branch 29, extending through a central opening 30 of the bed or base plate and threaded at its upper end 31, which is screwed into a threaded opening 32 in the center of the plate or disk 25 of the guiding and sealing member. The compressed air pipe 28, which extends to a suitable source of supply, is equipped with a pressure reducing valve 33, adapted to maintain a constant predetermined pressure within the balancing chamber. Pressure gages 34 and 35 are also preferably connected with the compressed air pipe 29 in advance and in rear of the pressure reducing valve for indicating the pressure in the pipe 28 and also the initial pressure, and a controlling valve 28^a is arranged between the pressure reducing valve and the initial pressure gage. The pressure within the balancing chamber partially counterbalances the weight of the piston and the load carried by the same, and is adapted to enable a smaller area of the piston to be operated on by the actuating fluid to vibrate the piston in the manner hereinafter fully described, and a smaller volume of the actuating fluid is required and a less waste or loss from exhaust thereby results. The pressure within the piston is always less than the weight of the same and the load, but it may be varied to adapt the machine for jarring flasks of different sizes and weights.

The lower end of the piston is equipped with an annular flange or portion 36, preferably formed integral with the piston and operating in the annular space 37 between the combined guiding and sealing member and the cylinder, and being of a thickness less than the width of the said annular space, as clearly shown in Fig. 2 of the drawings. The flange 36 constitutes an annular abutting portion striking the base or bed plate at the end of the downward movement or stroke of the piston. The base or bed plate is provided with a curved passage 38, and is preferably enlarged at the bottom adjacent to the passage to provide the necessary thickness of the metal at this point. The inner end of the passage 38 communicates with the annular space 37, and the outer end of the passage extends to a point exterior of the cylinder and is in communication with the lower end of a cylindrical valve casing 39, having an interior diameter corresponding to the diameter of the curved passage 38. The valve casing, which is provided at its lower end with a horizontal annular attaching flange 40, is secured to the base or bed plate by screws 41, or other suitable fastening means piercing the flange and engaging threaded apertures in the base or bed plate. The valve casing is provided at its lower portion with an air inlet opening.

A feed pipe 42, which is connected with a compressed air supply, communicates with the valve casing, but any other fluid pressure may be employed for actuating the piston. The fluid pressure entering the cylinder moves the piston upwardly, and this upward movement continues until a piston controlling valve 43 exhausts the fluid pressure and causes the piston to drop to the bottom of the cylinder, whereby the flask and the sand contained therein are jarred in the usual manner, and the sand caused to pack around the pattern. The piston controlling valve 43, which is cylindrical, is rigidly connected at its upper end to a valve stem 44, extending through a stuffing box 45, mounted in a central opening of a valve casing head 46. The cylindrical valve 43 is open at its lower end, and is provided in its upper end with openings 47 to admit pressure to the upper side of the valve, whereby the latter is balanced. The opposite walls of the valve 43 are provided with upper and lower rectangular ports or openings 48 and 49, which are adapted to register with opposite exhaust and inlet ports or

openings 50 and 51 of the valve casing. The opposite exhaust and inlet ports communicate with approximately semi-cylindrical chambers 52 and 53, provided each with three interiorly threaded openings for the reception of an exhaust pipe 54 and the feed pipe 42. The feed pipe is connected with one of the openings of the lower semi-cylindrical chamber 53, and the exhaust pipe is connected with one of the openings of the upper semi-cylindrical chamber 52, and the other openings of the two semi-cylindrical chambers are closed by suitable plugs 55, as clearly illustrated in Fig. 5 of the drawings. The threaded openings of the semi-cylindrical chambers enable the feed and exhaust pipes to be conveniently arranged to suit the requirements of the place where the machine is installed. When the jarring machine is located in a pipe pit, as illustrated in Fig. 1 of the drawings, the feed or supply pipe 42 and the compressed air pipe 28 extend to the top of the pit, and the feed pipe 42 is equipped with a suitable throttle valve 56 for controlling the quantity of fluid pressure to adapt the machine to the weight of the flasks operated on. The opposite exhaust ports are provided for the purpose of exhausting the fluid pressure at two sides of the valve and thereby relieving the latter of side pressure, and the inlet or feed ports or openings admit the compressed air at opposite sides of the valve and also eliminate side pressure.

