(No Model.) 3 Sheets—Sheet 1.

J. A. DENSMORE.

MACHINE FOR MAKING HOLLOW WARE.

No. 591,329. Patented Oct. 5, 1897.

Fig. 1.

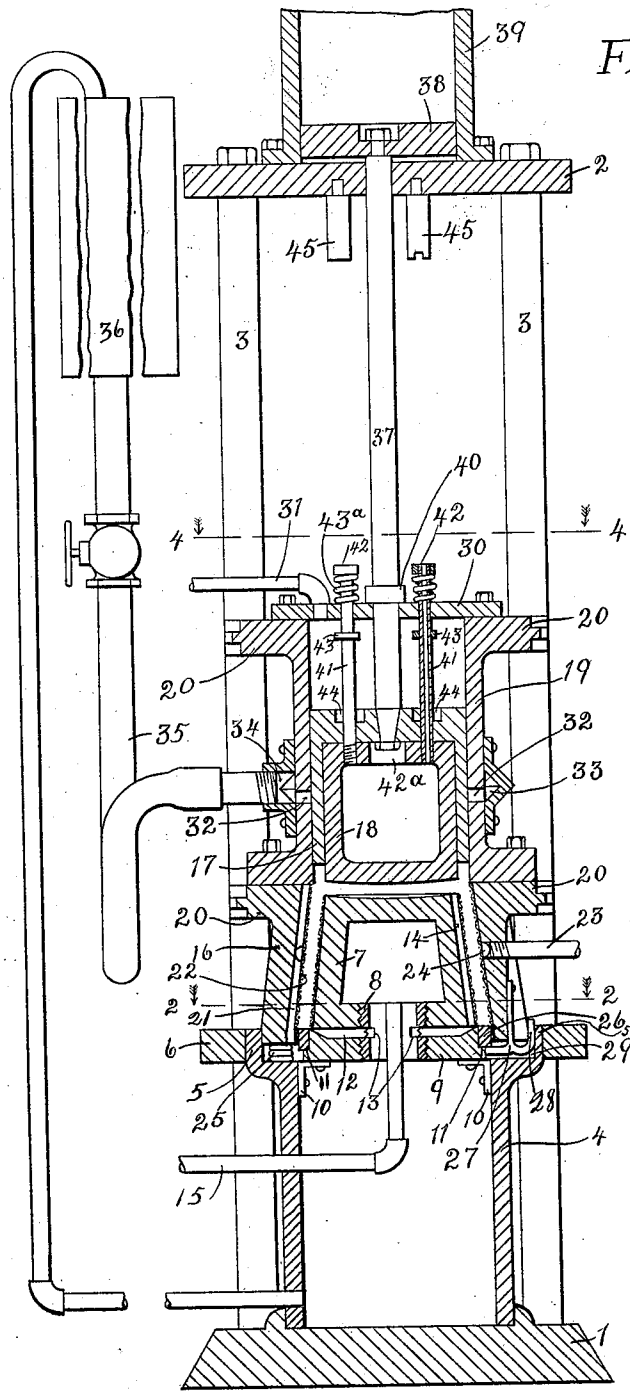
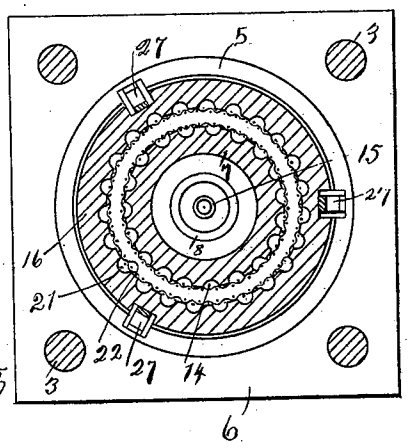


Fig. 2.



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Fig. 3.

