

Sept. 27, 1932.

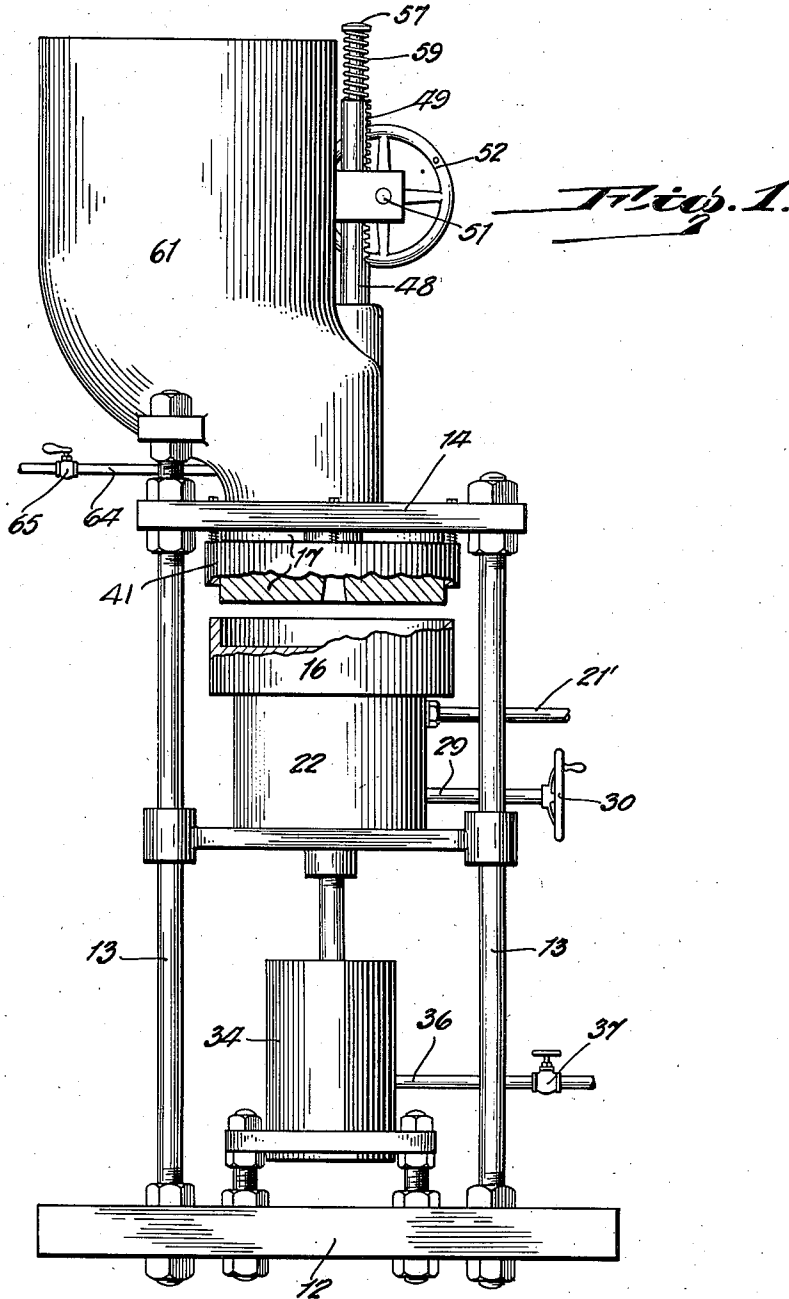
J. CARLE

1,879,076

METAL CASTING MACHINE

Filed July 29, 1930

5 Sheets-Sheet 1



Inventor

JOHN CARLE.

By *Clarence A. O'Brien*
Attorney

Sept. 27, 1932.

