Oct. 18, 1927. 1,645,732

C. VAUGHAN

MOLD

Original Filed July 8, 1925 5 Sheets-Sheet 1

Fig. 1.

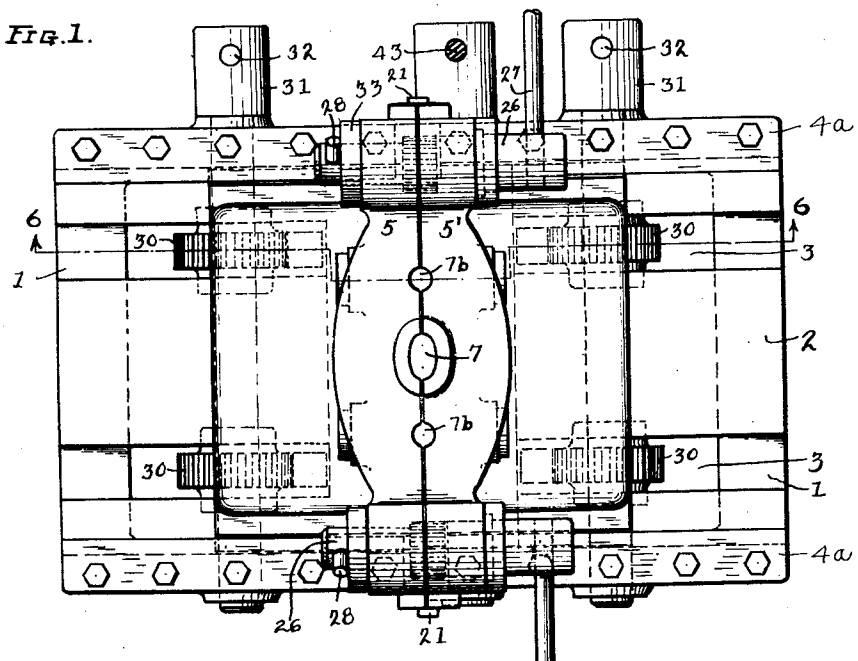
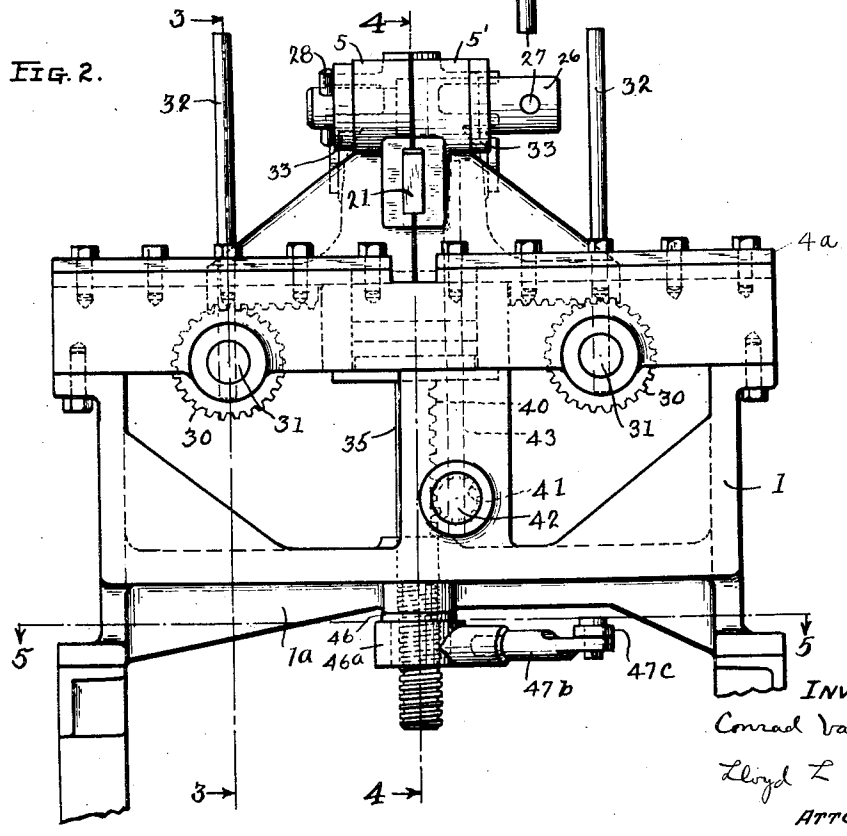


Fig. 2.



