Jan. 22, 1924.

1,481,320

L. JOHNSTON

MOLDING APPARATUS

Filed March 16, 1922

Fig. 1.

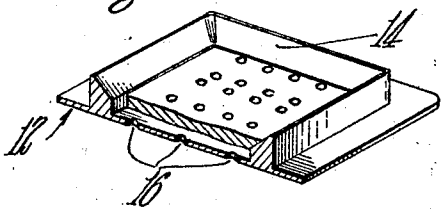


Fig. 2.

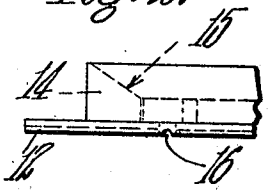


Fig. 3.

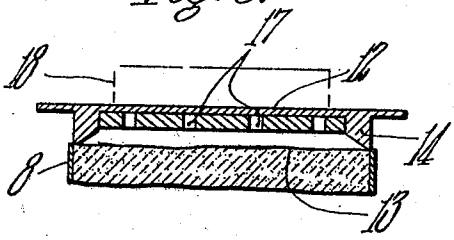


Fig. 4.

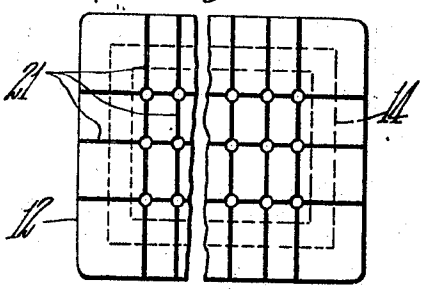


Fig. 5.

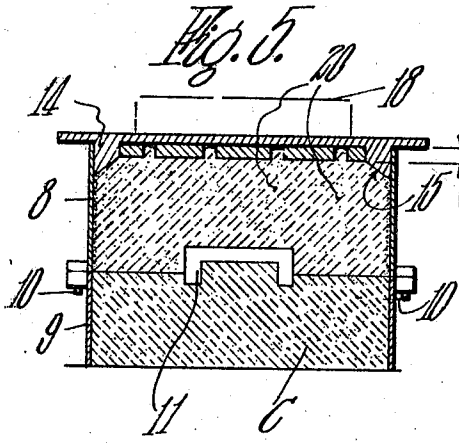
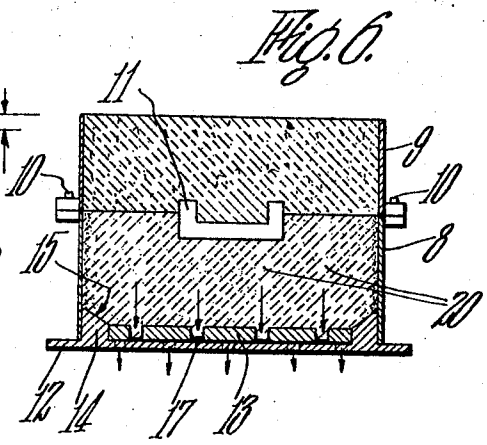


Fig. 6.



INVENTOR

Leonard Johnston

BY Chapin & Neal

ATTORNEYS

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UNITED STATES PATENT OFFICE.

LEONARD JOHNSTON, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO SPRINGFIELD BRONZE COMPANY, INC., A CORPORATION OF MASSACHUSETTS.

MOLDING APPARATUS.

Application filed March 16, 1922. Serial No. 544,309.

To all whom it may concern:

Be it known that I, LEONARD JOHNSTON, citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Molding Apparatus, of which the following is a specification.

This invention relates to improvements in molding apparatus and more particularly to means for use in compressing a mass of sand or like molding material within a flask and against a pattern so as to form a mold and for subsequently cooperating with the flask to support the mold during the casting operation.

Sand molds are commonly made from a pattern with the aid of the usual two part molders' flask consisting of a nowel and a cope. In accordance with a method heretofore more or less generally practised the cope is filled with sand and the pattern positioned therein so that at least half of its surface area is exposed above the level of the sand. The nowel is then placed upon the cope and filled with sand which is packed firmly therein either entirely by means of hand tools or with the aid of a molding machine. The flask is then inverted to bring the cope uppermost and a gate is formed in the sand of the cope to enable the metal to be poured into the mold cavity. If power is to be employed to assist in the packing of the sand in the flask, the sand is usually piled somewhat above the top of the flask and a flat board is laid on the sand, and forced downwardly by the plunger of the molding machine so that the surplus sand is pressed into the flask and compacted against the upwardly directed portions of the pattern. A suitable hand tool such as a peen hammer is then employed to ram the sand tightly against the sides of the flask so that it will stay in place when the flask is subsequently inverted. This tool is normally of such shape and so manipulated that a certain amount of lateral pressure is imparted thereby to the mass of sand tending to compact the sand against the sides or other portions of the pattern which may be so disposed as not to receive the direct pressure of the molding machine plunger. When the board is used, as above described, to transmit downward pressure to the sand it is obvious that the degree of compression of the sand will be determined by the proportional amount of the mass projecting above the top of the flask and inasmuch as there is no means for accurately gaging the amount of sand to be thus piled above the flask the degree of compression of the mass will vary more or less in making successive molds.