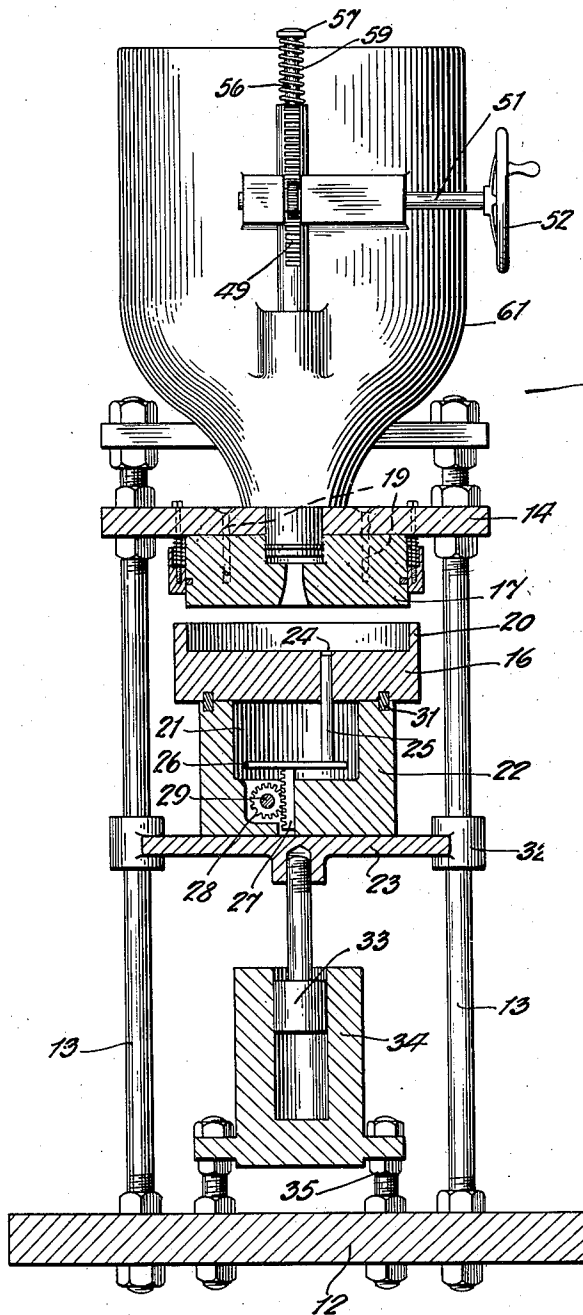
J. CARLE

1,879,076

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5 Sheets-Sheet 2



Inventor

JOHN CARLE.

By *Clarence A. O'Brien*
Attorney

Sept. 27, 1932.

J. CARLE

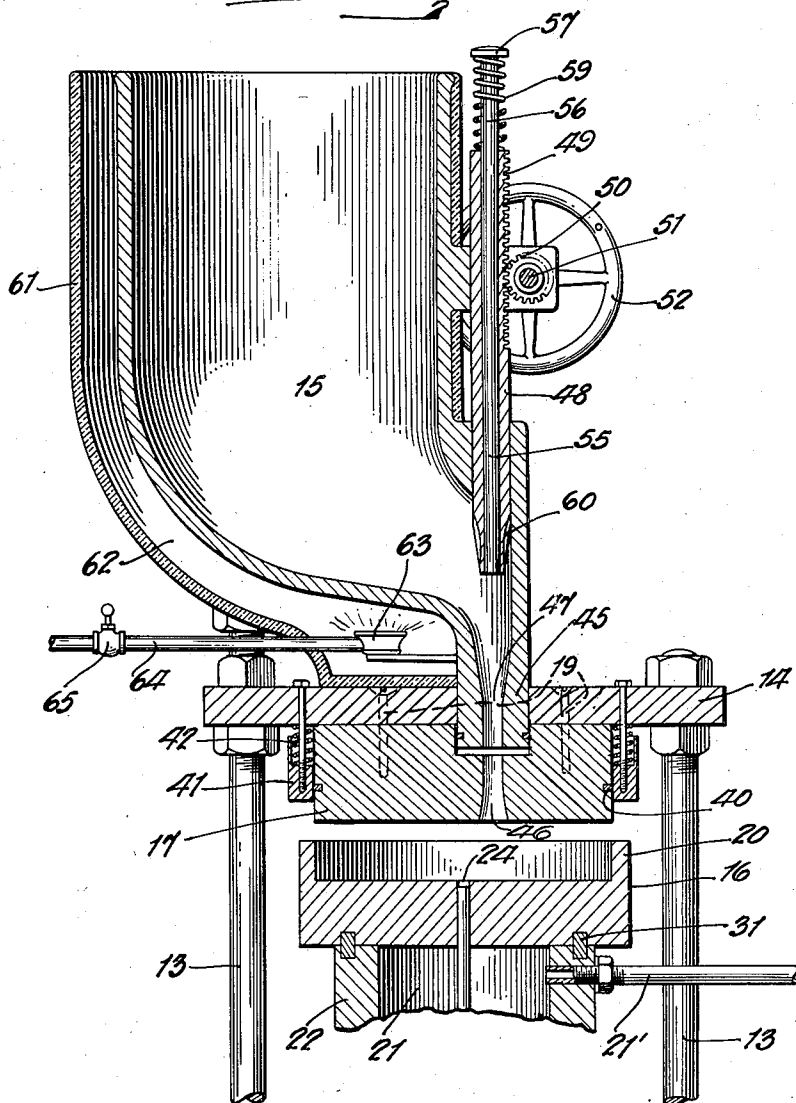
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Fig. 3.



