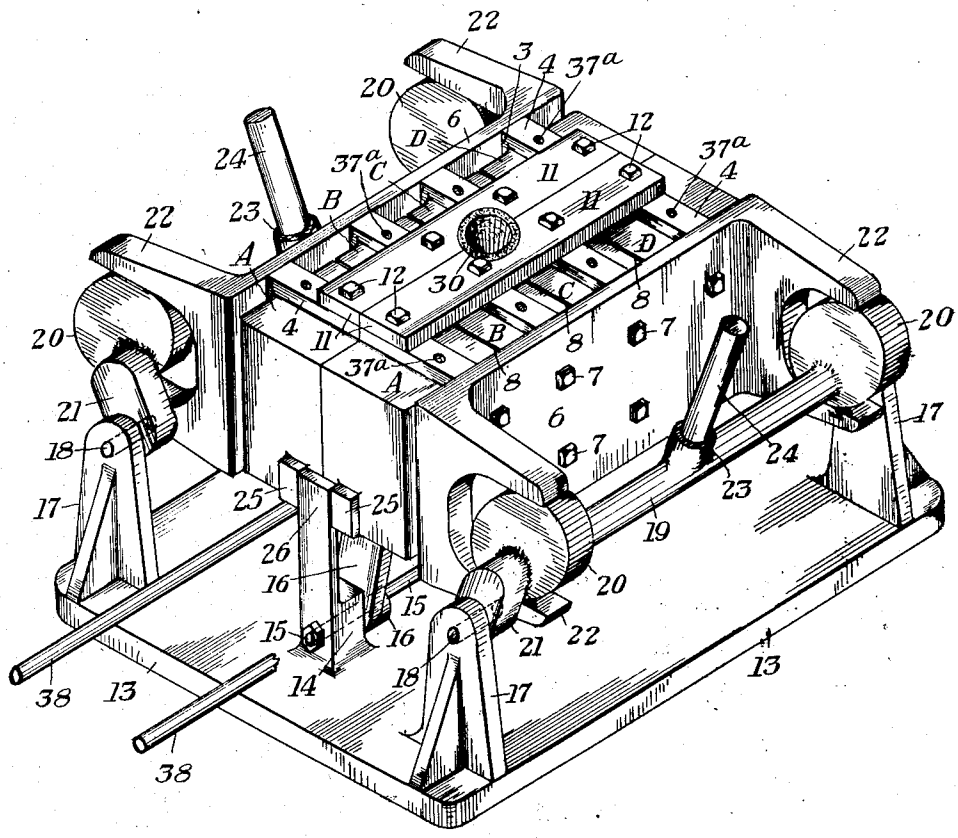
June 16, 1925. 1,542,643

C. D. PETTIS

MOLD AND METHOD OF MOLDING

Filed April 10, 1925 3 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

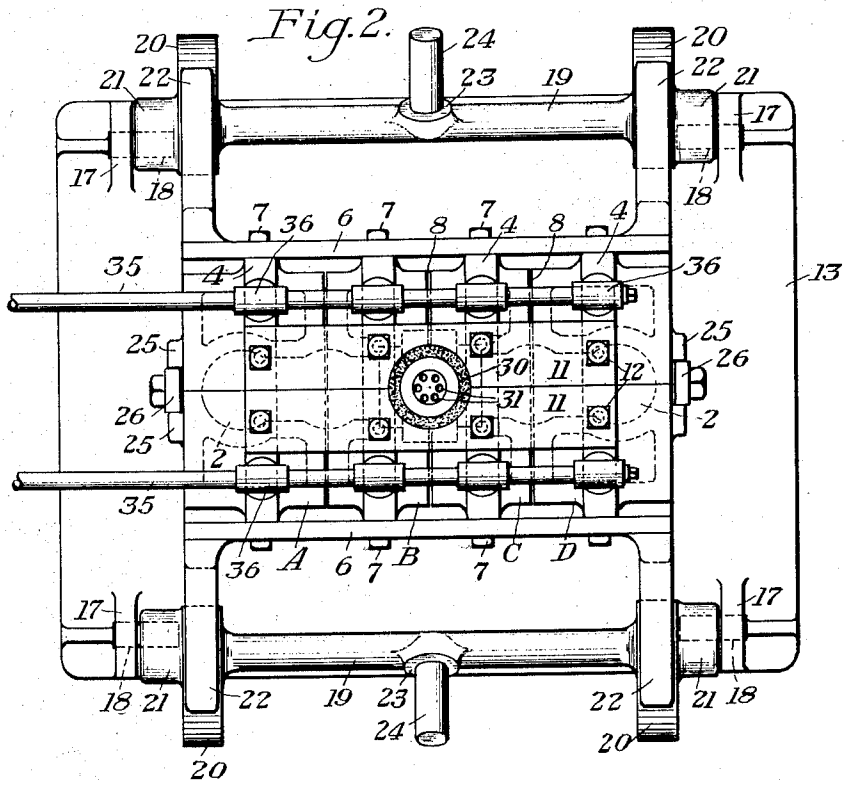
