June 23, 1942. S. W. JACKSON 2,287,524

MOLDING APPARATUS

Filed Feb. 26, 1941 3 Sheets-Sheet 1

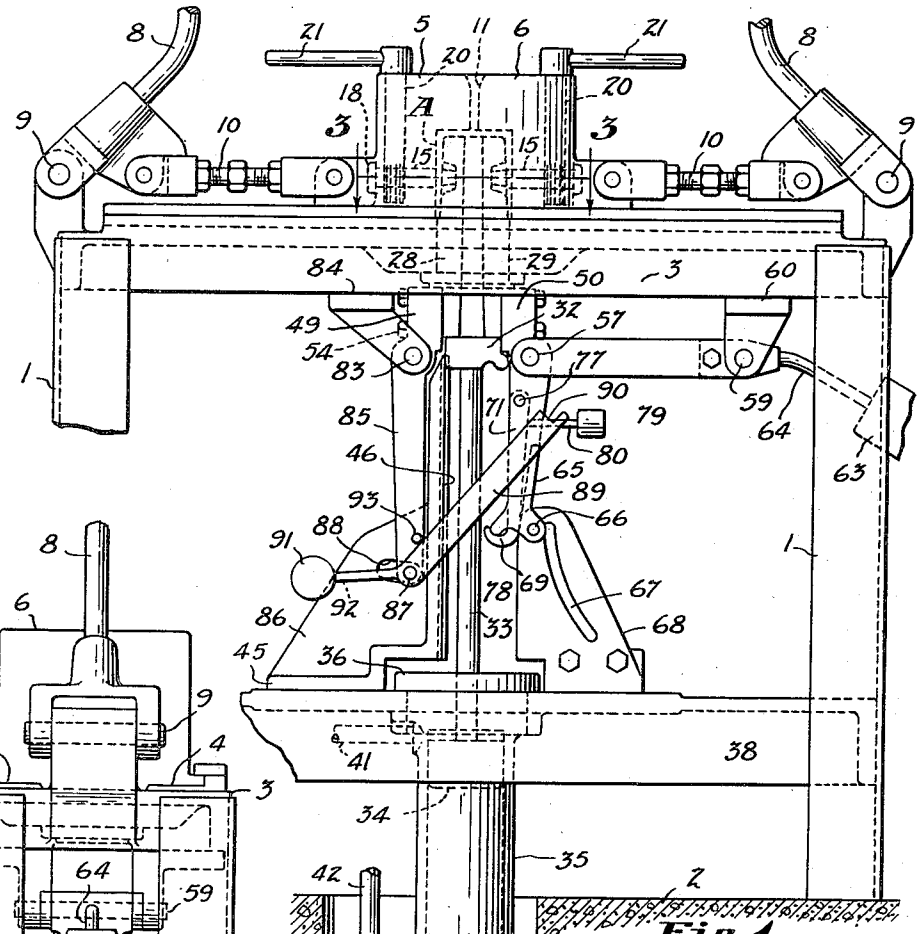


Fig. 1

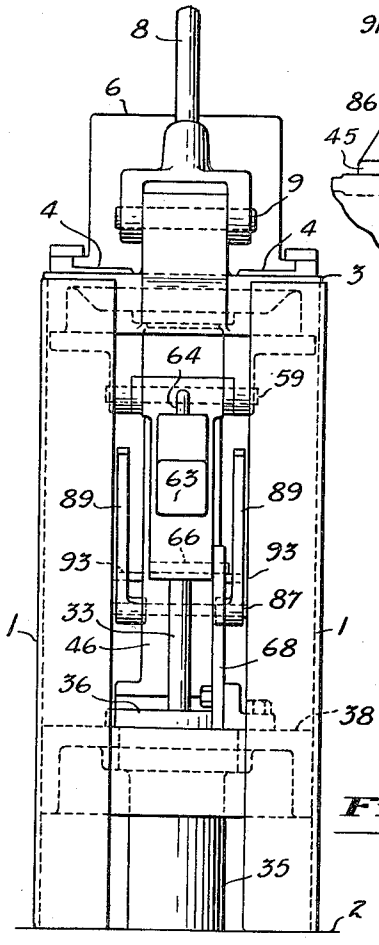


Fig. 2

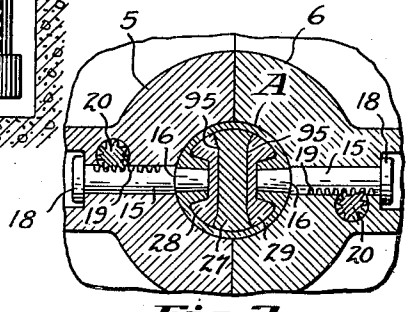


Fig. 3

INVENTOR
Sidney W. Jackson
BY
Evans & McCoy
ATTORNEYS

June 23, 1942. S. W. JACKSON 2,287,524

MOLDING APPARATUS

Filed Feb. 26, 1941 3 Sheets-Sheet 2

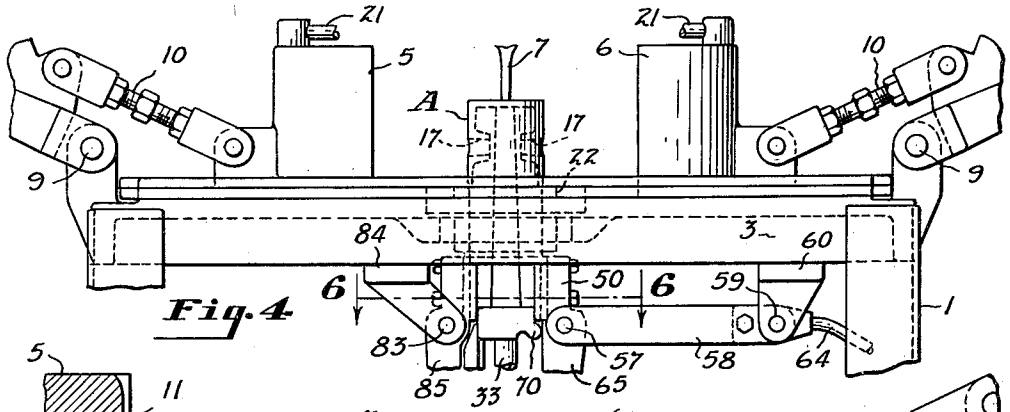