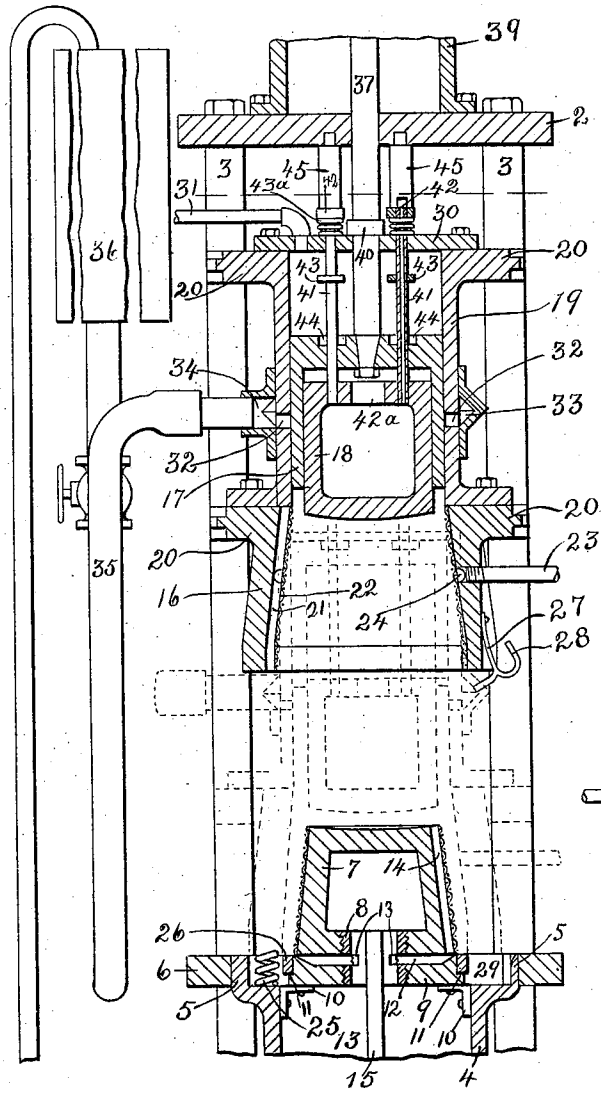
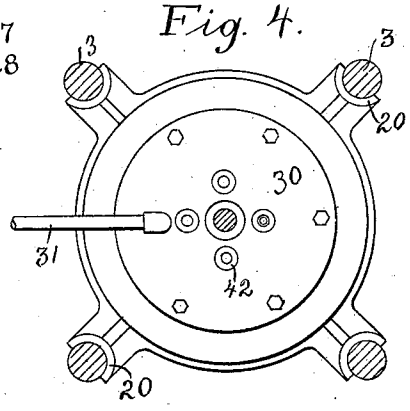


Fig. 4.



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Fig. 5.