Inventor

JOHN CARLE.

By *Clarence A. O'Brien*
Attorney

Sept. 27, 1932.

J. CARLE

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Fig. 4.

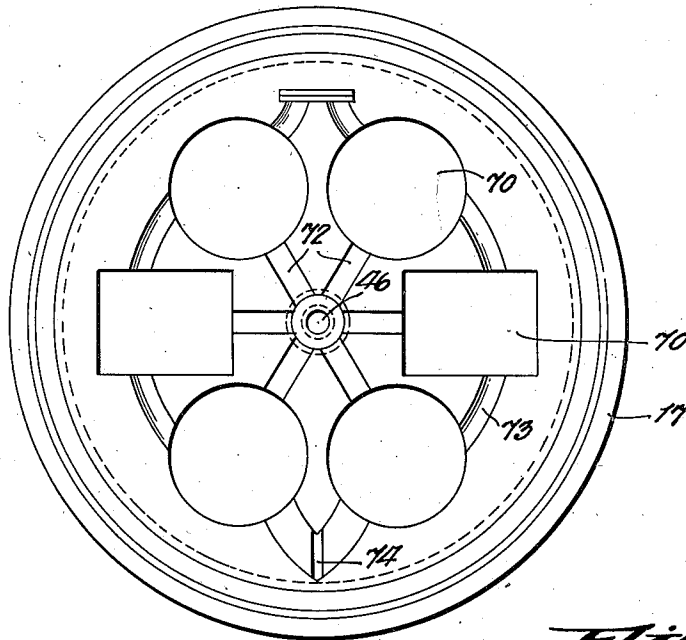
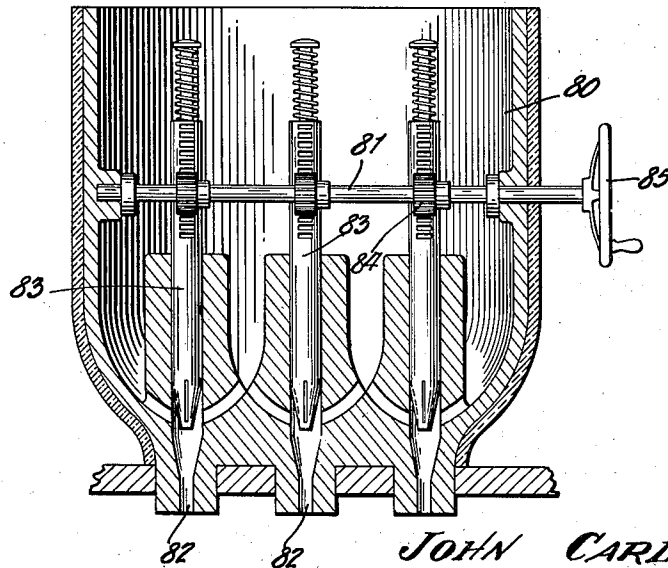


Fig. 5.