The cylindrical valve is capable of rotary adjustment to cause its ports or openings to register to a greater or less extent with the ports or openings of the valve casing to vary the size of the inlet and exhaust area according to the weight of a pipe flask, or other mold, which it is desired to ram by the jarring process. The stem of the valve carries a horizontal arm 57, provided at its inner end with an opening 58 through which the valve stem passes, and the said arm 57 is rigidly secured to the valve stem by a pin 59, or other suitable means. The outer end of the horizontal arm 57 is provided with an opening 60, and is slidable on a vertical guiding rod or member 61, extending through the opening 60 and connected at its lower end to an adjusting ring 62. The adjusting ring 62, which is arranged horizontally, surrounds the upper portion of the periphery of the head 46 of the valve casing, and is supported by a horizontal flange 63, extending from the lower portion of the periphery of the valve casing head 46. The said ring 62 is provided with an integral handle 64, which is pierced by the lower end of the guiding rod or member 61. The lower end of the guiding rod or member 61 is threaded to receive a nut 65, engaging the lower face of the handle 64 and co-acting with the collar 66, arranged at the upper face of the handle and suitably fixed to the guiding rod or member 61. The adjusting ring is adapted to be rotated on the bearing formed by the valve casing head 46, and it is secured in its adjustment by a clamping screw 67, mounted in a threaded opening of a boss or enlargement 68 and adapted to engage the periphery of the valve casing head. After the ring has been adjusted to set the valve in proper position with relation to the ports of the valve casing, it is rigidly clamped in its adjustment by the screw 67.

The upper portion 69 of the valve stem is threaded and extends through an opening 70 of an operating arm 71, fixed at its inner end to the lower face of the upper exterior horizontal flange 15 of the piston 8 by one of the bolts 14 of the table 13, and extending downwardly and outwardly from the said flange 15, as clearly illustrated in Fig. 2 of the drawings. The operating arm is located between upper and lower nuts 72 and 73, equipped with hand wheels and forming adjustable stops. These nuts are adapted to either rigidly connect the operating arm with the valve stem, or to permit a limited movement of the operating arm independently of the valve stem and by adjusting the nuts 72 and 73, the length of the stroke of the piston and the distance the piston drops may be controlled.

The machine is operated by a continuous inflow of fluid pressure, which is controlled by the throttle valve, the extent of the opening of the throttle valve being proportional to the load on the machine and the desired speed or force of the operation. The accumulated pressure of this influx of air or other fluid under the lower end of the piston forces the latter upwardly until the piston controlling valve uncovers the exhaust ports and releases the pressure in the cylinder with such suddenness that the piston drops, jarring the sand and closing the exhaust ports. The air inlet ports are covered or closed by the cylindrical piston controlling valve prior to the opening of the exhaust ports, the elasticity of the air operating to complete the stroke of the piston and the closing of the inlet ports prior to the exhaust, preventing unnecessary waste of the compressed air and reducing the escape or loss of the same through the operation of the machine to a minimum. By maintaining a constant fluid pressure within the balancing chamber of the piston, the force required to lift the piston is greatly lessened and a much smaller volume of compressed fluid is required to raise the piston than when the actuating fluid operates upon the entire area of the lower end of the piston and constitutes the sole means for lifting the piston and its load.

The jarring machine is susceptible of three adjustments: First, the adjustment

through the throttle valve; second, the adjustment of the piston controlling valve and the consequent variation of the area of the inlet and exhaust ports or openings, which control the suddenness of the discharge of the exhaust and the drop of the piston, and third, the adjustment of the length of the stroke of the machine to vary the distance or the extent of the drop of the piston. These adjustments enable the machine to be arranged to suit the size, weight and character of the flasks to be rammed, and a rapid, thorough and uniform packing of the sand around the pattern is thereby secured.

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

1. In a jarring machine, the combination of a vertical cylinder, a piston, means for maintaining a constant pressure on the piston to partially balance the same, means for introducing a separate pressure into the cylinder, said separate pressure coöperating with the constant pressure to produce a combined pressure sufficient to lift the piston, and means for exhausting the said separate pressure to cause the piston to drop.

2. In a jarring machine, the combination of a vertical cylinder, a piston having an interior pressure chamber open at the bottom, means for maintaining a constant fluid pressure within the same to partially balance the piston, means for introducing a separate fluid pressure into the cylinder to lift the piston, and means for exhausting the latter fluid pressure to cause the piston to drop.

3. In a jarring machine, the combination of a cylinder, a hollow piston open at the lower end to form a pressure chamber, a combined guiding and sealing device fitting in the lower end of the piston, means for maintaining a constant pressure within the piston to partially balance the same, means for introducing a separate pressure into the cylinder, said separate pressure coöperating with the constant pressure to produce a combined pressure sufficient to lift the piston, and means for exhausting the said separate pressure to cause the piston to drop.

4. In a jarring machine, the combination of a cylinder, a hollow piston operating within the cylinder and open at its lower end to form an interior pressure chamber, a combined guiding and sealing device of annular form fitting within the lower end of the piston and arranged in spaced relation with the cylinder, means for maintaining a constant pressure within the piston to partially balance the same, means for introducing pressure into the space between the combined guiding and sealing device and the cylinder to lift the latter, and means for exhausting the latter pressure to cause the piston to drop.

5. In a jarring machine, the combination of a vertical cylinder, a hollow piston operating within the cylinder and open at its lower end to form a pressure chamber, a combined guiding and sealing device consisting of a plate, and a vertical annular wall fitting within the lower end of the piston and arranged in spaced relation with the cylinder, means for maintaining a constant pressure within the piston to partially counterbalance the same, and means for introducing pressure into the space between the cylinder and the combined guiding and sealing device to lift the piston and for exhausting the latter pressure to cause the piston to drop.