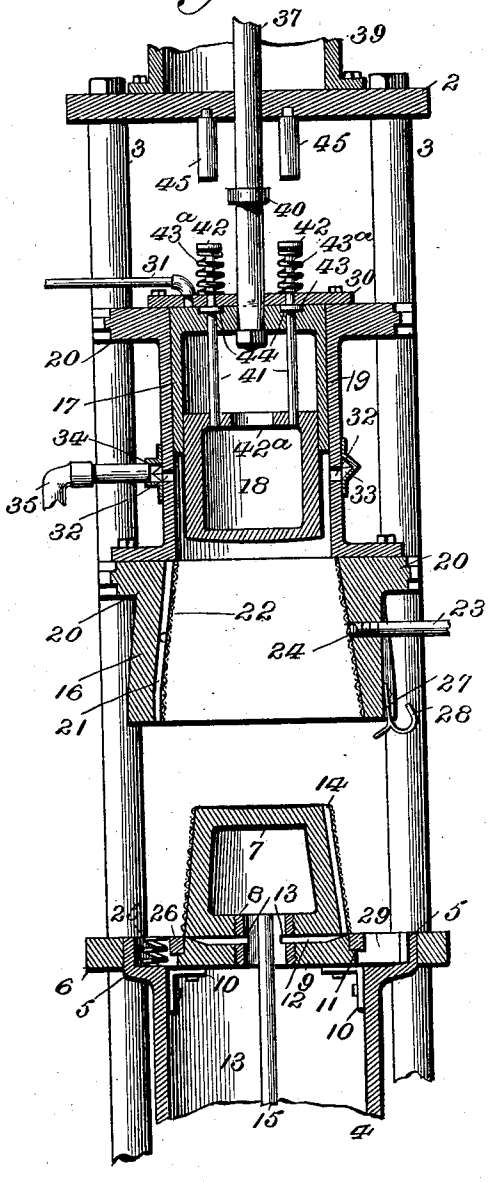
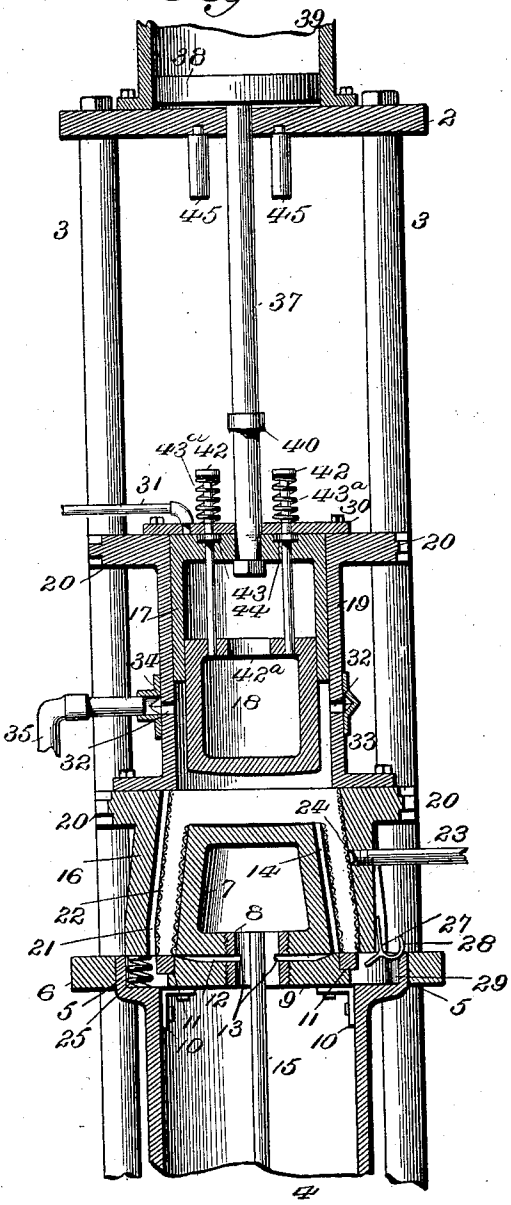


Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES A. DENSMORE, OF WINNETKA, ILLINOIS.

MACHINE FOR MAKING HOLLOW WARE.

SPECIFICATION forming part of Letters Patent No. 591,329, dated October 5, 1897.

Application filed July 17, 1894. Serial No. 517,834. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. DENSMORE, a citizen of the United States, residing at Winnetka, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Making Hollow Ware; 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 a novel construction in a machine for making pails and analogous hollow ware from pulp, the object being to provide a machine of this description that will accomplish its work in an expeditious and efficient manner.

The invention consists in the features of construction and combinations of parts hereinafter fully described and specifically claimed.

In the accompanying drawings, illustrating my invention, Figure 1 is a central vertical section of a machine constructed in accordance with my invention with certain parts shown in elevation and illustrating the parts in the position they will assume after the pail has been completed and is setting. Fig. 2 is a cross-section on the line 2 2 of Fig. 1. Fig. 3 is a central vertical section showing the parts in the position they will assume when the mold, die, and plunger are elevated and the pail has been ejected. Fig. 4 is a cross-section on the line 4 4 of Fig. 1. Fig. 5 is a detail sectional view showing the mold, die, and plunger raised, but the air exhausted from between the plunger and mold-head. Fig. 6 is a similar view showing the parts in position to be charged with pulp.

This machine is intended to form a pail or analogous hollow ware from a fibrous pulp of a thin consistency which is forced into the mold, after which the parts are to be so operated that the watery matter is pressed from the pulp and the pulp pressed into the desired shape and hardened, after which it is to be removed from the machine.