Inventor

JOHN CARLE.

By *Clarence A. O'Brien*
Attorney

Sept. 27, 1932.

J. CARLE
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Fig. 6.

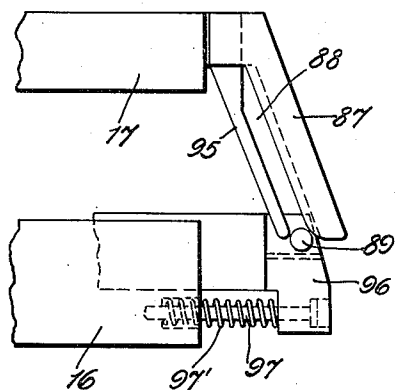


Fig. 7.

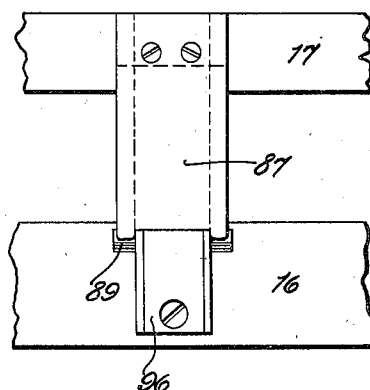


Fig. 8.

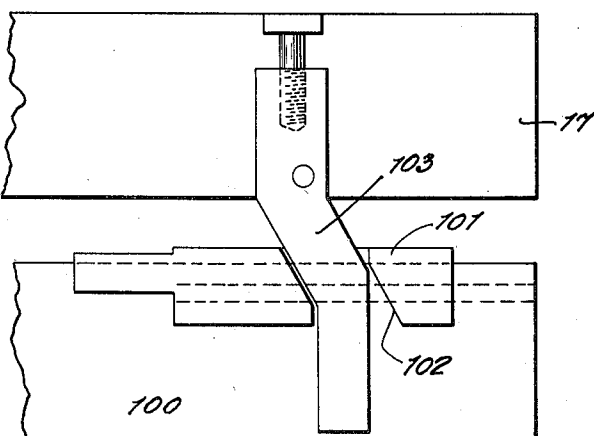
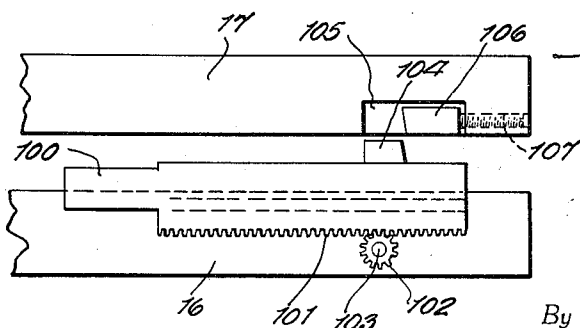


Fig. 9.

Inventor

JOHN CARLE.

By

Clarence A. O'Brien

Attorney

UNITED STATES PATENT OFFICE

JOHN CARLE, OF GARWOOD, NEW JERSEY

METAL CASTING MACHINE

Application filed July 29, 1930. Serial No. 471,497.

This invention pertains to machines for molding metal, and more particularly it pertains to machines in which the metal is molded or cast without pressure.

5 I am aware that metal casting machines have heretofore been constructed in which molten metal has been forced into the dies or molds by air pressure, but in all such machines with which I am familiar the cast
10 product contains numerous air or blow holes which are highly undesirable, and often completely ruin the casting. Another outstanding disadvantage in machines of the aforementioned type with which I am familiar is
15 an inability to maintain tight the break joints and other meeting faces of the mold or die sections, which condition is partially responsible for the formation of blow holes in the finished product, and which also permits of
20 the escape of metal around the parting and other joints of the mold or die.