Fig. 4

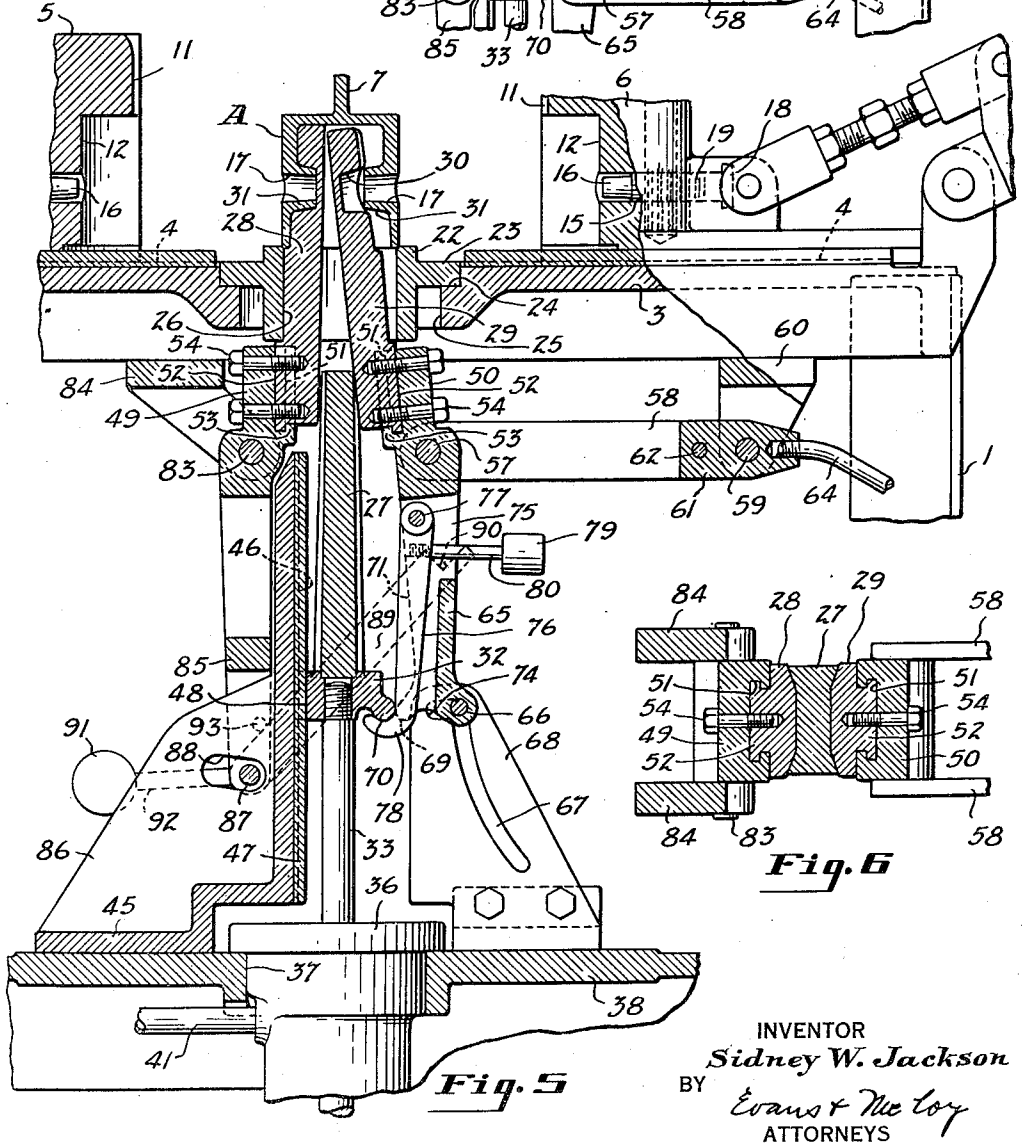


Fig. 5



Fig. 6

INVENTOR
Sidney W. Jackson
BY Evans & McCoy
ATTORNEYS

June 23, 1942. S. W. JACKSON 2,287,524

MOLDING APPARATUS

Filed Feb. 26, 1941 3 Sheets-Sheet 3

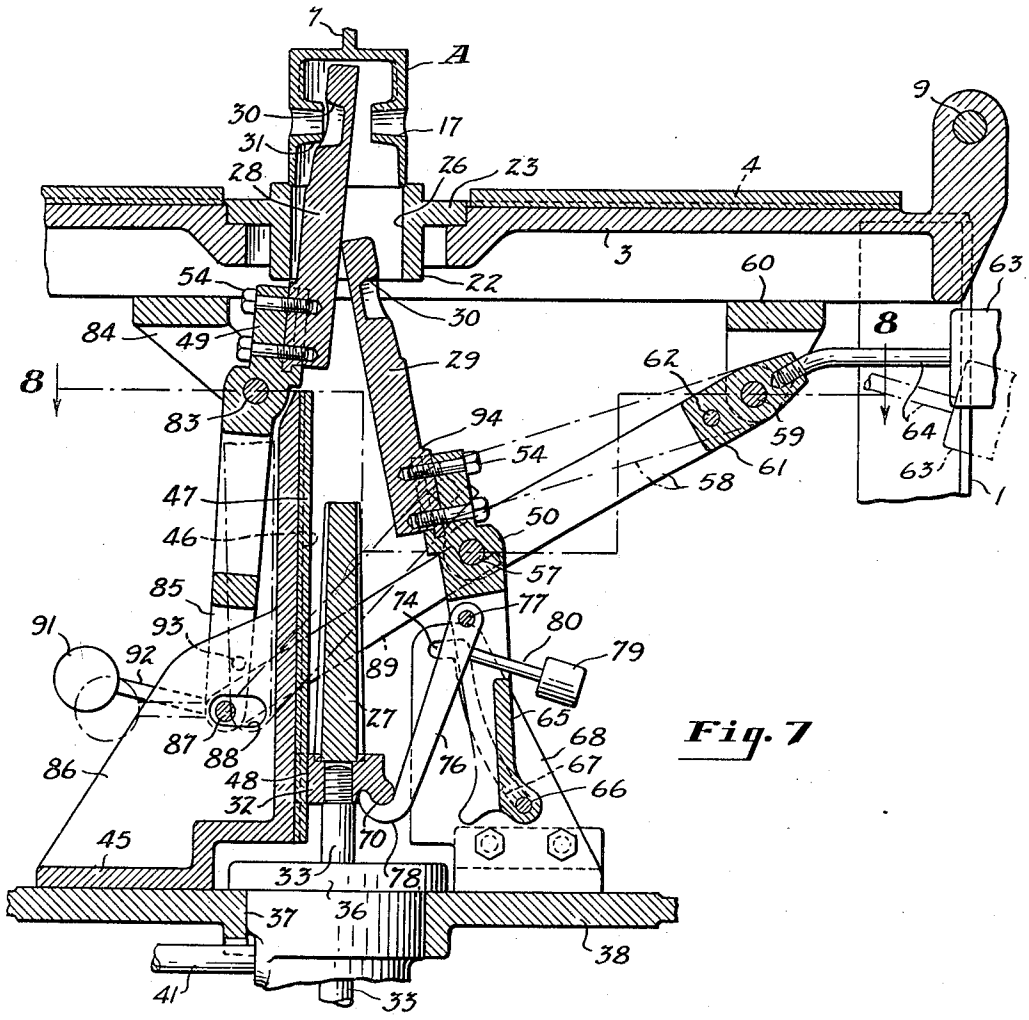



Fig. 7

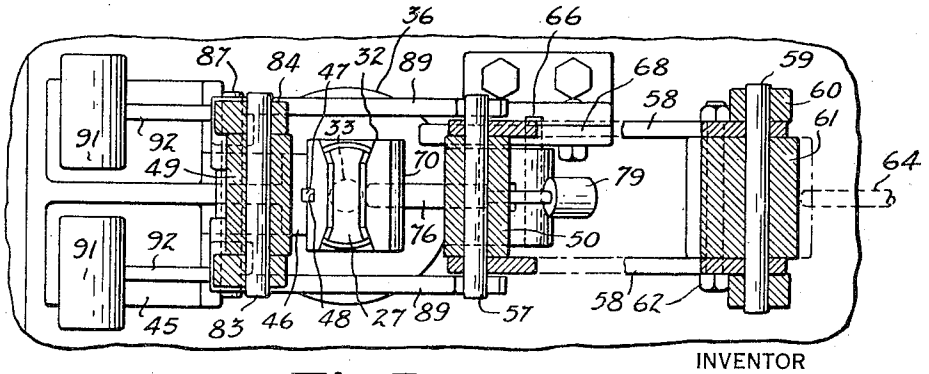



Fig. 8

INVENTOR
Sidney W. Jackson
BY
Evans & McCoy
ATTORNEYS

Patented June 23, 1942 2,287,524

# UNITED STATES PATENT OFFICE

2,287,524

## MOLDING APPARATUS

Sidney W. Jackson, Parma, Ohio, assignor to The Permold Company, Cleveland, Ohio, a corporation of Ohio

Application February 26, 1941, Serial No. 380,695

17 Claims. (Cl. 22—93)

This invention relates to molding apparatus, and more particularly to apparatus of this character for casting cup shaped articles such as pistons for internal combustion engines and the like.