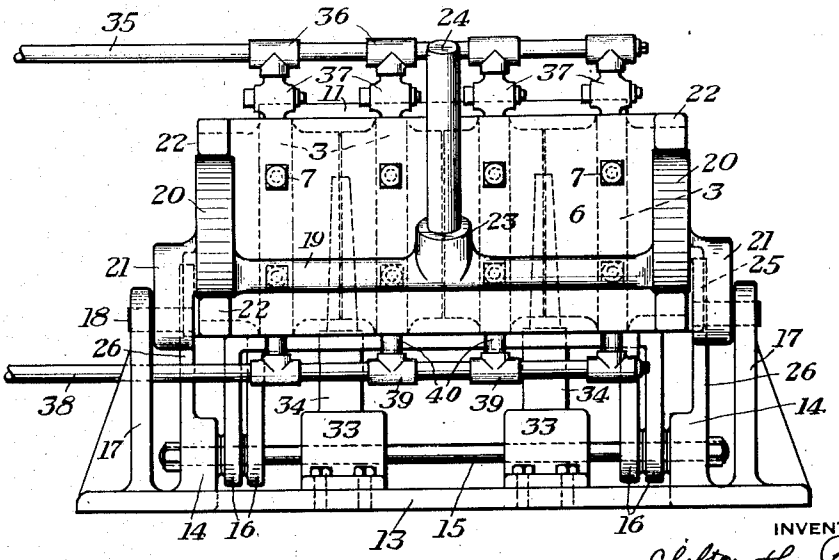


Fig. 3.



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MOLD AND METHOD OF MOLDING

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Fig. 4.