It is an object of the present invention, to provide a novel metal molding or casting machine in which the casting operation is
25 carried out in a vacuum, and in which the molten metal is drawn by a vacuum, into the mold as distinguished from the more common method of forcing the molten metal into the mold or die under pressure.

30 It is another object of the invention to provide a novel form of two part mold or die, and to provide novel means for operation of the several parts of the mold or die to effect opening and closing thereof.

35 It is another object of the invention so to construct the mold or die, that when closed, it will be air tight, whereby to produce and maintain a vacuum within the mold or die.

40 It is another object of the invention to provide a novel form of container for molten metal and to provide for the introduction of the molten metal into the mold or die in a molten state.

45 With the above and other objects in view;

reference is to be had to the accompanying drawings, wherein:

Figure 1 is a view in elevation of a machine constructed in accordance with the present invention, the two parts of the mold
50 or die being shown partly broken away.

Figure 2 is a view partly in elevation, and partly in vertical section taken at right angles to Figure 1.

Figure 3 is an enlarged detail vertical
55 sectional view through the molten metal container and the sectional mold or die.

Figure 4 is a bottom plan view of an upper mold or die member employed for casting a plurality of articles at a single operation.
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Figure 5 is a vertical sectional view illustrating a modified form of molten metal container and molten metal discharge controlling mechanism therefor.
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Figure 6 is a fragmentary view in elevation of a mechanism for operating a core for use with the mold or die.

Figure 7 is a similar view taken at right angles to Figure 6.
70

Figure 8 is a fragmentary view in elevation of a modified form of core operating mechanism, and

Figure 9 is a fragmentary view of a still further modified form of mold core operating
75 mechanism.

Referring specifically to the drawings, a machine constructed in accordance with the present invention includes a suitable base 12, and extending vertically from the base, there are a plurality of standards 13 of which in
80 the present illustration of the invention, there have been shown but two. Mounted upon the upper ends of the standards 13 there is a platform or plate-like member 14 and this
85 platform 14 forms the means for supporting a molten metal container 15 and one member of a two-part mold or die to be hereinafter more specifically described.

The mold or die used in connection with the 90

present machine, preferably comprises two members 16 and 17. The member 17 is immovable in operation and is supported by means of screws or the like 19 which engage the platform 14 in any suitable manner such as being received in sockets therein, or passing entirely therethrough. The other member of the mold that is the member 16, is cup shaped, having a flange 20 and is adapted to receive the member 17 to close the mold. Associated with the member 16 there is a vacuum chamber 21 formed in a block like member 22 which member is carried upon a platform or the like 23. Communication between the vacuum chamber 21 and the interior of the mold or die member 16, is established by means of a passage 24. Mounted in the passage 24, there is a plunger or similar member 25 and this member 25 carries a right angular extension 26 from which depends a rack 27 operated by a pinion 28 mounted on a shaft 29 which shaft extends through the bottom wall of the member 22 and terminates in a hand wheel 30 by means of which the shaft may be rotated to rotate the pinion and through the medium of the rack 27 move the member 25 into and out of engagement with the opening 24 to cut off or establish communication between the vacuum chamber 21 and the interior of the mold member 16. To provide an airtight joint between the member 22 and the bottom wall of the mold member 16, a sealing ring such as 31 is employed.

The platform 23 is provided with suitable bearings 32 by means of which it is mounted for sliding movement upon the standards 13, and depending from the lower face of said platform 23 there is a piston or plunger 33 which operates in the cylinder 34 of a hydraulic jack mounted as at 35 upon the base 12. Fluid is admitted to the cylinder of the hydraulic jack by means of a pipe or conduit 36 and the flow of fluid to and from the hydraulic jack may be controlled by means of a suitable hand valve 37.