Pistons are preferably made from light metals, such as aluminum alloys, and it is desirable for various reasons to cast the pistons in permanent molds. Such molds, when utilized for making a great number of pistons, are capable of producing the pistons with great uniformity and at a low unit cost. Additionally, the physical properties of the pistons are improved so that the pistons are stronger and wear better than pistons made in sand molds.

The internal structure of aluminum alloy pistons and the like and pistons formed primarily of aluminum alloy with ferrous metal inserts therein, may have widely variant internal structures. Accordingly, the cores for casting such pistons may have numerous shapes or configurations. Most light metal or aluminum alloy pistons do have lateral extensions or bosses on the inside of the skirt to receive the connecting rod pins. Frequently, the pistons have other lateral formations on the inside of the skirt, such as ribs and bosses, provided to strengthen or balance the structure. These lateral extensions interiorally of the piston, being formed by the core, require that the latter be contracted or collapsed and withdrawn in sections. Usually the composite or sectional core of a piston mold includes a central section and lateral or outer sections. The practice is to first withdraw the central sections from a casting, after which the outer or lateral sections are moved serially or simultaneously into the space vacated by the central section so as to clear the projections on the inside of the piston skirt and are then withdrawn axially from the piston casting. This withdrawal of the several core sections and the subsequent reassembling thereof to prepare the apparatus for the next casting operation requires considerable time and dexterity on the part of the operator if performed by hand. The faster the core sections can be withdrawn from a piston casting and then reassembled in preparation for the next casting operation, the more rapidly the cyclic casting operation can be performed. Consequently the production of the mold is increased by a core that can be quickly withdrawn from a casting and reassembled.

It is therefore the principal object of the invention to provide an improved molding apparatus having a sectional or multi-part core in combination with a mechanism for automatically withdrawing the core sections rapidly from a piston casting and for rapidly reassembling the sections in readiness for a succeeding casting operation.

Another object is to provide a sectional core for a permanent mold and actuating mechanism therefor which withdraws the several sections of the core from a casting over predetermined paths so as to avoid engagement between the core sections and casting during the withdrawal of the core.

Another object is to provide actuating mechanism for a multi-part core which is so interconnected that by the movement of a single power-driven actuating means all of the core sections can be moved into and out of casting position. More specifically, the invention aims to provide a sectional core for a piston mold in which a plurality of the core sections are mounted for tilting movement so as to clear the same from the lateral projections on the inside of the piston, and are so interconnected by the operating mechanism for the core that they can be successively moved into the center of the piston by a single power means.

Numerous structural improvements are incorporated in the apparatus, including: means for pivotally mounting the outer sections of the core so that the core movement is guided by pivots and confined to predetermined paths; an arrangement of counterweights for balancing the core sections and for normally holding the core sections in assembled positions; the combination of pivotally mounted support members and a cam plate for guiding the movement of one of the core sections; and a lost motion connection including hook means for actuating one of the core sections after a predetermined movement of another core section. Other objects and advantages will become apparent from the following detailed description of a suitable embodiment of the invention made in connection with the accompanying drawings, in which:

Figure 1 is a front elevational view of the molding apparatus, partly in section and with parts broken away, showing the mold sections and core assembled together in readiness for casting;

Fig. 2 is an end elevational view, with parts removed, of the apparatus shown in Fig. 1;

Fig. 3 is a sectional detail taken substantially on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary elevational view of the apparatus shown in Fig. 1 with the mold sections drawn apart to expose the casting;

Fig. 5 is a vertical sectional view on an enlarged scale through the center of the apparatus illustrated in the preceding figures and showing the central core section removed from the casting and one of the outer core sections tilted into the space previously occupied by the central section;

Fig. 6 is a sectional detail taken substantially on the line 6—6 of Fig. 4;

Fig. 7 is a vertical sectional view on an enlarged scale and similar to Fig. 5, illustrating a subsequent stage in the removal of the sectional core in which one of the outer sections has been withdrawn from the casting and the other outer core section has been tilted into the space previously occupied by the central core section; and

Fig. 8 is a sectional detail taken substantially on the line 8—8 of Fig. 7.

In the description of the invention like parts have been indicated by the same reference numerals in the several figures. The apparatus comprises a supporting structure including uprights 1 which may rest on a suitable foundation 2 and are preferably formed of iron or steel. A table or bed 3, which may be an iron or steel casting, is mounted in a generally horizontal position on the upper ends of the uprights 1.