INVENTOR
Conrad Vaughan
Lloyd L Evans
ATTORNEY.

Oct. 18, 1927. 1,645,732

C. VAUGHAN

MOLD

Original Filed July 8, 1925 5 Sheets-Sheet 2

FIG. 3.

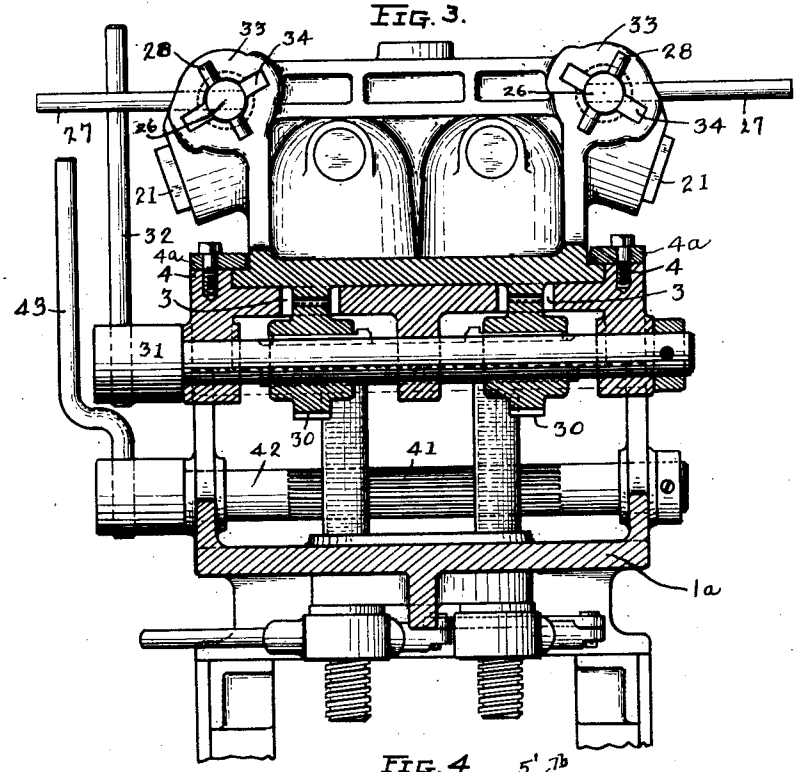
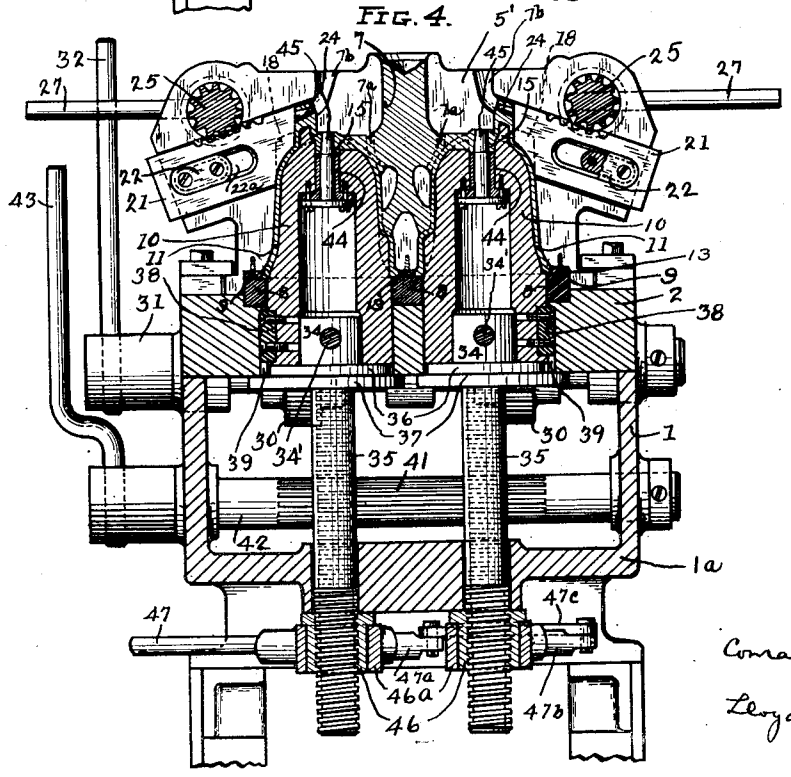


FIG. 4.