Referring now to the accompanying drawings, 1 indicates the base-plate, and 2 the top plate, of the frame of the machine, and 3 the uprights resting upon said base-plate and carrying the top plate at their upper ends. Mounted upon the base-plate is a cylinder 4, provided at its upper end with an outwardly and upwardly extending annular flange 5. The upper end of this upright cylinder 4 is held firmly in position by a plate 6, having a circular opening to receive the flange 5 of the cylinder, and said plate is held upon the uprights 3 by openings, through which said uprights pass. The core 7 of the mold is mounted upon the said cylinder 4 and in the instance illustrated is in the shape of a frustum of a cone, being hollow to permit the injection of steam into the same for heating. The said core 7 is provided at its lower end with an opening that receives one end of a nipple 8, the other end of said nipple screwing into a plate 9, that is a little smaller than the interior of the cylinder 4 and held upon said cylinder by brackets 10. The said plate 9 at its upper end is the same in diameter as the core 7, but at its lower end is provided with an annular shoulder 11. The upper face of the plate is hollow or dished, as shown at 12, to form a space between the core and plate, and the nipple 8, opposite said dished portion of the plate, is provided with openings 13.

The outside of the core is provided with a plurality of upright grooves 14, extending from the upper to the lower end thereof, and around the outside of the core and covering these grooves is placed a reticulated casing. A pipe or passage 15 passes through the side of the cylinder 4 and enters the lower end of the core through the nipple 8. This pipe 15 communicates with the source for supplying steam to heat the core, which steam condenses within the core and runs into the cylinder 4.

Acting in conjunction with the core are three principal members—namely, the "mold" 16, the "plunger" 17, and "die" 18, as I term them. The said mold 16 is connected with the lower end of the mold-cylinder 19, within which is located the plunger 17, and within the plunger 17 the die 18 is located. The mold 16 corresponds in shape to the core and its lower end fits within the flange 5 of the cylinder 4, while said mold is further provided with guides 20, as well as the mold-cylinder, which guides engage and slide upon the uprights 3 of the machine. The interior face of the mold is provided with a plurality of upright grooves 21, extending from its up-

per to its lower end, and these grooves are covered with a reticulated lining 22. A pipe or passage 23 passes through the mold at one side thereof and communicating with one of the upright grooves 21 and with an annular groove 24, extending around the mold at this point and joining said upright grooves 21. The pipe 23 communicates with the source for supplying hot air by a flexible connection, so as to permit the ascent and descent of the mold. Located within the seat made at the upper end of the cylinder 4 by the flange 5 are a plurality of springs or cushions 25 to encounter the lower end of the mold 16 as it passes into this seat. Resting upon the shoulder 11 upon the plate is a ring 26 about as wide as the space between the mold and core, and the upper face of this ring is flush with the lower end of the core. This ring serves to form the bottom of the mold and is free to slide upon the plate 9. Said ring is wider than the shoulder 11, and the said mold 16 carries a plurality of catches 27, adapted to engage the lower edge of the said ring 26. Said catches 27 are arranged so that when the mold is at the lower limit of its movement they engage said ring, and will also hold the ring during a limited period of the ascent of the mold, after which the catches are disengaged and the ring falls back upon the shoulder 11. These catches 27 are secured to the outer side of the mold and consist of a spring-piece having a catch end standing beyond the ring 26. The said catches, however, are provided with fingers 28, adapted to enter notches 29 in the flange 5 and engage the rear wall of said notches, so that as the mold 16 descends these fingers 28, by engagement with the walls of the notches, will press the catch inwardly under the ring 26. When the mold rises, the catches will lift the ring a short distance and until the fingers are released from the notches, when the spring will throw the catches out and allow the ring to fall.

The mold-cylinder 19 is firmly secured to the end of the mold 16, and its interior diameter is the same as the upper end of the mold. The said mold-cylinder 19 is closed at its upper end by a head 30, through which passes a pipe 31, that communicates with a source for supplying compressed air, the said pipe 31 having a flexible connection with the air-forcing device to permit the rise and fall of the mold-cylinder. Between the ends of the mold-cylinder a plurality of openings 32 are made therethrough, and around these openings is an annular channel 33, having a port 34, communicating by means of a flexible pipe or passage 35 with a pulp-reservoir 36. The said pulp-reservoir 36 is provided with means for forcing the pulp to the annular channel 33 under pressure. A pipe or passage also leads from the lower end of the cylinder 4 to the reservoir 36 and is provided with means for pumping the fluid running into the cylinder 4 into said reservoir. The plunger 17 fits closely within the mold-cylinder and can slide up and down therein, and is hollow and closed at its upper end, while open at its lower end. The width of the wall of said plunger is the width of the chime of the pail. The said plunger 17 is connected with the lower end of a piston-rod 37, that extends upwardly through an opening in the head 30 of the mold-cylinder and through the top plate 2 of the frame of the machine and is connected with the piston 38 within a cylinder 39, mounted upon said top plate 2. The said cylinder 39 may be of any desired construction to cause the reciprocation of said piston. The said piston-rod is also provided with a shoulder or projection 40 to encounter the head 30 of the mold-cylinder.

