E. E. CARTER.

MOLDING APPARATUS.

APPLICATION FILED FEB. 24, 1909.

**956,939.** **Patented May 3, 1910.**

3 SHEETS—SHEET 1.

Fig. 2.

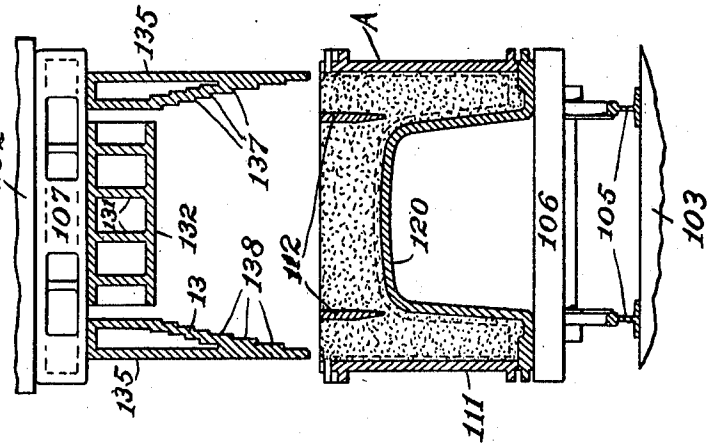
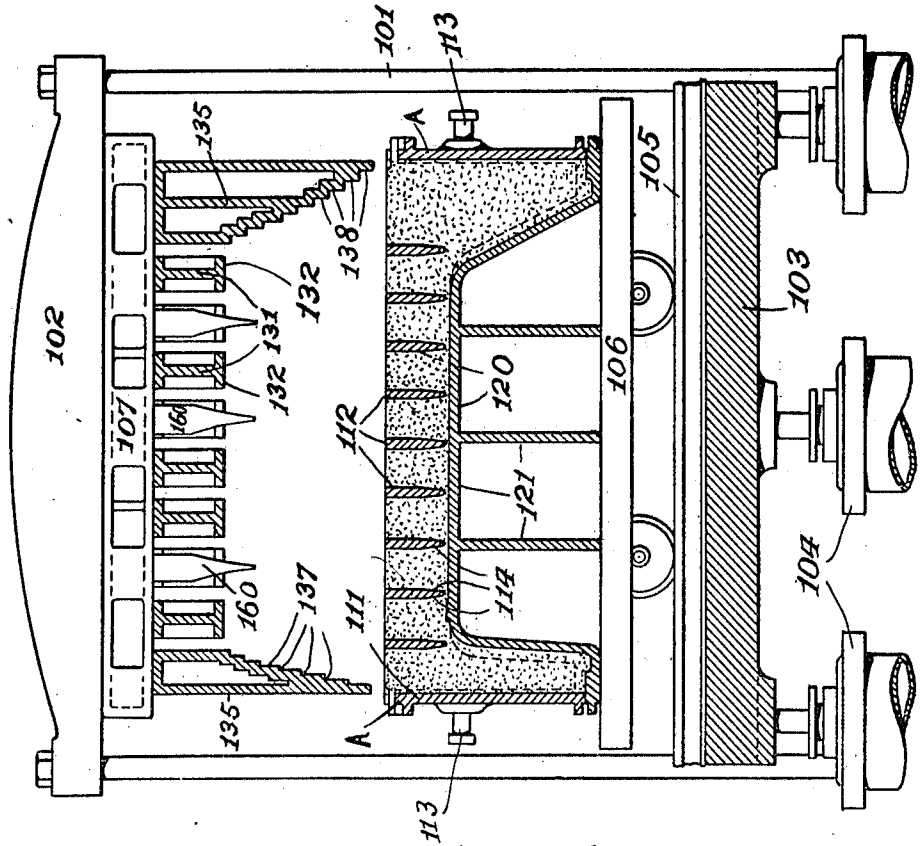



Fig. 1.




Attest:
May Hughes
Alan C. MacDonnell.

Edwin E. Carter, Inventor:
by William R. Baird
his Atty.

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3 SHEETS—SHEET 2.

Fig. 4.