INVENTOR
Conrad Vaughan
Lloyd L Evans
ATTORNEY

Oct. 18, 1927.

1,645,732

C. VAUGHAN

MOLD

Original Filed July 8, 1925 5 Sheets-Sheet 3

FIG. 5.

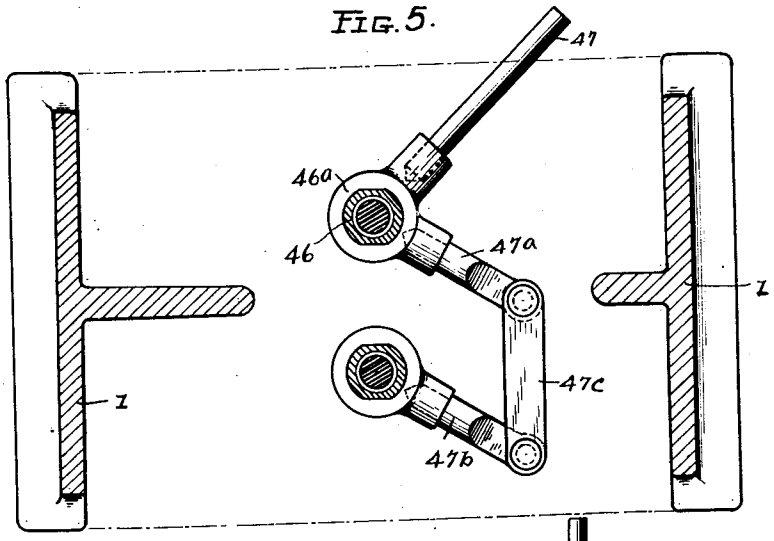
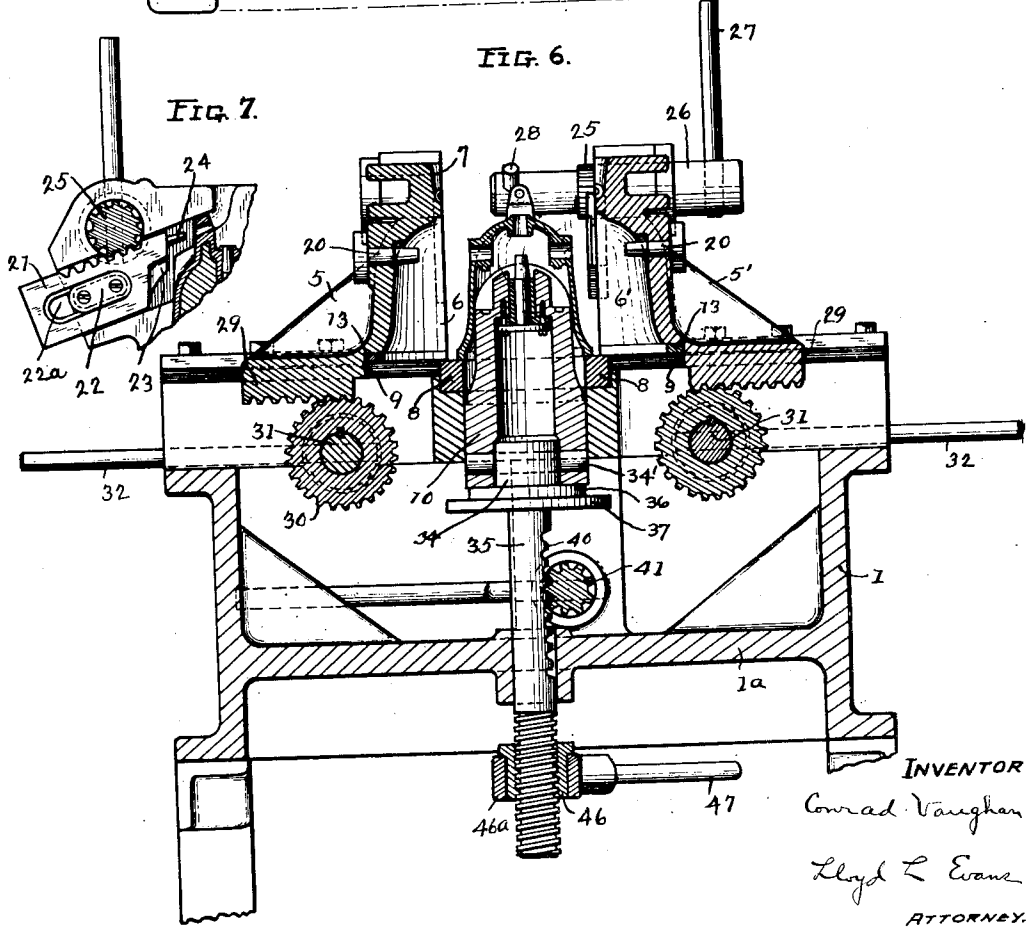