The die 18 is hollow and has a closed lower end which forms the bottom of the pail and fits within the plunger 17. The said die 18 is also provided with a plurality of upright rods 41, that pass upwardly through the top piece of the plunger and head 30 of the mold-cylinder and are provided with enlarged or headed ends 42, between which and the said head 30 yielding cushions 43^a are located. One or more of the rods 41 are hollow to establish communication between the outer air and the interior of the die, and an opening 42^a is made in the upper end of the die. The said rods 41 are also provided with collars or projections 43, and in the upper end of the head of the plunger 17 are sockets or recesses 44 to receive these collars 43. The top plate 2 is provided with a plurality of stops or abutments 45, located to engage the headed ends 42 of the rods 41.

The parts being constructed and arranged as above described, the operation of the machine is as follows: We will suppose, for instance, that a pail has just been formed and is located within the mold and the parts are in the position shown in Fig. 1. Air is then forced in through the pipe 31 into the space between the head of the plunger and the head of the mold-cylinder. The piston 38 is then raised and carries with it, by means of the piston-rod, the plunger 17, and with it the mold-cylinder and mold by reason of the interposed body of air between the plunger and mold-cylinder, and also the die 18 by reason of the rods 41 connecting it with the mold-head, the parts retaining their relative position as they rise until the headed rods 41 encounter the stops 45. As the mold rises the ring 26 is lifted a little distance and sufficient to separate the pail from the core and allow it to be carried upwardly with the mold, after which the catches 27 spring out and allow the ring to drop. The piston then carries the mold-cylinder, mold, plunger, and die upwardly until the headed rods 41 encounter the stops 45, whereupon a further movement of the mold-cylinder and plunger will cause the compression of the cushions 43^a, so that the rods will slide through the openings in the heads of the mold-cylinder and plunger and cause the die to descend

relatively to the plunger, so that the die and plunger and accompanying parts assume the position shown in Fig. 3. This movement of the die relative to the plunger and mold will cause the die to press on the bottom of the pail and eject it from the mold. The end of the stops 45 encountering the hollow rods 41 are suitably cut away or recessed to permit the entrance of air into the rods when the same are in contact, so that the die and plunger can slide with relation to each other. The parts now being in the position shown in Fig. 3, it is desired to bring them into position to form another pail. To accomplish this, the compressed air within the space between the heads of the plunger and mold-cylinder is allowed to escape through the pipe 31, whereupon the mold-cylinder and mold will descend, carrying with them, of course, the die. When the collars or projections 43 on the rods 41, carrying the die, are seated within the sockets 44 in the upper end of the plunger, the said die will cease to descend and the mold-cylinder and mold will descend farther until the heads of the mold-cylinder and plunger are in contact. The parts being now in this position the piston 38 is allowed to descend, carrying with it the mold, mold-cylinder, plunger, and piston, until the lower end of the mold enters slightly the seat formed by the flange 5 and rests upon the spring-cushions 25, whereupon the parts will be in the position shown in dotted lines in Fig. 3 with the core, mold, and die in position to form the pail, but with the plunger elevated so that its lower end stands above the openings 32 from the annular pulp-passage 33. To form a pail, the pulp is forced from the reservoir 36 into the annular passage 33. Hence it passes through the openings 32 into the space between the mold-cylinder and die and downwardly into the mold. The core 7 is kept heated by steam entering from the pipe 15. After a sufficient supply of the pulp has entered the mold the plunger is forced downwardly to compress the pulp within the mold and force out the watery matter contained therein, which oozes through the reticulated sides of the mold and core into the grooves or channels, the water passing into the grooves or channels of the core, running into the disk portion of the plate 9, and through the opening 13 into the cylinder 4, while the water passing into the grooves or channels of the mold runs down into the cylinder 4 through the passage formed between the plate 9 and cylinder, as shown. The full extent of the downward movement of the plunger causes the collar or projection 40 upon the piston-rod 37 to engage the head 30 of the mold-cylinder and carry said mold-cylinder downwardly a little distance, together with the mold, the lower end of which passes farther into the seat formed by the flange 5 and compresses the cushions 25. This gives great pressure between the mold and core and compresses the pulp to make a compact mass. The parts are now in position, as shown in Fig. 1, and the article formed is allowed to stay within the mold a short while, while hot air is forced in through the pipe 23 to heat the outside of the mold and steam forced into the core to heat the core. When the final downward movement of the core takes place, the fingers 28 of the catches encounter the walls of the notches 29 and force the catches beneath the ring 26. When the pail is considered as sufficiently set, the mold is lifted, as heretofore described.