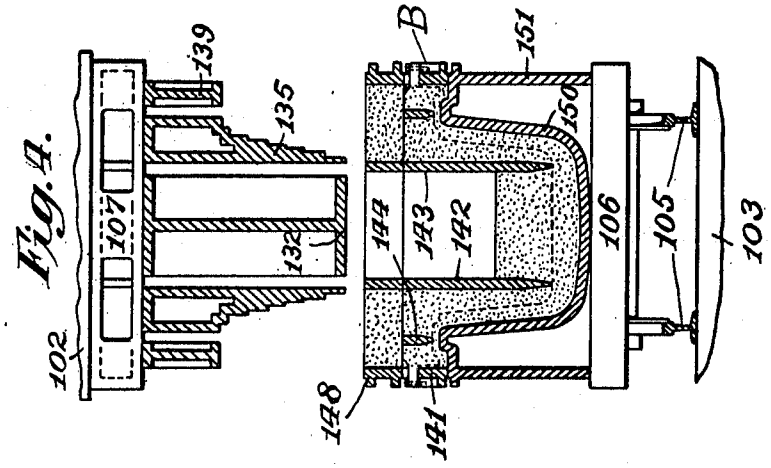
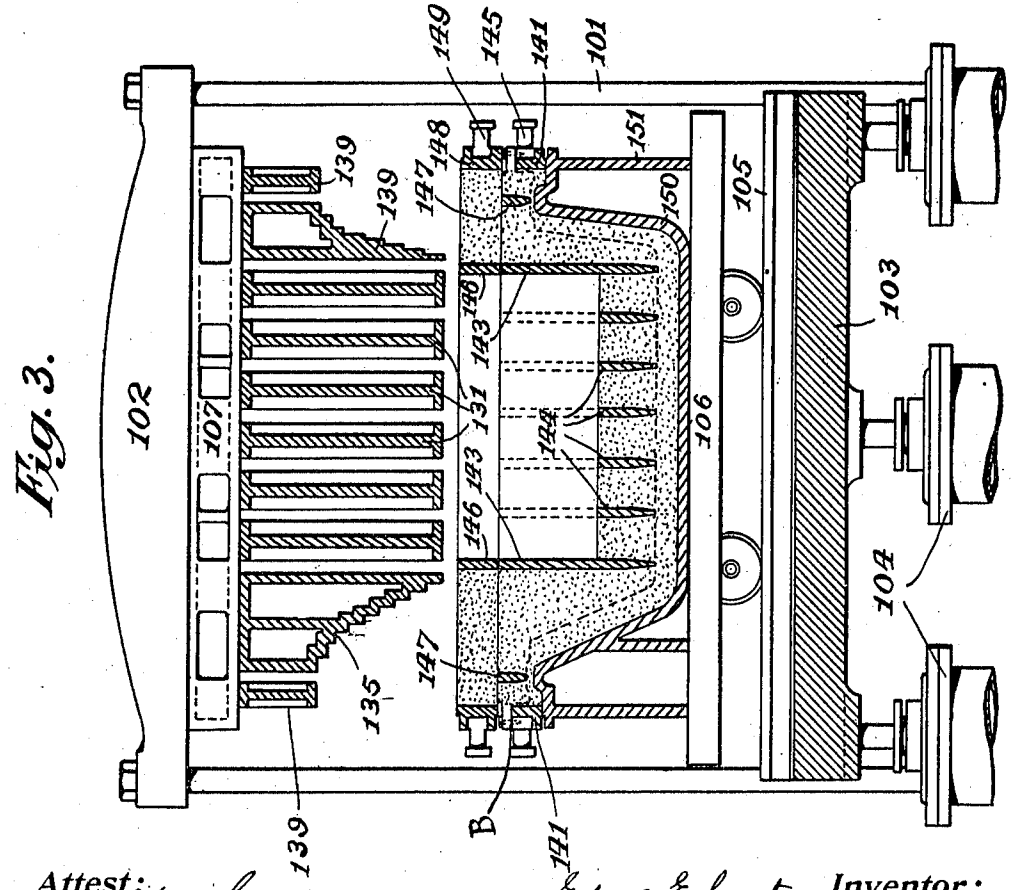



Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 5.

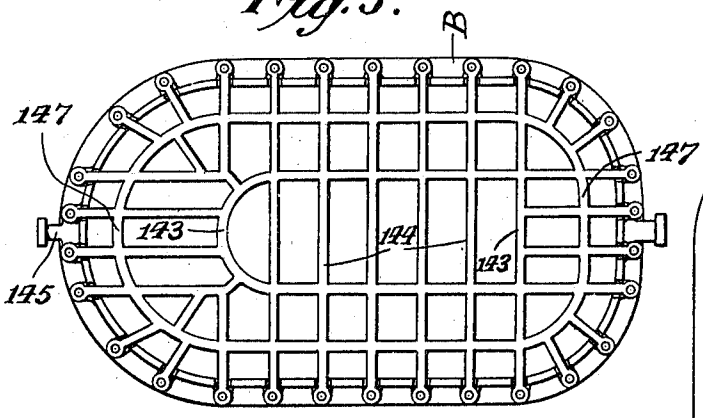



Fig. 7.