FIG. 6.

FIG. 7.



INVENTOR

Conrad Vaughan

Lloyd L Evans

ATTORNEY.

Oct. 18, 1927. 1,645,732

C. VAUGHAN

MOLD

Original Filed July 8, 1925 5 Sheets-Sheet 4

FIG. 8.

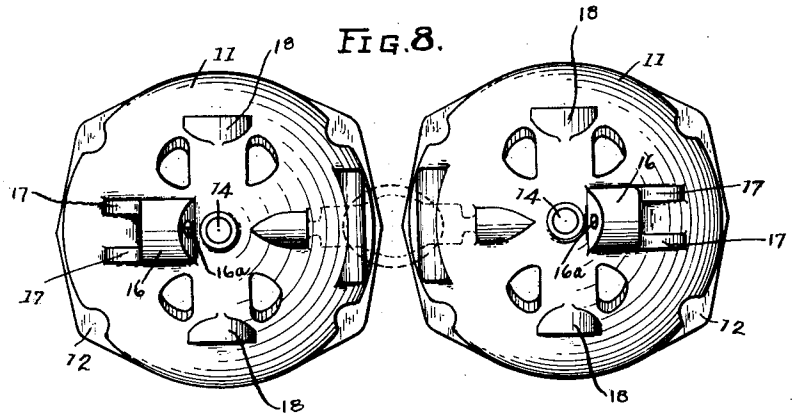
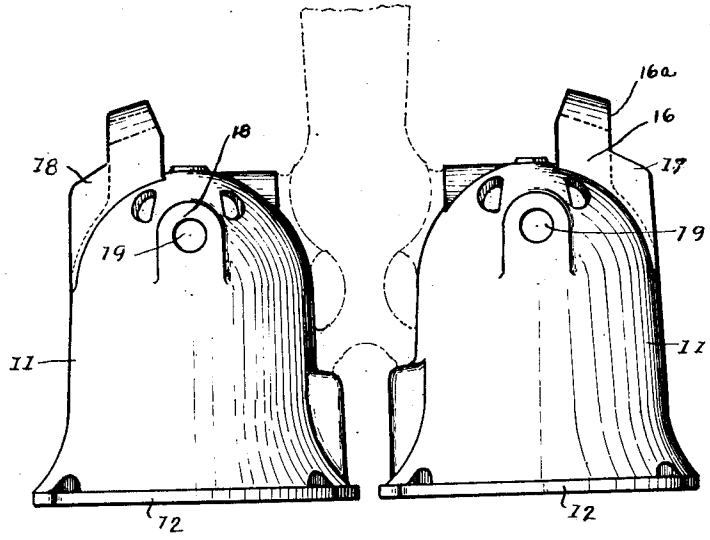


FIG. 9.



Inventor
Conrad Vaughan

Lloyd L Evans

By

Attorney

Oct. 18, 1927. 1,645,732

C. VAUGHAN

MOLD

Original Filed July 8, 1925 5 Sheets-Sheet 5

FIG. 10.