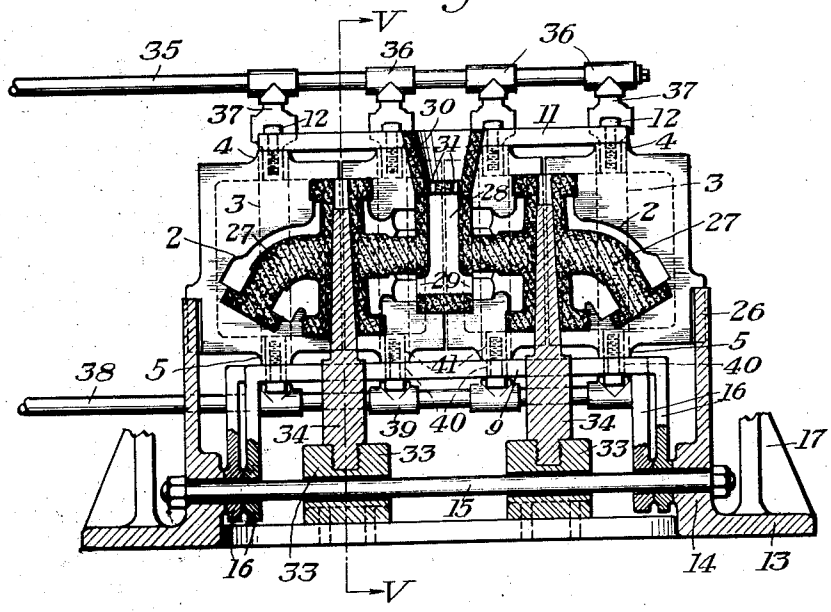
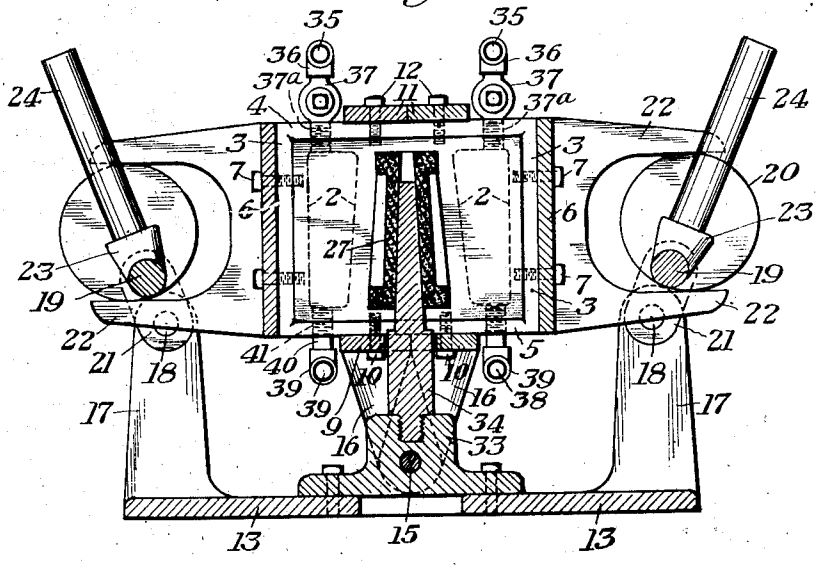


Fig. 5.



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Patented June 16, 1925. 1,542,643

UNITED STATES PATENT OFFICE.

CLIFTON D. PETTIS, OF NEW YORK, N. Y.

MOLD AND METHOD OF MOLDING.

Application filed April 10, 1925. Serial No. 22,180.

To all whom it may concern:

Be it known that I, CLIFTON D. PETTIS, a citizen of the United States, residing at New York city, county of New York, State of New York, have invented a new and useful Improvement in Molds and Methods of Molding, of which the following is a full, clear, and exact description.

The present invention relates broadly to metal founding, and more particularly to improvement in so-called repetition or permanent molds and methods of molding.

At the present time, the large majority of metal castings are made in molds of the sand type which are used for only one casting operation. After each casting, the molds have to be remade before another article can be cast therein. The expense incident to this method of procedure, as well as the room required in the foundry, and the delay involved, are responsible for the growing demand for molds having a greater period of usefulness, and therefore frequently referred to as permanent molds.

I have heretofore constructed and utilized molds of the so-called permanent type having matrix forming portions constructed of different materials, both refractory, such as carborundum, and metallic. In all cases I have found it desirable to provide for the free escape of gases from the matrix cavity to thereby insure the production of uniformly sound castings of exact dimensions. I have also discovered the desirability of providing a mold structure of such character that substantially constant overall dimensions in the matrix cavity are maintained. Repeated experiments have disclosed the possibility of obtaining both of these results by the use of a plurality of sections normally spaced to an extent to permit the passage of gases between the adjacent sections, but close enough to obviate any possibility of the passage of metal into or through the spaces. With such a construction, as the molds become heated by the pouring of molten metal into the matrix cavity, the sections each have a tendency to expand independently of the others. This results in a closing of the spaces to an extent directly proportional to the temperature of the sections and the co-efficient of expansion thereof. It does not, however, affect the original overall dimensions of the matrix.