I claim as my invention—

1. In a machine of the kind specified, a frame carrying a stationary core, a mold moving in guides upon said frame and adapted to receive the core, ports in said mold for supplying the material to be cast, a plunger located and sliding within said mold, means for reciprocating said plunger, a die located and sliding within said plunger, and connections between the die and the mold, substantially as described.

2. In a machine of the kind specified, a frame carrying a stationary core, a mold moving in guides upon said frame and adapted to receive the core, ports in said mold communicating with a channel therein, a pipe or passage for supplying the material to be cast to said channel, a plunger located and sliding within said mold, means for reciprocating said plunger, a die located and sliding within said plunger, and connections between the die and the mold, substantially as described.

3. In a machine of the kind specified, a frame carrying a stationary core, a mold moving in guides upon said frame and adapted to receive the core and having a closed upper end, ports in said mold for supplying the material to be cast, a plunger having a closed upper end located and sliding within said mold, means for supplying a fluid to the space between the closed ends of said mold and plunger, means for reciprocating said plunger, a die located and sliding within said plunger, and connections between said die and mold for moving said die, substantially as described.

4. In a machine of the kind specified, a frame carrying a stationary core, a mold moving in guides upon said frame and adapted to receive the core and having a closed upper end, ports in said mold for supplying the material to be cast, a plunger having a closed upper end located and sliding within said mold, means for supplying a fluid to the space between the closed ends of said mold and plunger, means for reciprocating said plunger, a connection between said plunger and mold for moving the mold with the plunger during the latter portion of its downward movement, a die located and sliding within said plunger, and connections between said die and mold for moving said die upwardly with the plunger, substantially as described.

5. In a machine of the kind specified, a frame carrying a stationary core, a mold mov-

ing in guides upon said frame and adapted to receive the core and having a closed upper end, ports in said mold for supplying the material to be cast, a plunger having a closed upper end located and sliding within said mold, means for supplying a fluid to the space between the closed ends of said mold and plunger, means for reciprocating said plunger, a shoulder or projection carried by said plunger and located to engage the mold during the latter portion of the downward movement of the plunger, a die located and sliding within said plunger, and connections between said die and mold for moving said die upwardly with the plunger, substantially as described.

6. In a machine of the kind specified, a frame carrying a stationary core, a mold moving in guides upon said frame and adapted to receive the core, ports in said mold for supplying the material to be cast, a plunger located and sliding within said mold, means for reciprocating said plunger, means for raising the mold by and with the plunger, a die located and sliding within said plunger, and connections between the die and mold for moving the die in one direction, substantially as described.

7. In a machine of the kind specified, a frame carrying a stationary core, a mold moving in guides upon said frame and adapted to receive the core, ports in said mold for supplying the material to be cast, a plunger located and sliding within said mold, means for reciprocating said plunger, means for raising the mold by and with the plunger, a die located and sliding within said plunger, yielding connections between the die and mold for moving the die in one direction, and stops on the frame adapted to arrest the upward movement of the die with the mold, all substantially as and for the purpose described.

8. In a machine of the kind specified, a frame carrying a stationary core, a mold moving in guides upon said frame and adapted to receive the core, ports in said mold for supplying the material to be cast, a plunger located and sliding within said mold, means for reciprocating said plunger, means for raising the mold by and with the plunger, a die located and sliding within said plunger, rods secured to said die and engaging elastic cushions carried by the mold, and stops on the frame located to encounter said rods, substantially as and for the purpose described.