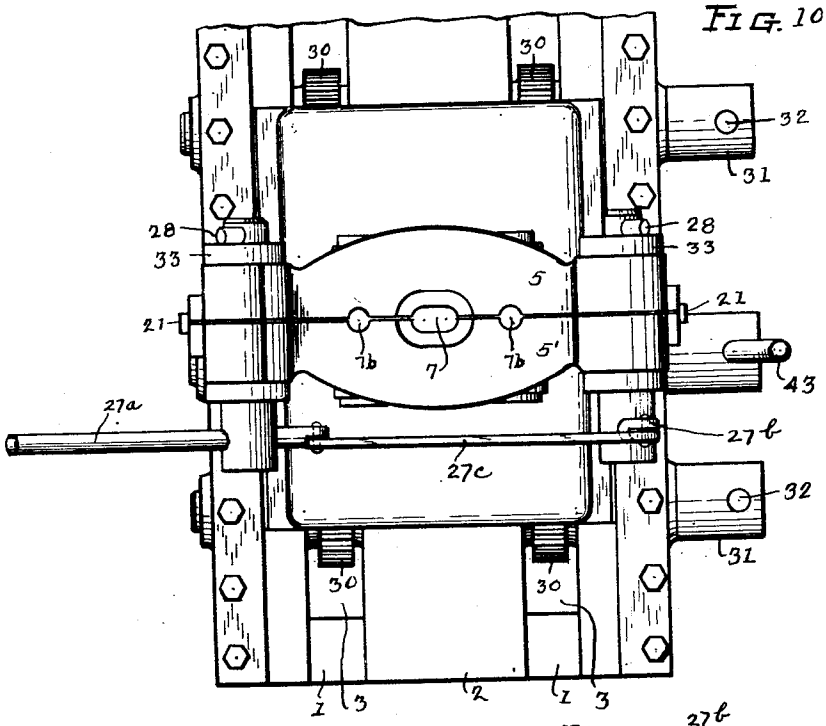
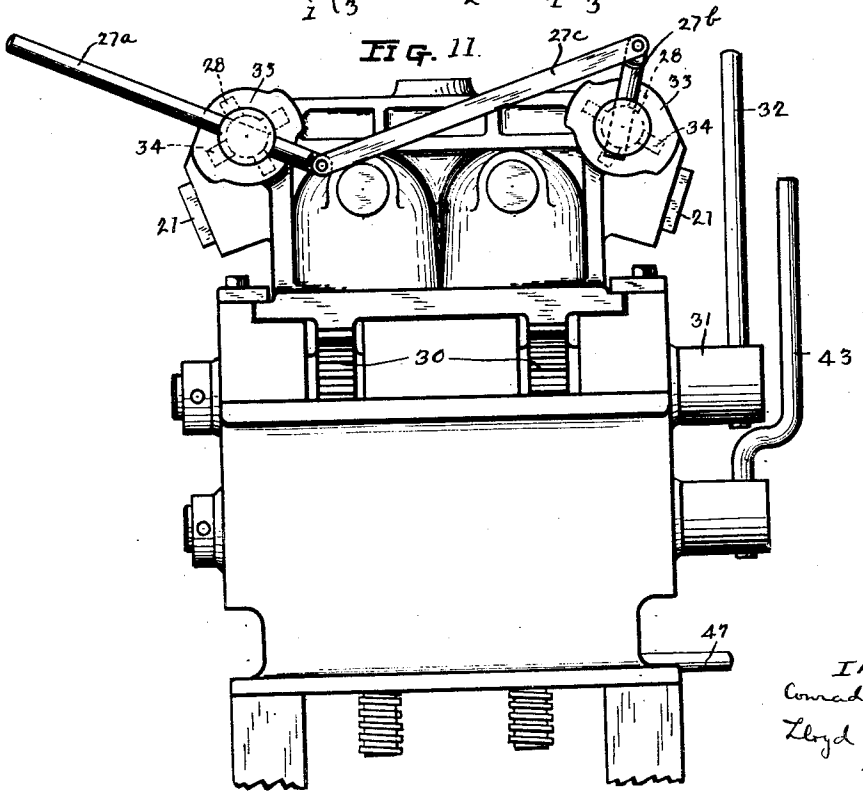


FIG. 11.