In the production of castings of substantially constant cross-sectional area throughout the lengths, it is possible to provide unit matrix forming sections having arbitrary dimensions, and, in some cases, to a large extent interchangeable. In such constructions the planes of the spaces or the planes of the edges of the sections when arranged side by side in longitudinal relationship will obviously all be substantially normal to the plane or portion of the wall of the matrix cavity which they intersect, thereby insuring broad corners exposed to the hot metal which are not likely to become burned off. As the character of the castings being produced changes, however, so that they are of changing cross-sectional area at different points in their lengths, it will be apparent that the side walls of the matrix extend in various angular directions, thereby making it necessary to carefully determine the exact plane of division for the sections in order to always intersect the wall of the matrix cavity at different points so substantially right angles will be formed. In such cases the sections are not infrequently of different lengths, and even where of uniform length they have different areas directly exposed to the action of the hot metal. This results in unequal temperature conditions in different portions of a mold, thereby producing correspondingly different cooling actions on the metal, and also subjecting different portions of a single mold to non-uniform conditions of expansion and contraction.

The present invention has for one of its objects the construction of a sectional mold in which, irrespective of the size of the sections, or the areas exposed to the metal during the casting operation, uniform conditions of temperature can be maintained therein, whereby each portion of an entire mold may be easily kept at substantially the same temperature.

Where repetition or permanent molds are used, there is naturally a tendency for the temperature of the mold to rise with each casting operation. While certain maximum temperature conditions are not objection-

able, it is undesirable to permit the temperature of a mold to rise beyond certain limits. The control of the temperature, therefore, is important, and this in turn is directly proportional to the heat dissipation which varies as the thermal conductivity or rate of heat transfer through the matrix walls. The heat transfer rate is in turn dependent on the temperature differential on opposite sides of the body through which heat is being transmitted.

It is a further object of my invention to construct a mold in which not only can the temperature differential be easily and accurately controlled, but in which different temperature differentials may be arbitrarily created at different portions of the mold, thereby insuring uniformity throughout every casting, or control of the rapidity of cooling of any portion independently of the rest, to thereby accurately control the character of the casting.

I have also found that the character of the casting produced, and the operation of the mold may be improved by coating the molding surfaces between successive casting operations. Preferably this coating is accomplished by spraying onto the surfaces a volatile substance such as a suitable hydrocarbon base oil, the spraying preferably being accomplished by air under pressure. The application of this oil, where used, also serves to cool the mold to some extent, thereby advantageously cooperating with the temperature differential conditions which are arbitrarily maintained.

I am aware that it has heretofore been proposed to utilize hollow mold forming members adapted to have cooling fluids circulated therethrough, but I do not know that anyone prior to my invention has ever subjected a sectional mold to artificial cooling, or subjected different unit portions of an individual mold to different amounts of cooling directly proportional to the area exposed. Neither am I aware that it has heretofore been proposed to introduce a cooling fluid at a plurality of spaced points lengthwise of a mold and withdraw the fluid at a plurality of similar points, to thereby make the cooling independent of the amount of heat which may previously have been absorbed by the fluid while traversing another portion of the mold.

In the accompanying drawings I have shown for purposes of illustration only, a preferred embodiment of the present invention, it being understood that the drawings do not define the limits of my invention, as changes in the construction and operation disclosed therein may be made without departing either from the spirit of the invention or the scope of my broader claims.

In the drawings:

Figure 1 is a perspective view partly broken away, having certain of the operating parts omitted for the sake of clearness, and illustrating one embodiment of my invention;

Figure 2 is a top plan view of a mold constructed as illustrated in part in Figure 1;

Figure 3 is a side elevational view of a mold as shown in Figure 2;

Figure 4 is a longitudinal sectional view through the mold; and

Figure 5 is a transverse sectional view along the line V—V of Figure 4 looking in the direction of the arrows.