9. In a machine of the kind specified, a frame carrying a stationary core, a mold moving in guides upon said frame and adapted to receive the core, ports in said mold for supplying the material to be cast, a plunger located and sliding within said mold, means for reciprocating said plunger, means for causing the mold to rise with the plunger, a die located and sliding within said plunger, connections between the die and mold for moving the die in one direction, and a stop or projection carried by said die and adapted to engage said plunger to limit the separation of the die and plunger, substantially as described.

10. In a machine of the kind specified, the combination with a frame carrying a stationary core, of a mold moving in guides upon said frame and adapted to receive said core and provided with devices for moving the same and for supplying the material to be cast, and a seat in said frame located to receive the lower end of said mold and provided with cushions, substantially as described.

11. In a machine of the kind specified, the combination with a frame carrying a stationary core of a mold moving in guides upon said frame and adapted to receive said core, devices for moving said mold and for supplying the material to be cast, a ring 26 resting on a stationary part of the machine and forming the bottom of the mold, and catches carried by said mold and adapted to engage said ring when the mold is at the lower limit of its movement, and to lift said ring a little distance during the first part of the upward movement of the mold, substantially as described.

12. In a machine of the kind specified, a cylinder, a plate 9 supported at the upper end of said cylinder and smaller than said cylinder, and a core and mold provided with reticulated casings and grooves, said grooves communicating with said cylinder, substantially as described.

13. In a machine of the kind specified, a mold-cylinder carrying a mold; a plunger located to slide within said mold-cylinder, said plunger and mold-cylinder having closed upper ends and a pipe or passage 31 leading through the upper end of the mold-cylinder, substantially as described.

14. In a machine of the kind specified, a plunger closed at its upper end and open at its lower end, a die located within said plunger, said die being hollow and provided with an opening at its upper end, and a pipe or passage 41 communicating with the interior of said die, substantially as described.

15. In a machine of the kind specified, a mold-cylinder carrying a mold and closed at its upper end, a plunger located within said mold-cylinder and carried by a piston extending through the upper end of the same, a pipe or passage communicating with the upper end of the mold-cylinder, rods 41 resting upon cushions upon the top of the mold-cylinder and engaging a die located within said plunger and having an opening at its upper end, an opening or passage through one or more of said rods 41, stops or collars 43 upon said rods, and seats 44 in said plunger to receive said stops or collars, substantially as described.

16. The combination of a dished plate 9 mounted upon a stationary support, a hollow core fixed upon said plate having grooves on its sides, communicating at bottom with the hollow of the plate, and a reticulated casing fitted on said core; with a vertically-movable mold having grooves on its inner face, a retic-

ulated casing fitted over the grooves within the mold; and means for conducting away fluids, &c., drained into said dished plate, all substantially as and for the purpose described.

17. The combination of a cylinder having a seat on its upper end and a core supported on said cylinder and surrounded by said seat; with a mold adapted to rest in said seat having grooves on its inner face and a channel communicating with said grooves; and a reticulated casing covering said grooves, all substantially as and for the purpose set forth.

18. The combination of a cylinder having an annular seat at top; a dished plate within said seat; a core resting on said seat having grooves communicating with the dished plate, and a reticulated casing over the core; with a mold adapted to set in said seat over the core having grooves on its inner face communicating with the seat, a reticulated casing or lining over the grooves in the mold; means for supplying pulp to the interior of the mold, and means for compressing the pulp, all substantially as and for the purpose described.

19. The combination of a core and a movable mold and mold-cylinder; with a plunger within the mold-cylinder; means for reciprocating said plunger; and means for introducing compressed fluid into the mold-cylinder between the head of the latter and the plunger, for the purpose and substantially as described.

20. The combination of a core, a movable mold and mold-cylinder, a plunger within the mold-cylinder and means for reciprocating said plunger; with a movable die within the plunger, yielding connections between the die and head of the mold-cylinder whereby the die is raised with the mold-cylinder; and means for introducing compressed fluid between the heads of the plunger and mold-cylinder, all substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES A. DENSMORE.

Witnesses:

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ERWIN J. LOTZ.