INVENTOR
Conrad Vaughan
Lloyd L. Evans
ATTORNEY

Patented Oct. 18, 1927. 1,645,732

UNITED STATES PATENT OFFICE.

CONRAD VAUGHAN, OF CLEVELAND, OHIO, ASSIGNOR TO THE PERMOLD COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

MOLD.

Application filed July 8, 1925, Serial No. 42,144. Renewed July 22, 1927.

This invention relates to mold apparatus and particularly to permanent metal molds for casting alloys such as those having a relatively high crystallization shrinkage and a relatively low freezing point.

An object of this invention is to provide a permanent mold for casting articles of a shape requiring the use of a core and in which the core is movable downwardly out of the casting cavity.

Another object of the invention is to provide a mold particularly for casting cup-shaped articles in which the mold proper comprises complementary parts movable along a common support and in which a permanent core is movable upwardly into the casting cavity and downwardly out of the same whereby it is aided by gravity in freeing itself from the casting.

A further object of the invention is to provide such a mold in which a plurality of cup-shaped castings can be cast at the same time, the cores simultaneously removable and the mold sections simultaneously separable.

Another object of the invention is to provide a permanent mold for casting a plurality of like metal objects requiring core sections for the casting of the same, said mold being provided with easily accessible core-operating means, said means serving to operate simultaneously corresponding core sections in each of the like metal objects to be cast.

Another object of the invention is to provide a permanent mold in which a plurality of castings may be cast simultaneously, the metal for each of the castings being supplied from a common sprue.

A further object of my invention is to provide a permanent mold for casting a plurality of like metal objects in which a suitable means is provided to operate certain core forming mechanisms or slides, said means serving also to simultaneously operate mold-locking means.

Another object of this invention is to provide a permanent mold for casting a plurality of like metal objects wherein means is provided for simultaneously operating a plurality of core-forming mechanisms and mold-locking devices.

Other objects of this invention will be apparent to those skilled in the art from the description of it hereinafter given.

In the drawings, Figure 1 is a top plan view of a casting apparatus.

Fig. 2 is an elevation, partly broken away, of the apparatus.

Fig. 3 is a vertical section on line 3—3 of Fig. 2.

Fig. 4 is a vertical section on line 4—4 of Fig. 2.

Fig. 5 is a horizontal section on line 5—5, Fig. 2.

Fig. 6 is a vertical section on line 6—6 of Fig. 1.

Fig. 7 is an enlarged view of a sliding core-forming mechanism.

Fig. 8 is a top plan view of two like cup-shaped castings formed in the casting apparatus, showing in dotted lines the common sprue.

Fig. 9 is a vertical elevation of the castings shown in Fig. 8.

Fig. 10 is a top plan view of a casting apparatus having a slightly modified form of operating means.

Fig. 11 is an elevation of the apparatus shown in Fig. 10.

In the drawings the rigid frame 1 carries a horizontal top or bed 2 provided with longitudinal apertures 3, side ribs 4, and strips 4^a extending longitudinally thereof and forming between them a slideway for a pair of separable mold sections 5, 5′ which are to be held in engagement with each other to form the mold cavity and to be separated after the casting is formed. The mold sections 5, 5′ are formed with recesses 6, 6′ on their inner or meeting faces which extend from the bottom sections upwardly toward the top thereof and which when the sections 5, 5′ are secured together form the cavity in which the casting is formed. Extending up from the recesses 6, 6′ is the common sprue cavity 7 through which is poured the molten metal to feed each of the castings to be formed in the respective mold cavities. Preferably the sprue cavity is separated from the mold cavity by a constricted or gate portion 7^a, the molten metal thus passing from the sprue cavity through the gate portion into the mold cavity. The castings may frequently be formed without risers, but when desired, riser cavities 7^b may be provided.

To center the mold sections on the supporting bed, the bed 2 is provided with bushings 8 projecting a short distance above

the bed 2 and positioned so that they are concentric with the mold cavities when the two sections 5, 5′ are secured together; the sections 5, 5′ being rabbeted at 9 along the lower edges of the recesses 6 to provide shoulders engaging the sides and tops of the bushings.