6. In a jarring machine, the combination of a vertical cylinder, a hollow piston operating in the cylinder and open at its lower end to form a pressure chamber and also provided at its lower end with an annular abutting flange spaced from the cylinder, a combined guiding and sealing device of annular form fitting within the lower end of the hollow piston and spaced from the flange of the same, means for maintaining a constant pressure within the hollow piston to partially balance the latter, and means for introducing a separate pressure into the cylinder between the lower end of the same and the combined guiding and sealing device to raise the piston and for exhausting the latter pressure to cause the piston to drop.

7. In a jarring machine, the combination of a vertical cylinder having a lower guiding portion, a hollow piston guided at its lower end in the lower guiding portion of the cylinder and also provided at its lower portion with an inner cylindrical face and provided below the same with a depending abutting flange, an annular guiding and sealing device fitting within the lower end of the piston and co-acting with the cylindrical face thereof, means for maintaining a constant pressure within the piston to partially balance the same, and means for introducing a separate pressure into the cylinder to raise the piston and for exhausting the latter pressure to cause the piston to drop.

8. A jarring machine including a single vertical cylinder having a lower guiding portion, a hollow piston open at its lower end and guided thereat in the lower guiding portion of the cylinder and having a reduced upper portion, a guide ring secured to the upper end of the said cylinder and guiding the reduced upper portion of the piston, a combined guiding and sealing device fitting within the open lower end of the piston, and means for admitting fluid pressure to the cylinder and for exhausting the pressure at intervals.

9. A jarring machine including a single vertical cylinder having a lower guiding portion, a hollow piston open at its lower

end and guided thereat in the lower guiding portion of the cylinder and having a reduced upper portion forming a shoulder, a guiding ring mounted upon the upper end of the said cylinder and guiding the reduced upper end of the piston and arranged in the path of the said shoulder to form a stop for limiting the upward movement of the piston, a combined guiding and sealing device fitting within the open lower end of the piston, and means for introducing fluid pressure into the cylinder and for exhausting the same at intervals.

10. A jarring machine including a single vertical cylinder having a lower guiding portion, a hollow piston open at the lower end and guided thereat in the lower portion of the cylinder and having a reduced upper portion forming a shoulder, the intermediate portion of the piston being spaced from the upper portion of the cylinder, a guide ring secured to the upper end of the said cylinder and extending inward therefrom to form a guide for the lower portion of the piston and arranged in the path of the shoulder thereof, a combined guiding and sealing device fitting in the open lower end of the piston, and means for introducing fluid pressure into the cylinder and for exhausting the presure at intervals.

11. A jarring machine including a vertical cylinder, a hollow piston open at its lower end to form a pressure chamber and guided at its lower portion in the cylinder and provided at its upper portion with interior and exterior flanges, a head secured to the interior flange and closing the upper end of the piston, a table carried by the piston and secured to the exterior flange thereof, means for maintaining a constant pressure within the piston to partially balance the same, and means for introducing a separate pressure into the cylinder to lift the piston and for exhausting the latter pressure at intervals.

12. A jarring machine including a base or bed plate, a vertical cylinder mounted thereon, a hollow piston operating within the cylinder and open at its lower end to form a pressure chamber and closed at its upper end, said piston being guided at its lower portion within the cylinder, a guide ring secured to the cylinder at the top thereof and guiding the upper portion of the piston, a combined guiding and sealing device consisting of a plate secured to the bed plate, and an annular flange or wall extending into the lower end of the piston, a packing arranged at the inner and outer faces of the lower end of the piston, means for maintaining a constant pressure within the piston to partially balance the same, and means for introducing a separate pressure into the cylinder to lift the piston and for exhausting the latter pressure at intervals to cause the piston to drop.

13. In a jarring machine, the combination of a vertical cylinder, a hollow piston operating within the cylinder and open at the lower end, a valve casing communicating with the cylinder and provided with exhaust and inlet ports, a valve operating within the valve casing and having exhaust and inlet ports and connected with and operated by the piston, feed and exhaust pipes connected with the valve casing, a fluid pressure pipe communicating with the interior of the hollow piston for maintaining a constant pressure within the same to partially balance the piston, a pressure reducing valve connected with the said fluid pressure pipe, and pressure gages also connected with the latter and arranged in advance and in rear of the pressure reducing valve.

14. In a jarring machine, the combination of a vertical cylinder, a hollow piston carrying a supporting table at the top and working in the cylinder, means for admitting fluid pressure within the piston at the bottom to partially counter-balance the same, separate means for admitting fluid to the cylinder exteriorly of the piston and at the lower end thereof so as to lift the latter, and means for exhausting the fluid at the exterior of the piston to cause the piston to drop.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

EDGAR CLARENCE WILEY.

Witnesses:

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J. B. JENNINGS.