Slidably supported on ways 4 of the table or bed 3 are mold sections 5 and 6 which are movable toward and away from one another and have their meeting faces suitably formed or recessed as shown at 12 to define the exterior of the piston or other article to be cast, indicated at A, and also suitable passages for introducing molten metal into the casting cavity. For example, a centrally disposed vertical passage 11 may be provided which forms sprue 7 on the piston A when the molten metal freezes in the mold.

Levers 8 pivoted at 9 to the bed 3 are connected by adjustable linkages 10 to the mold sections 5 and 6 so that the latter can be moved toward and away from one another and positioned on the ways 4 in definite relation with respect to one another and the sectional core to be later described.

Core pins 15 are slidably mounted in the mold sections 5 and 6 and have tapered ends 16 which project into the casting cavity when the mold is assembled in pouring position to form aligned apertures 17 in the piston A. These passages are later machined to receive a connecting rod pin. The pins 15 have heads 18 which limit the movement of the pins into the casting cavity and each of the pins is formed with rack teeth 19 engaged by the toothed end of a vertically disposed rod 20 rotatably mounted in the corresponding mold section. Handles 21 secured on the upper ends of the rods 20 enable the latter to be rotated for movement of the pins 15 into and out of the casting cavity.

A ring-like base member 22 is formed with a circumferentially extending radial flange 23 which seats on a depressed shoulder 24 of the table 3. The base 22 extends downwardly through an opening 25 in the table and a cylindrical passage or opening 26 is formed in the base member to receive the multi-part core.

The core comprises a central section 27 and outer sections 28 and 29, the latter being disposed on opposite sides of the center section and having recesses 30 which form inwardly directed or laterally extending bosses 31 on the inside of the skirt of the piston A. These bosses have therein the openings 17 defined by the tapered ends 16 of the core pins 15.

The central section 27 of the core is mounted on a support 32 secured on the upper end of an actuating or power driven rod 33. This rod has a piston 34 (Fig. 1) secured on its lower end and reciprocable in a cylinder 35 secured by an upper end member 36 in an opening 37 formed in a cross member 38 supported by the uprights 1. The foundation 2 for the apparatus may be formed with a pit 39 to receive the lower end of the cylinder 35. The top end member 36 and a bottom end member 40 on the cylinder 35 are connected by conduits 41 and 42, respectively, through control valves (not shown) to a suitable source of fluid or air under pressure. Thus, air or fluid under pressure can be introduced into the cylinder 35 either above or below the piston 34 to force the same up or down as desired to either raise or lower the rod 33 and the central core section 27.

Supported on the cross member 38 is a bracket 45 which has a vertically disposed guide portion 46 engageable with one side of the support 32 which slides therealong. Preferably, a vertically extending key 47 is secured in the guide portion 46 along the face thereof and is slidingly received within a recess 48 in the support 32.

The mechanism for supporting and actuating the outer core sections 28 and 29 includes members 49 and 50 formed with T-slots 51, into which correspondingly shaped portions 52 of the base of the core sections 28 and 29 are interfitted. The lower ends of the core base portions 52 are received behind lips 53 of the supports 49 and 50 and bolts 54 which extend through the supports 49 and 50 are threaded into the bottoms of the core pieces to secure the latter in the T-slots 51 of the supports.

The support 50 for the core section 29 is tiltably carried by a pivot pin 57 and is disposed between the ends of pivoted members or arms 58, which are also received on the pivot pin 57 to support the same. The arms 58 are pivotally supported on a pin 59 carried by a bracket 60 secured to the underside of the table or bed 3 at a point remote from the opening 26 in the mold base. Thus, the mold section 29 may be raised or lowered through the cylindrical opening 26, the arms 58 describing an arcuate path and the core support 50 pivoting on the pin 57. Desirably, a separator 61 is recived on the pivot pin 59 between the arm members 58 and is secured to the latter by means of a bolt 62, so that the separator rotates with the arms. A counterweight 63 is mounted on the end of an arm 64 threaded into the separator 61 and balances the weight of the core section 29 and the mechanism for supporting the latter, so that the core is normally held thereby in its uppermost position and the raising and lowering of the core section is facilitated.

A depending extension 65 of the core support 50 has secured in its lower end or foot a transverse guide pin 66 which extends into a slot 67 formed in a cam member 68 secured to the cross member 38. The foot of the extension 65 has a toe portion 69 which is directed toward the path of the support 32 for the central core section. The support 32 has a knob-like portion 70 which bears against one side 71 of the extension 65 as the central core section 27 is lowered by the downward movement of the piston 34. As the central core section approaches its lower limit of movement, the knob 70 of the support 32 bears against the curved toe portion 69 of the extension 65 on the support 50 and forces the toe to

the right, as viewed in Fig. 5. This movement tilts the support 50 and the mold section 29 in a counter-clockwise direction on the pivot 57, as shown in Fig. 5, thus freeing the core section 29 from one of the wrist pin bosses 31 of the piston A, and moving the core section into the space vacated by the lowered central core section 27

The upper end of the cam slot 67 has a horizontal portion 74 which receives the cam pin 66 when the core sections are in assembled position (Fig. 1). Accordingly, while the central core section 27 is being withdrawn from a casting by the power device 35, the outer core section 29 is positively held in its uppermost position within the casting by the engagement of the cam pin 66 in the horizontal portion 74 of the cam slot. It is not until the knob 70 on the central core support 32 has engaged the toe 69 of the support extension 65 and tilted the outer core section 29 to the position shown in Fig. 5 that the core section 29 can be lowered. When the support mechanism for the core section 29 is tilted as shown in Fig. 5, the cam pin 66 is in line with the downwardly extending portion of the cam groove 67 which controls the movement of the core section 29 cooperatively with the support members or arms 58 and restricts the downward movement of the core section to a predetermined path.