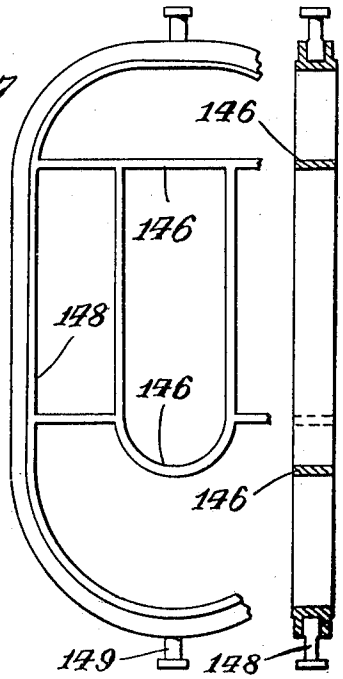



Fig. 8.

Fig. 6.

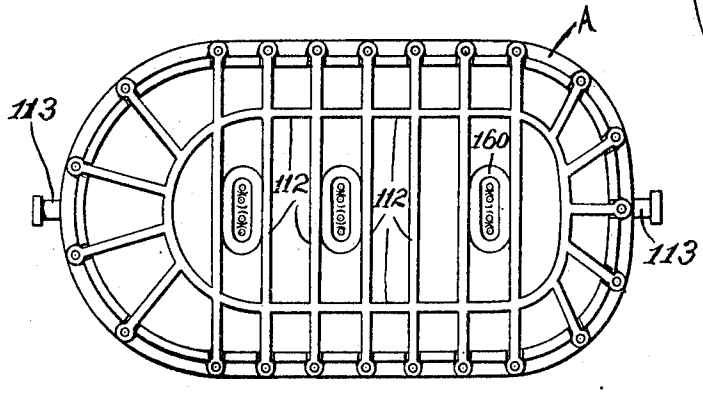



Fig. 10.

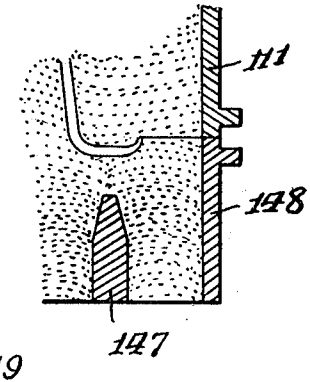
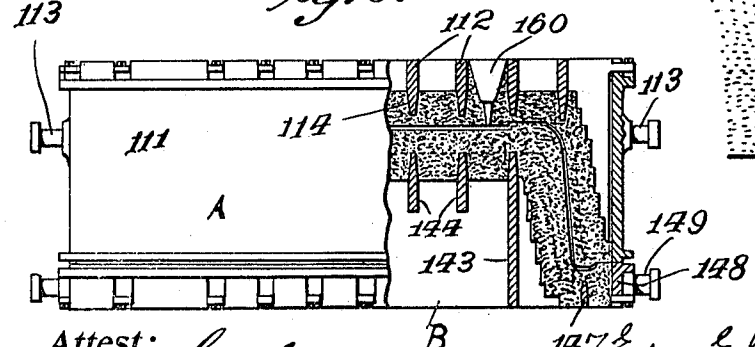



Fig. 9.

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# UNITED STATES PATENT OFFICE.

EDWIN E. CARTER, OF WARREN, OHIO, ASSIGNOR TO THE DAY WARD COMPANY, OF WARREN, OHIO, A CORPORATION OF OHIO.

## MOLDING APPARATUS.

956,939. Specification of Letters Patent. Patented May 3, 1910.

Application filed February 24, 1909. Serial No. 479,823.

*To all whom it may concern:*

Be it known that I, EDWIN E. CARTER, a citizen of the United States, and resident of Warren, Trumbull county, Ohio, have invented certain new and useful Improvements in Molding Apparatus, of which the following is a specification.

This invention relates to apparatus for forming molds of sand adapted to be assembled together to form a complete mold to receive molten metal thus cast into proper form to make the desired articles. It is particularly useful in forming molds of articles of large size.

In the drawings, Figure 1 is a side elevation and partial central vertical section of an apparatus embodying my invention, showing the use of a flask-member A; Fig. 2 is a transverse vertical section of the parts shown in Fig. 1; Figs. 3 and 4 are views similar to Figs. 1 and 2 showing the use of a second flask-member B; Fig. 5 is a top plan view of the second flask-member B; Fig. 6 is a top plan view of the first flask-member A; Fig. 7 is a top plan view, and Fig. 8 is a central vertical section of the sand ring used with the second flask-member; Fig. 9 shows the molds assembled in the flask ready for pouring, and Fig. 10 is an enlarged diagrammatic detail of the position of the sand in the vicinity of the beveled supporting ribs after the sand is packed.