Slidably fitting in apertures in the bed 2 and in the bushings 8 are cores 10 adapted to be moved from a position below the top bushing up to a position within the mold cavity, the casting cavity being formed between the mold sections 5, 5′ and the core 10. As is shown clearly in Fig. 6, the areas of contact between the lower portions of cores 10 and the adjacent portions of the bed 2 and bushings 8 are relatively large, whereby lateral movement of the cores 10 is prevented during the longitudinal movement thereof. In this manner the cores may readily be withdrawn from the casting cavities without damaging the relatively soft and fragile newly formed castings, such as of an alloy having a relatively high crystallization shrinkage and a relatively low freezing point, for example, a light alloy of aluminum.

The castings 11 formed by the mold illustrated herein each consist of a cup-shaped body having a lower annular edge which forms part of the flange 12. In the present invention the flanges 12 of the castings are formed between cores 10, bushings 8, members 13 attached to the lower sections 5, 5′, and portions of the mold sections 5, 5′. The fit between the members 13 and the mold sections 5, 5′ is such that molten metal may not pass therebetween, thus serving as a vent and so permitting of the formation of sharper edges on the flange 12. The lower side of the flanges 12 of the castings 11 rest on the bushing 8 so that when the core 10 is moved downwardly as hereinafter described the casting will be held against such downward movement, the bushing thus acting as a stripper.

The castings 11 have rounded tops with axial apertures 14. Adjacent to the tops of the castings 11 are projections 16 having apertures 16^a and wing portions 17 with a channel shaped portion therebetween, and projections or bosses 18 having apertures 19. The apertures 19 in the bosses 18 are formed by inwardly projecting core sections 20 which extend into engagement with the core 10.

Core-forming mechanisms or slides 21 which form the channels between the wing portions 17, and apertures 16^a in the projections 16 are disposed in a slideway formed by inclined grooves in the meeting faces of the mold sections 5, 5′ and are attached to the mold section 5′ by means of an undercut block 22 bolted to the mold section 5′ and engaging in a slot 22^a extending lengthwise of slides 21. The inner portion 23 of each slide 21 is cut to conform to the outer surface of a casting 11 and carries projecting tapered pin 24 which extends into the recess of the mold to form the aperture 16^a in the projection 16. The slide 21 is provided with a rack adapted to engage with a pinion 25 for the purpose of moving slide 21 in its groove. The pinion 25 is mounted on bar 26 which has a handle 27 for operating the same and which has also a pin 28 adapted to hold the mold sections 5 and 5′ in immovable relation, as will be explained hereinafter.

The sections 5 and 5′ may be moved with respect to each other by means of racks 29 on the lower side of the mold sections 5 and 5′ and the pinions 30 mounted on shafts 31. Levers 32 are attached to shafts 31. By means of the levers 32 the mold sections 5 and 5′ can be placed, as desired, in open and in closed relation to each other.

As previously mentioned, when the mold portions 5 and 5′ are placed in closed relation to each other said mold sections may be maintained immovable by the suitable engagement of pins 28 with bosses 33 of mold section 5. The locking of the mold sections may be made simultaneous with the positioning of slides 21 within the respective mold cavities by causing shafts 26 to travel through apertures 34 of the bosses 33 and then when the mold sections are being brought into closed relation with each other, turning the levers 27 so that the slides 21 will be caused to enter the mold cavities, by which same motion the pins 28 will be caused to contact with the bosses 33 in such manner that the mold sections are held in immovable relation to each other. In the modification of my invention shown in Fig. 10, the levers 27^a and 27^b attached to shafts 26 are shown as connected by link 27^c. Thus, by turning lever 27^a, lever 27^b may also be moved, thus simultaneously rotating the shafts 26, and hence simultaneously inserting both slides into the casting cavities and operating both mold locking means. The reduction in the number of operations required to operate the mold, such as by causing the slide operating mechanism to simultaneously lock the mold, and by simultaneously operating both slide-operating mechanisms, causes appreciable saving of time and cost of operation.