One object of the present invention is to provide practical and reliable means for enabling all the necessary compression of the sand and compacting of the same against the pattern and against the sides of the flask to be accomplished at a single operation effected by power such as may be derived from the plunger of a molding machine.

Another object of the invention is to secure the desired compression of the sand more quickly and efficiently than heretofore and to insure the attainment of uniform results in successive compressing operations.

With the above objects in view, the invention contemplates the provision, for use in conjunction with a pattern and a molder's flask, of a pressure plate movable within the flask for compressing the sand, and constructed and arranged to exert a maximum amount of pressure adjacent the sides of the flask. In the illustrated embodiment of the invention, the pressure plate is provided adjacent its margin with a raised rib having an inwardly beveled face which is adapted to be forced into the sand adjacent the sides of the flask to exert an excess of pressure upon that portion of the sand and which has a tendency to displace the sand inwardly toward the pattern so as to compact the same against the sides thereof. In using a pressure plate such as just described the cope is filled with sand, the pattern is positioned therein, and the nowel is then placed upon the cope and filled with sand as usual. Instead of heaping the sand above the flask and crowding the surplus sand into the mold as heretofore, however, the sand is levelled off flush with the top edge of the flask and the desired degree of compression is secured by depressing the pressure plate to a certain definite extent within the mold. In this way variable factors are eliminated and exactly the same quantity of sand is employed each time a mold is to be made in a flask of a particular size, so that uniform results are insured.

A further object of the invention is to

provide a sand mold having an improved structure adapted to facilitate the escape from the mold cavity of gases generated by the molten metal during the casting operation.

To this end a feature of the invention consists in the provision, in a sand mold of a plurality of spaced apart zones extending through the sand between the mold cavity and the exterior of the mold in which zones the sand is less densely compacted than in the intervening portions of the mold.

A still further object of the invention is to provide means whereby said zones of less densely compacted sand may be produced during the operation of compressing the sand by means of a pressure plate such as hereinbefore mentioned.

In accordance with this object, a pressure plate is provided having a series of perforations into which the sand enters as the plate is depressed, so that little or no pressure is applied to the columns of sand immediately below said perforations. As a result the sand in these columns is less densely compacted than in the surrounding portions of the mass, and thus a plurality of zones of relatively low density extend transversely through the mass of sand to provide avenues of escape for the gases generated by the molten metal during the casting operation.

When the molten metal is poured into the mold cavity, its weight and nature is such that there is a tendency for the loosely compacted sand in the above mentioned zones to be displaced to a certain extent through the perforations in the pressure plate by the weight of the metal. As a result, some of the molten metal may escape from the mold cavity and run downwardly through the sand at these points. To prevent such a posibility it is preferred to construct the pressure plate in two superimposed sections or layers each of which is perforated, the perforations being so disposed that those of one section or layer are staggered with respect to those of the other layer. With this construction there is no direct or straight passage leading outwardly from the interior of the flask and when the flask has been inverted preparatory to pouring the metal into the mold the solid portions of the outer plate section provide support for the loosely compacted columns of sand above the perforations in the inner section of the pressure plate. To permit free escape of the gases, the opposed surfaces of said sections are adapted in any suitable manner to permit indirect communication between the staggered perforations of the two plate sections.

These and other features of the invention, including certain details of construction and arrangement of parts will be further explained in the following description and then particularly pointed out in the claims.

The various feature of the invention will be best understood from a description of the preferred embodiment thereof, illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective sectional view of a pressure plate constructed in accordance with the present invention;

Fig. 2 is a fragmentary side elevational view thereof;

Fig. 3 is a transverse sectional view of the pressure plate showing the same resting upon the sand at the top of a flask before the sand has been compressed thereby;

Fig. 4 is a bottom plan view, partly broken away, of the pressure plate shown in Figs. 1, 2 and 3;

Fig. 5 is a view, in vertical transverse section, of a two-part flask, showing a pattern supported in the sand within the flask, and showing also the pressure plate after pressure has been applied thereto and compress the sand; and

Fig. 6 is a view similar to Fig. 5 showing the mold inverted preparatory to the removal of the pattern therefrom.