The extension 65 of the support 50 is centrally slotted or cut away, as indicated at 75, and receives a hook member or arm 76 which is mounted on a pivot pin 77 extending through the upper end of the cutaway portion of the extension and secured in the sides of the extension. The member 76 hangs downwardly in the slot or groove 75 and lower end or hook portion 78 thereof is disposed slightly below the toe 69 and in the path of the knob-like portion 70 on the support 32. A weight 79 mounted on the end of an arm 80 threaded into the upper portion of the member 76 holds the latter against the knob 70 on the support 32 during the lowering of the latter, so that when the support 50 and outer core section 29 are tilted by the interengagement of the toe 69 and knob 70, the hook 78 is retained in the path of the knob to be engaged by the latter, as shown in Fig. 5. Since the hook 78 is below the end of the toe 69, the knob 70 does not engage the hook until after the guide pin 66 has been shifted into alignment with the downwardly extending portion of the cam slot 67. As the central core support 32 is drawn downwardly from the position shown in Fig. 5, the tilted core section 29 is lowered simultaneously therewith by the interengagement of the hook 78 with the knob 70. During this movement the outer core section 29 is guided over a predetermined path by the cam slot 67 in cooperation with the pivoted arms 58. Thus, objectionable contact between the core section and the lateral or inwardly extending projections on the skirt of the fresh casting is avoided.

The support 49 for the outer core section 28 is pivotally mounted on a pin 83 carried by a bracket 84 secured to the under side of the table or bed 3 adjacent the cylindrical opening 26 in the mold base. A depending extension portion 85 on the pivoted support member 49 has a lower end which is bifurcated and straddles web 86 of the bracket 45. A pin 87 journaled in the lower ends of the bifurcated portion of the extension 85 is received in a slot 88 formed in the web 86 and limits the oscillating movement of the support member 49 on the pivot 83. On the ends of the pin 87 beyond the sides of the extension portion 85 of the core support are struts or arms 89 which extend upwardly in an oblique direction and across the path of the pivot pin 57 which carries the support for the core section 29. The upper ends of the strut arms 89 are formed with seats 90 engageable with the ends of the pivot pin 57 as the latter is lowered by the interconnection of the parts with the piston 34. Weights 91 mounted on the ends of levers 92 secured to the arms 89 adjacent the pivot 87 normally hold the arms 89 against pins 93 carried by the extension portion 85 of the support 49. By this arrangement the arms 89 are retained in correct position for engagement of the pivot pin 57 in the seats 90 upon lowering of the outer core section 29. After the pin 57 has engaged the arms 89, the latter are thereby forced downwardly and to the left, which causes a shifting of the pin 87 in the slot 88 from the right to the left, so that the support member 49 and the outer core section 28 are tilted in a clockwise direction to substantially the position illustrated in Fig. 7. In this position the core piece 28 has been freed from the casting so that it clears the lateral or inwardly extending wrist pin boss 31 and is positioned in the space previously vacated by the central core section 27 and the other outer core section 29. The seats 90 on the upper ends of the arms 89 are so formed as to provide interfitting engagement between the parts, which prevents endwise movement of the arms 89 relative to the pins.

In operating a mold of the character described, the molten metal is poured into the casting cavity of the assembled mold shown in Fig. 1, the cavity being formed above the base 22 by the mold sections 5 and 6 around the core sections 27, 28, and 29. After solidification of the metal the pins 15 are retracted by rotating the handles 21, and the mold sections 5 and 6 are removed from the casting in the usual manner to the position shown in Fig. 4. The operator then introduces fluid or air under pressure into the upper end of the cylinder 35 to force the piston 34 downwardly. In this manner the support 32 carrying the central core section 27 is lowered. After the central core section has been withdrawn from the casting, the pressure of the knob 70 against the toes 69 of the extension 65 pivots the support 50 on the pin 57, freeing the outer core section 29 from the interior of the casting and moving the same into the space vacated by the descending central core section. The connection between the supports for the central and outer mold sections thus includes a lost motion arrangement which permits the center core section to be withdrawn from the casting before any movement of the outer core section occurs. As lateral pressure is exerted against the extension 65 of the outer core support by the knob 70, the support 32 bears laterally against the guide portion 48 of the bracket 45, thus preventing lateral displacement of the central core or the actuating rod 33 therefor, and holding the central core section 27 to a straight line movement. After the initial lost motion travel of the support 32 and the tilting of the core section 29 to the position illustrated in Fig. 5, the hook 78 engages the knob 70 so as to be drawn downwardly by the continued movement of the support 32. In this manner the core section 29 is withdrawn from the casting A through the space previously occupied by the central core section 27, the pin 66 being guided in the cam slot 67 to hold the

core section 29 and the support 50 therefor to a predetermined path of movement. After a second period of lost motion during which the outer core section 29 is withdrawn from the casting and the central core section 27 is further withdrawn, the pin 57 is engaged in the seats 90 of the arms 89, as indicated by the broken lines of Fig. 7, forcing the latter to the left to the position shown by the full lines of Fig. 7. In this manner the outer core section 28 is tilted to the position illustrated in Fig. 7, so that it clears the lateral extensions on the inside of the casting, permitting the latter to be removed by the operator.