Each of the cores 10 is hollow and is secured at its lower end to a head 34 of a rigid rod 35, there being a collar 36 at the lower part of the head on which the lower annular end of the core is supported. The core is secured to the head by means of the locking pin 34′. Collar 37 is secured to the rod 35 immediately below collar 36, said collar 37 acting as a stop for limiting upward movement of the core in that it extends out-

wardly from the rod 35 to engage the lower portion of the bed 2.

The upper end of the core 10 has a plug 44 removably secured in a central aperture 5 in the top thereof and secured in the plug 44 is a tapered pin 45 which serves to form the axial aperture 14 in the casting.

Blocks 38 attached to the cores 10 and extending outwardly therefrom into grooves 10 39 in the bed portion 2 and sliding in said grooves during movement of the cores serve to prevent the cores from lateral or rotative movement and displacement.

Racks 40 are formed on one side of each 15 of the rods 35 and these racks mesh with an elongated pinion 41 which is journaled in opposite sides of the frame 1 and extends transversely across the frame, the shaft 42 projecting from one side of the frame and 20 having a handle 43 by means of which it may be rotated to shift the cores into or out of the mold.

It is occasionally necessary, in order to loosen the cores from the castings, to apply 25 more force than can be conveniently applied through the rack and pinion 40 and 41. Thus each of the rods 35 has its lower end below the base members 1^a of the frame threaded and on the threaded ends are nuts 30 46. For rotative movement of the nuts 46 with respect to the rods 35, the nuts 46 are disposed in the collars 46^a provided with sockets, as shown in Fig. 5, the said nuts and collars being so shaped that rotation of 35 a collar 46^a will cause the contained nut 46 to rotate. The collar 46^a adjacent to the operator has a pair of sockets and in one of them is disposed an operating handle 47. The other socket in this collar receives an 40 arm 47^a which actuates the arm 47^b through the connecting link 47^c so that both of the rods 45 are simultaneously moved to loosen both of the cores from the casting when the operating handle 47 is turned. As soon as 45 the cores are loosened they can be quickly lowered out of contact with the casting by turning the shaft 43.

It will be seen that by my invention I have provided means for operating a per- 50 manent mold, said means being conveniently located adjacent to the operator so that the various movements may be made quickly and with a great saving of time and effort and with a corresponding increase in production. 55 It will further be noted that in my improved casting apparatus I have provided a mechanism for simultaneously placing cores within the mold cavity and locking the mold sections in immovable position and also for simultaneously operating the sliding core 60 mechanisms, thereby saving time and money in operation and increasing the rate of production.

To those skilled in the art many modifications of and widely differing embodiments 65 of my invention will suggest themselves, without departing from the spirit and scope thereof. My disclosures and the descriptions herein are purely illustrative and are not intended to be in any sense limiting. 70

What I claim is:

1. Mold apparatus comprising a fixed support, a pair of separable permanent mold sections mounted upon this support, said sections being formed to provide sprue and 75 casting recesses, said mold sections being provided with a sliding core section, mechanism to move said sliding core section into place and simultaneously to lock said mold sections in immovable relation to each other. 80

2. Molding apparatus comprising a supporting bed having a guideway thereon and a raised mold centering portion intermediate the ends thereof, a pair of permanent mold 85 sections slidably mounted in the guideway on opposed sides of the raised portion, longitudinal apertures in the guideway, racks mounted in the lower side of said mold sections and adapted to extend into said lon- 90 gitudinal apertures, pinions mounted on rods beneath said longitudinal apertures, and adapted to engage with said racks and means associated with said rods to laterally move said mold sections.

3. A molding apparatus comprising a 95 fixed support, a pair of separable permanent mold sections mounted upon the support, said sections having formed therein sprue and casting cavities, said mold sections being provided with movable core sections and 100 with means to lock the mold sections together in molding position, each said core section and a locking means being arranged to be simultaneously operated by a common mechanism. 105

4. The invention specified in claim 3, in which mechanism is provided to simultaneously move a plurality of core sections and lock the mold sections together in immovable relation. 110

In testimony whereof I affix my signature.

CONRAD VAUGHAN.