Refering to Figs. 5 and 6 of the drawings, the usual two-part molder's flask is therein shown comprising the nowel or drag 8 and the scope 9, these parts being held in proper registry by means of suitably arranged dowels 10. The present invention resides to a large extent in the pressure plate which, as shown, comprises a rectangular outer section 12 preferably made of metal and rectangular inner section 13 preferably made of wood. The outer section of the pressure plate is large enough to overlap the sides of the flask and is provided, adjacent its margin, with a continuous rib or peen portion 14 which is adapted to fit within the sides of the upper portion of the flask. The lower face of the rib 14 is bevelled inwardly as shown at 15. The portion of the pressure plate section within the rib 14 is provided with a series of spaced apart perforations 16. The inner section 13 of the pressure plate is shaped to fit loosely within the rib 14 although it may be secured thereto in any suitable manner and it is provided with a plurality of perforations 17 which are staggered relatively to the perforations 16 in the outer section of the pressure plate.

In making the mold, the practice hereinbefore briefly outlined is carried out. In accordance with this practice the cope 9 is first placed lowermost, the same being positioned upon the table of a molding machine. The cope is then filled with sand and the pattern 11 is pressed into the sand as shown in Fig. 5, the sand not being compressed around the pattern but serving only temporarily to support the same. The nowel is

then placed on the cope, filled with sand and levelled off flush with the top edge thereof. The pressure plate, comprising the sections 12 and 13, is then placed upon the sand with the rib 14 registering with the space within inner walls of the flask as shown in Fig. 3. The hydraulic plunger 18 of the molding machine is then actuated to depress the pressure plate into the position in which it appears in Fig. 5. By this single movement of the pressure plate, the sand is compressed in the desired manner. The sand is firmly packed against the sides of the flask by the action of the ribs 14, the bevelled or peened faces 15 of which serve to displace the sand inwardly thereby tending to compact it against the sides and ends of the pattern. The inner plate section 13 compresses the rest of the sand except that in the columns directly beneath the perforations 17 which columns are less densely compacted than the surrounding mass and project upwardly into and substantially through said perforations as shown in Fig. 5. Thus, by the action of the pressure plate alone, the sand is so compressed that it is firmly packed in the flask and tightly compacted against the portions of the pattern which project into the nowel. Furthermore, by reason of the presence of the perforations 17, the sand immediately beneath the same receives little if any pressure directly from the pressure plate, and consequently a series of zones 20 of more or less loosely compacted sand are formed which extend from the mold cavity, and from the line of parting between the sand in the nowel and the cope, upwardly to the perforations in the pressure plate section 13. The pressure of the plunger 18 is continued until the overlapping margin of the plate section 12 engages the upper edge of the nowel. It will thus be seen that there is no chance for variation in the amount of compresion of the sand in succeeding compressing operations and thus all molds constructed with the aid of the same flask pattern and pressure plate will be uniformly of the same characteristics.

After the sand has been thus compressed by the action of the pressure plate, the flask is removed from the molding machine and inverted as shown in Fig. 6. The pressure plate is left in place and serves to support sand in the nowel. The cope is now uppermost and the sand therein may be compressed by means of another pressure plate which may be similar in all respects to that already described and may be actuated in the same manner. After the sand in the cope has been properly compressed, the pressure plate is removed therefrom and a gate (not shown) is formed therein leading from the top surface thereof to the mold cavity to enable the metal to be poured therein. The pattern is then removed and the mold is ready to receive the metal. The inlet end of the gate is preferably disposed closely adjacent one of the sides of the flask. With this arrangement, the molds may conveniently be stacked one above another with gates of successive molds having their inlet ends at opposite sides of the stack and with alternate molds projecting beyond the stack at said opposite sides thereof exposing the gates of the several molds for the pouring operation.

When a mold is ready for the performance of the casting operation, the nowel is supported by the pressure plate as shown in Fig. 6, said plate resting upon the floor or upon another flask as the case may be. When the metal is poured into the mold, any tendency of the metal to displace the loosely compacted columns of sand in the zones 20 will be obviated by means of the outer pressure plate section 12 which provides adequate support for said sand columns. When the metal is poured into the mold the gases generated readily pass outward through the low density zones 20 in the sand. It will be seen that certain of the zones 20 terminate at the line of parting between the masses of sand in the cope and the nowel and any gases which may find egress from the mold cavity along said parting line will eventually escape through said zones. The inner pressure plate section 13 being preferably of wood fits with sufficient looseness against the outer plate section 12 to insure that the gases which pass through the zones 20 will work their way between said inner and outer pressure plates and finally pass through the perforations 16 in the outer plate section 12. To enable the gases to escape freely into the atmosphere in case the outer pressure plate section 12 rests upon a smooth flat surface, the outer face of the said plate is provided with a series of shallow grooves 21 (Fig. 4) interconnecting adjacent perforations 16 and connecting the outermost rows of said perforations with the margin of said plate thereby affording outlet passages for the gases.