To reassemble the core for the next casting operation the operator introduces air or fluid under pressure into the lower end of the cylinder 35, thereby forcing the piston and rod 33 upwardly. The knob or hook engaging member 70, moving upwardly, permits the support 50 to be raised by the weight 63 to elevate the outer core section 29 to its correct position with respect to the mold base 22. As the arms 89 are released by the pin 57, the weights 91 tilt or return the arms against the pins 93 and also tilt the support 49 on the pivot pin 83 so as to move the outer core section 29 substantially to its correct position with respect to the mold base 22. The upward movement of the core section 29 is guided by the movable or pivoted members 58 and the pin 66 in the cam slot 67. A shoulder 94 on the outer core section 29 engages the bottom of the mold base 22 to position the same and to limit the upward movement of the core section. Preferably, the central core section 27 is of tapered form so that it bears progressively against the sides of the outer core sections 28 and 29 to support the latter in correct relation with respect to one another, and to move the same to their correct positions with respect to the mold base. As shown in Fig. 3, sides 95 of the central core section 27 may be dished or hollowed so that each of the outer core sections may have interfitting relation with the central core section, thereby maintaining a proper relation of the parts when the mold core is assembled. At the upper limit of movement of the central core section 27, the top of the support 32 engages the bottoms of the outer core sections 28 and 29.

The present invention provides a generally improved multi-part core for casting cup shaped articles such as pistons and the like in permanent molds. The apparatus includes novel mechanism for automatically tilting several core sections in succession into the central region of the cast articles and withdrawing the tilted sections in succession. The successive tilting and withdrawal movements of the several core sections take place automatically under the influence of a single power actuated member and the retracted core sections can be automatically reassembled into molding positions by a simple reverse movement of the one prime mover or power member. Hence, the core may be efficiently manipulated by a single operator without an extended period of training or instruction. Furthermore, the apparatus can be quickly and economically operated, thereby lowering the cost of production of the articles being cast, while increasing the number of articles that can be made in a given period of time.

The principles of the present invention may be utilized in various ways, numerous modifications and alterations being contemplated, substitution of parts and changes in construction being resorted to as desired, it being understood that the embodiment shown in the drawings and described above is given merely for purposes of explanation and illustration without intending to limit the scope of the claims to the specific details disclosed.

What I claim is:

1. A piston mold comprising a supporting structure, mold sections recessed to define a casting cavity, a core having central and outer sections, means having connection with the central section and operative to withdraw the same from a casting, a member mounted on the structure and guided thereby for movement over a predetermined path, said member having pivotal connection with the outer sections, and mechanism secured to the outer section and adapted to make connection with said means during the withdrawal of the central section to be shifted by the operation of the withdrawing means to tilt the outer section on the pivot and then withdraw the outer section while the latter is guided by said member.

2. A piston mold comprising a supporting structure, a core having sections one of which is shaped to form a lateral extension inside a piston, means pivotally mounting said shaped section on the structure, mechanism for supporting another section and guiding the same as it is withdrawn from a casting, and a member pivoted on the mounting means and engageable with the supporting means to be actuated by the latter to rotate the shaped section on the pivot of the mounting and free said shaped section from the lateral extension.

3. A piston mold permanent core comprising a pair of outer sections each formed to shape a lateral projection on the inside of a casting, a central section and means actuable to withdraw the same from the interior of a casting, first mechanism making connection with said means after withdrawal of the central section, to be actuated thereby and having connection with one of the outer sections to shift the same to clear the lateral projection formed thereby and to then withdraw such section through the space cleared by the withdrawal of the central section, and second mechanism actuated by said means after said shift to move the other outer section into said space.

4. A mold comprising a supporting structure, mold sections mounted on the structure and formed to provide a casting cavity, a pair of spaced core sections disposed in the cavity and mounted on separated pivots carried by the structure, one of the pivots being movable and the other being fixed, a central core section disposed between the spaced core sections, means movable for withdrawing the central core section, and means disposed in the path of said withdrawing means to be actuated by the movement thereof, said last named means having connection with the movable pivot to shift the latter and thereby withdraw one of the first mentioned core sections from the cavity.

5. A piston mold core comprising a central section, a pair of outer sections, means supporting the central section and actuable to withdraw the same from a piston casting, and mechanism having connection with the supporting means and actuable thereby to tilt one of the outer sections into the space formerly occupied by the central section and withdraw the same from the casting and to then tilt the other outer section into said space.