In the drawings I have illustrated a mold particularly adapted for the production of angle cocks, the mold shown being adapted for the simultaneous production of two such articles. It will be understood, however, that these drawings are for the purpose of illustration only, and that the invention is equally adapted to the production of a wide variety of other shapes.

In carrying out the present invention there may be provided a plurality of sections A, B, C and D, for each half of the mold, the sections in each half being the same with the exception that those in one half are right while those in the opposite half are left hand.

Each of the sections is of hollow construction to provide a chamber 2 therein for the reception of cooling fluid as will be hereinafter more fully apparent. The outer surfaces are formed with a projecting reinforcing and spacing rib 3 on the back thereof, with a similar rib 4 across the top and another rib 5 across the bottom.

The backs of all of the sections of each half are secured to a back plate 6 by any desired means, such as machine screws 7. The back plates are so dimensioned and drilled that the sections will occupy slightly spaced relationship, as clearly shown in the drawings, the spaces 8 between adjacent sections being narrow enough to prevent the flow of molten metal into and through these spaces. The screws 7 preferably pass directly into the rib 3.

The bottoms of all of the sections of each half are in turn secured to a bottom plate 9, and by machine screws 10, passing into the rib 5, and the tops are similarly connected by top plate 11 secured by machine screws 12 passing into the rib 4. In this manner the sections of each half are securely held in position to be operated as a unit.

Operation of the respective halves of the mold may conveniently be accomplished by providing a base 13 having pivot brackets 14 adjacent each end thereof for the pivot shaft 15. Each of the bottom plates 9 is formed with a downwardly projecting lug 16 adjacent each end thereof, each of the lugs having a bearing at its lower end for

the shaft 15. In this manner all of the sections are mounted to swing to open and closed position about a common axis.

Adjacent each corner of the base 13 is an upright 17, these uprights being adapted to receive pivot pins 18 in their upper ends for the operating members. Each of these operating members is preferably in the form of a bail, as illustrated in my copending application Serial No. 19811 filed April 1, 1925, and comprises a horizontal portion 19 extending between cams or eccentrics 20. To the outer face of each cam is secured an arm 21 projecting downwardly below the periphery of the cam, and spaced to extend between the uprights 17. These arms receive the pivot pins 18, and form a pivotal mounting for the members with the axes thereof outside of the peripheries of the cams.

The back plates 6 have projecting outwardly therefrom bifurcated or forked portions forming spaced arms 22, the distance between the arms of each pair being substantially equal to the diameter of the cams 20, whereby the cams may work between their smooth surfaces. For moving the cams, the portions 19 may be formed with intermediate sockets 23 for the reception of handles 24. With this construction it will be apparent that as the handles are moved in one direction, the cams will work against the upper surfaces of the lower arms 22 and thereby move the mold halves to open position about the pivot shaft 15. As the handles are moved in the opposite direction, the cams will work against the under surfaces of the upper arms 22 and thereby move the halves to closed position. As the halves approach closed position the cams will approach their dead center position whereby the halves are automatically locked in abutting relationship. Preferably, however, the construction will be such that the dead center position is never quite reached, thereby always insuring additional operating surface to compensate for wear of the parts and provide positive action for complete closing movement.

The individual closing movement of each half may conveniently be controlled by providing projections 25 on each of the end sections A and D, which projections are adapted to cooperate with opposite sides of a stop 26 extending upwardly from the brackets 14.

The inner faces of the sections A, B, C and D are shaped to provide a matrix cavity for the simultaneous production of a pair of angle cocks, these inner faces also being formed with print receiving depressions. As these castings are hollow, the interior is formed by a core 27 preferably divided longitudinally, with the division plane between the halves of the core coinciding with the parting line between the relatively movable mold members. At its center the core has a pouring gate 28 with outlets 29 for the metal to enter the matrix cavity to form the individual castings.