In the drawing, there is shown a machine having a framework comprising uprights 101, a head 102, and a platform 103, the latter adapted to be vertically moved in the uprights by means of a hydraulic press indicated at 104, 104. The platform is supplied with suitable rails, or tracks, 105 adapted to receive a car 106 on which the pattern is placed. A false head 107 is suitably secured to the head 102 by bolts, or similar means, and is adapted to receive and support the compressing members.

One member of the flask (see Figs. 1, 2 and 6) has an outer frame 111 and an inner frame 112 and is provided with trunnions 113. The inner frame is composed of ribs which serve as sand adhering elements, and are beveled at 114 on their inner ends.

120 is the outer pattern for the article to be molded, in the case illustrated, a bath tub. It is suitably supported on the car 106 and is provided with internal reinforcing ribs 121.

The compressor, adapted to be used with said member of the flask, is made of two series of elements, viz: first, presser heads 131 having flat outer surfaces 132; and second, wedges 135 having sloping surfaces made up of a series of steps each having one surface 137 substantially horizontal, and the other surface 138 at an angle thereto and substantially vertical. The vertical surfaces of these steps are longer toward the lower edges of the wedges where the greatest compression force should be exerted against the same. It will be noted that the presser heads and wedges are so arranged with respect to the flask-member that when the parts are brought together they move between the parts of the flask-member frame.

Another member of the flask, as B (see Figs. 3, 4 and 5) has an outer frame 141 and an inner frame 142 composed of long ribs 143 and shorter ribs 144, each one of which is beveled at its inner end and serves as sand adhering elements. It is also provided with trunnions 145 by which it may be moved. The inner series of frame ribs 144 are much shorter than the other series 143, which extend from the top of the flask member and are adapted to coöperate with the pattern in compacting the sand. This member is also provided with a portion comprising a sand ring 148 identical in contour and size with the outer frame 141 and having ribs 146 registering with the ribs 143 of the flask-member itself. Trunnions 149 enable this sand ring to be readily removed. Smaller ribs 147, forming part of this flask member B, serve as sand adhering elements between the frame 141 and the ribs 143. These ribs are tapered toward the pattern and thus toward the outer surface of the sand mold.

150 is the pattern for the inner mold. It is provided with external reinforcing ribs 151 and is adapted to be supported upon the car or platform 106.

The compressor used with the member B (see Figs. 3 and 4) is made up of the same series of elements as the compressor used with the flask-member A, but the presser heads 131 are much longer and the sloping stepped surfaces of the wedge 135 are turned outwardly and not inwardly as were the surfaces of the wedges used with the flask-member A. Outer presser heads 139 are used to compress the sand in the spaces outside of the wedges.

Gate forming members 160 are made integral with or properly secured to the compressor.

The manner of using the apparatus with the flask-member A and outer pattern is as follows: The flask-member A and pattern are arranged as shown in Figs. 1 and 2 and the sand is placed within the member and against the pattern, the car being outside of the machine. It is then wheeled into position within the machine and by means of the hydraulic press 104 the compressor and the flask-member are brought toward each other. The wedges 135 enter the sand first and pack it very tightly at the bottom, and not so tightly near the top, the longer vertical sides of the steps toward the bottom insuring this result. The presser heads enter the spaces between the frame of the flask-member and press the same firmly and smoothly against the pattern. It is to be noted that there is no lateral movement of the sand but that by reason of the horizontal surfaces of the presser heads and the horizontal surfaces of the steps on the wedges, the sand is compressed evenly in a direction coincident with the direction of movement of the parts and at right angles to the longitudinal axis of the pattern.

The mold having thus been formed, the compressor and flask-member are moved apart, the car is removed from the machine, and the pattern is removed in the usual manner.

The manner of using the machine with the flask-member B is quite similar; the pattern and flask-member with the sand ring 148 are placed in position on the car outside of the machine and are there filled with sand. They are then run back into the machine and the compressor and car are moved toward each other by means of the hydraulic press. This brings the presser heads and wedges against the sand in the pattern and packs it against the latter, as before. The ring 148 is so constructed that when the proper amount of compression is secured the ring will be entirely free from the sand which has all been pressed to a point below its lower surface. After this compression has taken place, the movement of the press is reversed and the compressor and flask-member separated. The car is then run out of the press, the sand ring is removed, the flask-member is inverted and the pattern is removed.