The outer section 12 of the pressure plate may be made without the flange which as shown in the drawing projects beyond the rib 14 to overlap the sides of the flask. In such a case two or more cross beams may be secured to the unribbed face of the pressure plate, these ribs projecting beyond opposite edges of the plate to overlap the sides of the flask. Such a construction is advantageous inasmuch as it enables the operator to hold the flask after the same has been inverted by grasping the edges of the pressure plate between said cross beams and thus to place the flask upon the floor without liability of having his fingers squeezed between the pressure plate and the floor.

The invention has been herein shown and

described in an embodiment at present preferred but it is to be understood that the invention is capable of being variously changed and modified without departing from the spirit thereof, and that the scope of the invention is defined by the appended claims rather than by the foregoing description.

Claims:

1. In combination with a molder's flask, a pressure plate movable toward the bottom of the flask to compress the sand therein and having a raised peen portion thereon shaped to displace the sand inwardly toward the sides of a pattern within the flask as the plate is moved downwardly within the flask.

2. In combination with a molder's flask, a pressure plate for use in compressing the sand within the flask, said plate provided with means to displace the sand inwardly and having a plurality of perforations arranged therein to relieve the sand from the pressure of the plate at spaced intervals thereby producing zones of reduced density in the mass of sand.

3. In combination with a molder's flask, a pressure plate for use in compressing the sand within the flask, said plate having a plurality of perforations arranged therein to provide avenues of escape for gases, and means for preventing the escape of sand through said perforations while permitting the escape therethrough of the gases.

4. In combination with a molder's flask, a pressure plate for use in compressing the sand within the flask, said plate having a plurality of perforations arranged therein to relieve the sand from the pressure of the plate at spaced intervals thereby producing zones of reduced density in the mass of sand, means for preventing the escape of sand through said perforations while permitting the escape therethrough of gases and a second plate overlying the first plate and having perforations extending therethrough, said plates adapted to be relatively positioned with the perforations of one plate staggered with respect to the perforations of the other plate.

5. In combination with a molder's flask, a pressure plate for use in compressing the sand within the flask, said plate having a plurality of perforations arranged therein to relieve the sand from the pressure of the plate at spaced intervals thereby producing zones of reduced density in the mass of sand, a second plate overlying the first plate and having perforations extending therethrough, said plates having their opposed faces adapted to afford intercommunication between the perforations of said plates.

6. In combination with a molder's flask, a pressure plate for use in compressing the sand within the flask, said plate having a rib projecting from one face of the plate adjacent its margin for applying a greater amount of pressure to the sand than the rest of the plate and the portion of the plate within said rib being provided with a plurality of perforations to provide avenues of escape for gases, a second plate arranged face-to-face with the ribbed plate inside of said rib and having a plurality of perforations extending therethrough and arranged in staggered relation to the perforations of the ribbed plate, the opposed surfaces of said plates being adapted to provide avenues of communication between adjacent staggered perforations to afford continuous outlet passages for gases.

7. In combination with a molder's flask, a pressure plate for use in compressing the sand within the flask, said plate having a rib projecting from one face of the plate adjacent its margin for applying a greater amount of pressure to the sand than the rest of the plate and the portion of the plate within said rib being provided with a plurality of perforations, a second plate arranged face-to-face with the first plate and loosely fitting inside of said rib, the opposed faces of said plates together with the edge faces of the first plate being constructed and arranged to provide outlet passages leading from the interior of the mold to the exterior thereof thus providing avenues of escape for gases.

8. In combination with a molder's flask, a pressure plate for use in compressing the sand within the flask, said plate having a rib projecting from one face of the plate adjacent its margin for applying a greater amount of pressure to the sand than the rest of the plate and the portion of the plate within said rib being provided with a plurality of perforations, a second plate arranged face-to-face with the first plate inside of said rib and having a plurality of perforations extending therethrough and arranged in staggered relation to the perforations of the ribbed plate to relieve the sand from the pressure of the plate at spaced intervals thereby producing zones of reduced density in the mass of sand, said plates having their opposed surfaces adapted to provide avenues of communication between adjacent staggered perforations to afford continuous outlet passages for gases, and the outer face of the ribbed plate having a series of grooves interconnecting adjacent perforations and connecting the outermost rows of perforations with the margin of said plate thereby affording outlet passages for gases when the grooved face of said plate rests upon a smooth flat surface.

In testimony whereof I have affixed my signature.

LEONARD JOHNSTON.