The top plates 11 and portions of the meeting faces of the sections B and C are cut away to receive a pouring core 30 preferably made in one piece with strainer openings 31 for the purpose of preventing dirt from entering the mold and making defective castings. The pouring core is preferably separate from the gate 28. In operation, when the mold is open, one-half of the core 27 is placed in each half of the mold, and the mold is then closed. Thereafter the pouring core is placed in position and the melted metal is poured therethrough into the mold. As soon as the metal has sufficiently solidified, the mold is opened by means of the handles 24, to permit removal of the castings. In some cases, where a wide open movement is not essential, it is possible to lock one of the mold halves in position, and effect the opening movement entirely by manipulation of the other half.

The base 13 has formed thereon lugs 33 having posts 34 threaded into their upper ends. These posts extend upwardly into the matrix cavity and support the finished castings when the mold is opened. Certain of these features of the invention are disclosed and claimed in my copending application Serial No. 747,481, filed November 3, 1924.

Extending lengthwise above each half of the mold is a fluid conduit 35 having at intermediate points in its length a plurality of T's 36. Each of these T's is adapted to receive a valved nipple 37 which may be threaded into the aligned opening 37ª in the corresponding rib 4. By reason of the separate valve in each nipple, it will be apparent that the amount of cooling fluid flowing from the conduit 35 into each of the sections may be independently and individually controlled without reference to the amount of fluid supplied to the other sections. In this manner the rapidity of cooling may be made directly proportional to the area exposed to molten metal, thereby permitting different portions of the matrix to be cooled different amounts.

Extending lengthwise below the mold halves are similar conduits 38 having T's 39 at intermediate points adapted to receive nipples 40 threaded at their opposite ends into suitable openings 41 in the bottom rib 5, for conducting the cooling fluid away from the mold sections.

In addition to the cooling thus obtained, I have found that it is highly desirable to augment this cooling action by periodically spraying onto or applying to the molding surfaces a volatile substance such as oil.

Conveniently, this oil may be sprayed onto the desired surfaces by air under pressure after each molding operation, thereby not only further cooling the surfaces but also providing a protective film thereon.

Certain advantages of the present invention arise from the provision of a sectionalized openable mold having individual cooling means for each of the sections.

Further advantages of the invention arise from the artificial cooling by fluid proportionately to the heat absorbed in combination with the further cooling and protecting by coating.

I claim:

1. The method of making castings, comprising providing a mold, artificially cooling said mold by the application of cooling fluid to the back of the molding surface, and augmenting this artificial cooling by the addition of a volatile substance to the molding surface, substantially as described.

2. A casting mold having a matrix, comprising a plurality of sections spaced to permit individual expansion thereof, the spaces between said sections being of such width as to prevent the passage of molten metal therethrough while allowing for the escape of gas and means supplying a cooling fluid separately to each of said sections, substantially as described.

3. A casting mold comprising openable mold members, each comprising a plurality of sections, and a fluid supply connection to each of said sections, substantially as described.

4. A casting mold comprising openable mold members, each comprising a plurality of sections, and fluid supply connection to each of said sections, each of said fluid supply connections embodying means for individually controlling the amount of cooling fluid to the respective sections, substantially as described.

5. A casting mold, comprising openable members, each having a plurality of matrix-forming sections detachably secured thereto, and a separate fluid supply connection for each of said sections, substantially as described.

6. A casting mold, comprising a plurality of sections, each having ribs projecting from the back thereof, back plates each cooperating with a plurality of said sections and detachably secured thereto, and fluid supply connections for each of said sections, substantially as described.

7. A casting mold, comprising a plurality of longitudinally spaced molding sections adapted to form a substantially closed matrix cavity, and separate means for regulably supplying cooling fluid to each of said sections, substantially as described.

8. A casting mold, comprising openable halves each having a molding surface formed by a plurality of spaced sections, pivotal mountings for said openable halves, and a fluid supply conduit for each of said halves, each of said conduits having independent connections to each of the sections of each half, substantially as described.

In testimony whereof I have hereunto set my hand.

CLIFTON D. PETTIS.