From the foregoing it will be apparent that as fluid under pressure is admitted to the hydraulic jack, the piston or plunger 33 thereof will be elevated. Elevation of the plunger or piston 33 raises the platform 23, and moves the mold member 16 in the direction of the mold member 17 and causes the latter to pass into the former to close the mold or die for a casting operation.

The mold or die member 17 is provided with a sealing ring 40, and this sealing ring is adapted for engagement with the inner face of the flange 20 of the die member or mold 16 when the mold is closed. In the closing of the mold, the upper edge of the flange 20 of the mold or die member 16 engages a ring like member 41 resiliently mounted as at 42 upon the platform or base member 14, and said flange 20 moves this

ring member 41 against the resilient mounting in order that the sealing ring 40 may pass into the mold or die member 16 to form a gas-tight joint therewith. It will be understood that when the parts are in the position shown in Figure 3, the ring member 41 holds the sealing ring 40 compressed, and that upon movement of the members toward each other the flange 20 will engage the sealing ring before it is disengaged with the ring 41 and therefore the ring 40 will be able to pass into the mold or die member 16.

The molten metal receptacle heretofore mentioned is provided with a neck extension 45 which extends through the plate 18 heretofore mentioned and registers with a pouring opening 46 in the mold member 17. The neck 45 has a discharge passage 47 therethrough, and as best illustrated in Figure 3, this neck 45 and its pouring passage 47 are offset with respect to the longitudinal axis of the molten metal container. For controlling the flow of molten metal through the discharge passage 47, there is a closing plug 48 and said closing plug 48 is adapted for movement into and out of the upper end of said passage 47. For effecting movement of the plug 48, the same is provided with a plurality of rack teeth 49 which are engaged by a pinion 50 carried by a shaft 51 operated by a hand wheel 52. By this means the operation of the hand wheel in the proper direction may be employed to raise or lower the closing plug as it is desired to either open or close the discharge opening 47. The closing plug 48 is preferably hollow, and mounted therein there is a bar 55 which I will hereafter refer to as a knock-out bar. The lower end of this bar terminates flush with the lower end of the plug 48, and the upper end is projected therebeyond as at 56, and is provided with a head 57 and between this head 57 and the upper end of the plug 48, there is a coil spring 59. As will be noted by reference to Figure 3 the plug 48 is provided on its lower end with a plurality of channels or surface grooves 60, and the purpose of these grooves is to permit of the flow of molten metal back into the receptacle 15 as the plug 48 is forced to its seat to close the discharge outlet or passage 47. The function of the knock out bar 55, is to clear the metal which may collect in the pouring opening 46 of the mold member 17 after the casting has been completed, and the metal has partly solidified, and this is accomplished by tapping gently with a hammer upon the head 57 of the knock-out bar 55 with the plug 48 in its closed position, forcing the knock-out bar 55 through the pouring passage 46 to clear the same of metal lodged therein.

The molten metal receptacle 15 is provided with a heat insulating jacket 61, and upon one side thereof or for the greater portion of the outer surface of said receptacle 15, the

heat insulating jacket 61 is spaced therefrom to provide a chamber 62. Mounted in this chamber 62 and preferably at a point closely adjacent the discharge opening 47, there is a burner or heat supplying medium 63 to which fuel may be supplied by the pipe 64 controlled by a valve 65. By this means, the molten metal in the container 15 is maintained in the proper state for use, and by reason of the location of the heat supplying medium 63 closely adjacent the discharge passage 47, the relatively small body of material passing through the discharge passage 47 is prevented from unduly or rapidly cooling in its transit to the mold, or die.

As thus far described, the device operates in the following manner. With the parts in the position shown in Figure 2, fluid under pressure is admitted to the hydraulic jack 34 which elevates the plunger or piston 33 therein and moves the mold member 16 into closing position with the mold member 17, the sealing ring 40 of the mold member 17 passing into position behind the flange 20 of the mold member 16 to form a gas tight joint between said two mold members. The air is next exhausted from the closed mold and this is accomplished by means of a suitable evacuating apparatus attached to the pipe 21' which leads into the vacuum chamber 21, it being understood that the member 25 is removed from the opening 24 by operation of the hand wheel 30 as heretofore described.