The flask-members A and B are then assembled to form the complete flask, as shown in Fig. 9. When the molten metal is poured through the gates into the space between the two molds, it runs to the bottom of the space by gravity. By the process outlined, not only has the sand been packed more firmly along these molding surfaces than at other parts and thus been made better able to resist the weight of the metal, but the shape of the ribs 147 and other reinforcing ribs similarly tapered has a tendency to form the intervening sand into an arch which helps resist this thrust, such formation being diagrammatically indicated in Fig. 10.

Another result from the tapered ribs with beveled sides is that as the sand is compressed to a point where the surfaces to which it adheres are always flaring toward the mold line no mold board is required to support the sand when the flask-members are inverted and the pattern is removed.

By varying the size of the steps of the wedges 135 any desired degree of compression can be readily secured at any part of the mold when the wedges are employed, a great advantage in molding articles of irregular shape.

What I claim as new is:—

1. In an apparatus of the kind described, the combination with a flask-member, of compression elements consisting of wedges, the effective surfaces of which are formed into steps.

2. In an apparatus of the kind described, the combination with a flask-member, of compression elements consisting of wedges, the effective surfaces of which are formed into steps having vertical and horizontal surfaces.

3. In an apparatus of the kind described, the combination with a flask-member, of compression elements consisting of wedges, the effective surfaces of which are formed into steps having angular surfaces.

4. In an apparatus of the kind described, a compressor comprising presser heads with horizontal surfaces and wedges with horizontal and vertical surfaces.

5. In apparatus of the character described, a compressing member provided with a series of sand-engaging steps of different heights.

6. A flask-member having reinforcing ribs beveled at their inner ends toward the mold line, and provided with a removable sand ring having ribs adapted to register with those of the flask-member.

7. A flask-member having reinforcing ribs, each composed of inwardly beveled surfaces, the outermost ribs on each side and the inner ribs being small and the intermediate ribs being much greater in length to coöperate with the pattern.

8. A sand molding machine comprising a pattern support, a head, means for relatively moving them, the head being provided with a compressor including wedge-shaped elements, the effective surfaces of which are made in the form of steps.

9. In an apparatus of the kind described, a pattern support, a pattern, a compressor holder, means for relatively moving the com-

pressor and pattern, a flask-member, flat presser heads secured to the compressor and wedges also secured thereto having outwardly flaring sides composed of steps.

10. In an apparatus of the kind described, a pattern support, a pattern, a compressor holder, means for relatively moving the compressor and pattern, a flask-member, flat presser heads secured to the compressor and wedges also secured thereto having outwardly flaring sides composed of steps made up of vertical and horizontal surfaces.

11. In an apparatus of the kind described, a pattern support, a pattern, a compressor holder, means for relatively moving the compressor and pattern, a flask-member, flat presser heads secured to the compressor and wedges also secured thereto having inwardly flaring sides composed of steps.

12. In an apparatus of the kind described, a pattern support, a pattern, a compressor holder, means for relatively moving the compressor and pattern, a flask-member, flat presser heads secured to the compressor and wedges also secured thereto having inwardly flaring sides composed of steps made up of vertical and horizontal surfaces.

13. In an apparatus of the kind described, a pattern support, a pattern, a compressor holder, means for relatively moving the compressor and pattern, a flask-member having beveled reinforcing ribs, flat presser heads secured to the compressor and wedges also secured thereto having outwardly flaring sides composed of steps.

14. In an apparatus of the kind described, a pattern support, a pattern, a compressor holder, means for relatively moving the compressor and pattern, a flask-member having beveled reinforcing ribs, flat presser heads secured to the compressor and wedges also secured thereto having inwardly flaring sides composed of steps.

15. In an apparatus of the character set forth, the combination with a flask member having a plurality of spaced sand-engaging ribs, of a compressor member including a plurality of spaced sand pressing heads that operate between the ribs, and means for effecting a relative movement between the members.

16. In an apparatus of the character described, the combination with a flask member having spaced sand-engaging ribs, of a compressor member having a plurality of spaced pressing heads that operate between the ribs and wedges surrounding and projecting beyond the heads, and means for effecting a relative movement between the members.

17. In molding apparatus, the combination with a flask member comprising separable sections, one of which constitutes mold-holding means, the other forming a temporary sand holding device, of a sand pressing member coöperating with the flask member and pressing the sand from said sand holding device into the mold-holding means.

18. A flask-member comprising a body member and a removable sand ring, said body and ring having sand reinforcing ribs, the ribs of the ring registering with those of the body.

Witness my hand this 20th day of February, 1909, at Warren, Ohio.

EDWIN E. CARTER.

Witnesses:

WILLIAM R. BAIRD,

ALAN C. MCDONNELL.