6. A piston mold comprising a core having an outer section formed to shape a lateral extension inside the piston, a section adjoining the outer section, mechanism connected to the adjoining section to withdraw the same from a piston casting, and co-acting members interconnecting the sections and operative to shift the outer section into the space previously occupied by the adjoining section by the movement of the adjoining section.

7. A core for a permanent piston mold comprising a number of sections including an outer section formed to shape a lateral extension inside the piston and a central section disposed to normally support the outer section, means for supporting the central section and operative to withdraw the same from a piston casting, mechanism including a pivot for supporting the outer section and having connection with the support means to first tilt the outer section on said pivot into the space formerly occupied by the central section and, upon continued withdrawal movement of the central section, to then withdraw the outer section synchronously with said withdrawal movement of the central section.

8. A core for a permanent piston mold comprising a pair of outer sections formed to shape lateral extensions on the inside of the piston casting, a central section normally disposed between the outer sections, means for supporting the central section and for withdrawing the same from between the outer sections, and mechanism for supporting the outer sections and including pivots, said mechanism being adapted to make connection with the support means after predetermined withdrawal movement of the central section to be actuated thereby to tilt one of the outer sections into the space formerly occupied by the central section and withdraw such outer section, and to then tilt the other outer section into said space.

9. A core for a permanent piston mold comprising a pair of outer sections formed to shape lateral extensions on the inside of the piston casting, a central section normally disposed between the outer sections, means for supporting the central section and for withdrawing the same from between the outer sections, a movable member for supporting one of the outer sections and having pivotal connection therewith, a pivotable member for supporting the other outer section, means connecting the movable member with the supporting means to be moved thereby after a predetermined withdrawal of the central member, and means connecting the pivotable member with the supporting means to be pivoted thereby after a predetermined withdrawal of the central member.

10. A piston mold core comprising withdrawable sections, means for supporting and actuating one of the sections to withdraw the same from a casting, a hook carried by another of the sections, and means urging the hook against said actuating means to engage the same for withdrawal of said other section by the movement of the actuating means.

11. A piston mold core comprising withdrawable sections, means for supporting and actuating one of the sections to withdraw the same from a casting, means pivotally mounting another of the sections, and said supporting and mounting means having co-acting elements which bear against one another and progressively tilt said other section on the pivot mounting during withdrawal of said one section.

12. A piston mold core comprising withdrawable sections, means for supporting and actuating one of the sections to withdraw the same from a casting, means pivotally mounting another of the sections, and said supporting and mounting means having co-acting elements which bear against one another and progressively tilt said other section on the pivot mounting during withdrawal of said one section, and a hook disposed to connect said sections after a predetermined withdrawal movement of said one section for withdrawal thereby of said other section.

13. A piston mold core comprising separable sections each having means for supporting the same and for withdrawing the supported section from a casting, one support including a pivot, and said pivot support and another section support having co-acting members including a cam for progressively tilting said pivot support means during the withdrawal of said other section support.

14. A mold for making cup shaped articles comprising a supporting structure, a core having sections one of which is shaped to form lateral extensions inside the articles, means mounting the shaped section for pivotal movement on the structure, mechanism for supporting another section and guiding the same as it is withdrawn from an article, and means on the mounting means and having connection with the supporting mechanism to be actuated by the latter during withdrawal of said other section to rotate the shaped section on the pivotal mounting and thereby free the shaped section from the lateral projections.

15. A mold for making cup shaped articles comprising a supporting structure, a core having sections shaped to form lateral extensions inside the articles, means mounting one of the sections for pivotal movement on the structure, mechanism for pivotally supporting another section and guiding the same as it is withdrawn from an article, means for actuating the mechanism to first rotate said other section to free the same from one of the lateral extensions and to then withdraw the same while guided by the mechanism, and means on the mounting means and having connection with the supporting mechanism to be actuated by the latter during withdrawal of said other section to rotate said one section on the pivotal mounting and thereby free said one section from one of the lateral projections.

16. A mold for making cup shaped articles comprising a supporting structure, a core having a pair of outer sections and a central section therebetween, means for supporting the central section and actuable to withdraw the same from between the outer sections, means mounting one of the outer sections for pivotal movement on the structure and adapted to guide such section as it is withdrawn from an article, and means connecting the mounting means to the supporting means for actuation thereby during withdrawal of the central section to rotate said one section into the space provided by the withdrawal of the central section and then withdraw said one section through such space.

17. A mold for making cup shaped articles comprising a supporting structure, a core having a pair of outer sections and a central section therebetween, means for supporting the central section and actuable to withdraw the same from between the outer sections, means mounting one of the outer sections for pivotal movement on

the structure and adapted to guide such section as it is withdrawn from an article, means connecting the mounting means to the supporting means for actuation thereby during withdrawal of the central section to rotate said one section into the space provided by the withdrawal of the central section and then withdraw said one section through such space, and a tiltable member for supporting the other outer section, said member having such connection with the supporting means as to be actuated thereby subsequent to the withdrawal of said one section to tilt the other section into the space provided by such withdrawal.

SIDNEY W. JACKSON.