After the mold has been closed and exhausted, the hand wheel 52 is operated to raise the closing plug 48 from the passage 47 and permit of the flow of molten metal from the receptacle 15 through the pouring passage 46 into the closed mold. When sufficient metal has been introduced into the mold, the closing plug 48 is again seated, and in doing so the excess metal is squeezed through the passages 60 back into the receptacle 15. After the desired period of time has elapsed, the mold is opened by exhausting the fluid under pressure from the jack 34 and moving the lower member 16 of the mold or die to its lowermost position. It sometimes happens that in opening the mold the mold spore will break off from the casting, and be retained in the pouring passage 46. In such cases, it is only necessary to gently tap the head 57 of the knock out bar 55 and this detached spore will be dislodged from the discharge passage 47 of the metal receptacle 15.

In Figure 4, which illustrates a bottom plan view of an upper mold member, the reference numeral 70 designates a plurality of recesses or pockets herein conventionally shown as of circular and rectangular forms. These pockets 70 however are adapted to the casting of articles of various shapes and will be shaped according to the article desired.

Leading through the center of the member 17, the bore opening or passage 46 is provided with a plurality of flanges 72 which leads from the bore passage 46 to the various pockets or recesses 70. The pockets or recesses 70 are connected by channels 73, and certain of these channels are provided with relatively small passages 74 through which the air may be exhausted from the mold when the same is in the closed position.

In Figure 5 of the drawings, there is illustrated a slightly modified form of molten metal container, and in said figure the container is designated by the reference character 80 and extending transversely thereof, there is a shaft 81. The container has three outlets 82 and each outlet 82 is adapted to be controlled by a closing plug 83 similar to the closing plug 48 heretofore described. The closing plugs 83 are simultaneously operated by pinions or the like 84 carried by the shaft 81, and the shaft is in turn operated by a hand wheel 85 to effect a movement of the closing plug 83. This device is adapted for use in machines where a plurality of individual castings of different nature are formed, and each discharge opening 82 will be connected with its respective mold or die.

In the casting of certain articles, it is necessary to form passages through the article, and this is done by means of a core. In Figures 6 to 9 I have illustrated three forms of core operating mechanisms and these three forms will now be described.

The core member is designated by the reference character 95, and is mounted for radial movement of the lower mold or die member 16. It is to be understood that there are two of these core members 95 and that they move in directions opposite to each other during the opening and closing of the mold or die members 16 and 17. The core member 95 is provided with a depending portion 96 and extending therefrom and into the mold or die member 16, there is a bolt or the like 97 surrounded by a coil spring 97'. The depending member 96 carries a pin 89 the purpose of which will be hereinafter described. For moving the core member 95 inwardly of the pockets or recesses in the lower mold or die member, the upper mold or die member 17 is provided with a depending arm 87 slotted as at 88, and having a depending leg, which with the leg 87 forms the slot 88.

By this construction it will be apparent that as the mold or die members 16 and 17 are moved toward each other to close the mold or die, the pin 89 moving through the slot 88 will force the core member 95 inwardly of the mold or die member 16 against the tension of the spring 97', and will retain the core in position within the pockets or recesses of the mold or die members 16, during such time as the mold or die is maintained closed. Upon opening of the mold or die, the pin 89

rides in the opposite direction through the slot 88 and aided by the tension of the spring 97' moves the core outwardly of the mold or die member 16.

5 In Figure 8 there is shown a slightly modified form of core operating means, and in this figure the core will be carried by the member designated 100, and said member will be provided with a block or the like 101, having a cam slot 102. The member 101 is carried by the core member 100 which in turn would be mounted for sliding movement in the lower mold or die member 16, and it is to be understood that there are two such members 100. Carried by the upper mold or die member 17, there is a cam shaped arm 103, and this cam shaped arm is adapted to move through the slot 102 as the mold or die members 16 and 17 are moved to closing position, and as they move to open position the arm 103 will retract the core from the mold member.

In Figure 9 of the drawings, a still further modified form of core operating mechanism is illustrated. In this figure the bottom mold or die member 16 carries a core 100, and said core 100 is provided with a plurality of rack teeth 101 which are engaged by pinions 102 carried by a shaft 103, and said shaft will have a suitable hand wheel for operation thereof. Upon the upper side of the core 100, there is a lug or projection 104 adapted to be received within a recess 105 in the upper mold or die member 17, and mounted in said recess 105 there is an adjustable block 106 operated by a screw 107 and moved longitudinally of the recess 105 by said screw.

By this construction it will be apparent that as the two mold or die members 16 and 17 are brought together, the projection 104 will pass into the recess 105 and prevent movement of the core 100 during the time that the mold or die members are in their closed position. Immediately the mold or die members are separated however, the core may be withdrawn by an operation of the shaft 103 by its hand wheel.

While the invention has been herein disclosed in what may be termed a preferred form, it is to be understood that it is not to be limited to the specific construction herein illustrated and that it may be practiced in other forms, and that this is particularly true as regards the several sealing rings in that they may be made of any desired shape such as square, round, oval, or hexagonal, or any other multiple number of sides in cross sectional form.

While in the present illustration, the sealing rings have been shown as located between the discharge nozzle 45 and the plate 18 of the upper mold member, between the mold and die members, and between the lower mold and die member and the vacuum chambers, it is to be understood that these sealing rings

are employed wherever necessary, and particularly around the core members where they slide within the mold or die members, and in fact in any place where it is desired. These various constructions have not been herein illustrated for the reason that the article to be formed by the machine determines the character of the mold or die members, and therefore cannot in all cases be anticipated. It is to be understood however, that in the various forms of dies, mold and the like, these sealing rings may be introduced wherever it has been found necessary to provide a gas or air tight joint between the movable members.

Having thus described the invention, what I claim as new and desire to secure by Letters Patents is:—

1. A casting apparatus comprising a base, standards extending vertically therefrom, a platform adjustably mounted upon the upper ends of said standards, a fluid metal supply carried by said platform, a two part mold or die, means for attaching one of the mold or die parts to said platform, means for moving the other mold or die part into closing relation with said first mentioned mold or die part, a sealing ring carried by said first mentioned mold or die part and means for holding said sealing ring compressed for engagement therewith of the second mold or die member.

2. A two part mold or die comprising a movable part and a stationary part, means for operating said movable part to open and close the mold or die, a flange on one of said members and adapted to embrace the other member when the mold or die is closed, a sealing ring carried by the other member for sealing engagement with said flange, and means for holding said sealing ring compressed until engaged by said flange, said last mentioned means comprising a ring-like member carried by and slidably mounted upon the mold or die member which carries the sealing ring.

3. A two part mold or die comprising a movable part and a stationary part, means for operating said movable part to open and close the mold or die, a flange on one of said members and adapted to embrace the other member when the mold or die is closed, a sealing ring carried by the other member for sealing engagement with said flange, and means for holding said sealing ring compressed until engaged by said flange, said last mentioned means comprising a ring-like member slidably mounted upon the mold or die member which carries the sealing ring, and means on the support for the stationary die part for yieldably carrying said ring-like member.

4. In combination, a plurality of vertically disposed standards, a two part mold or die, a platform carried by said standards and forming means for rigidly supporting one of the parts of said mold or die, means movable

along said standards for moving the other
part of said mold or die into closing engage-
ment with said stationary part, an expansible
and compressible sealing ring carried by said
5 stationary mold or die part and adapted to
engage the movable mold or die part to form
a tight joint therebetween, and means car-
ried by the platform and having engagement
with said sealing ring to hold the same com-
10 pressed until engaged by the movable mold or
die part.

In testimony whereof I affix my signature.
JOHN CARLE.

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