July 31, 1923. 1,463,247

H. H. BRAND

METAL MOLD

Filed April 25, 1921 2 Sheets-Sheet 1

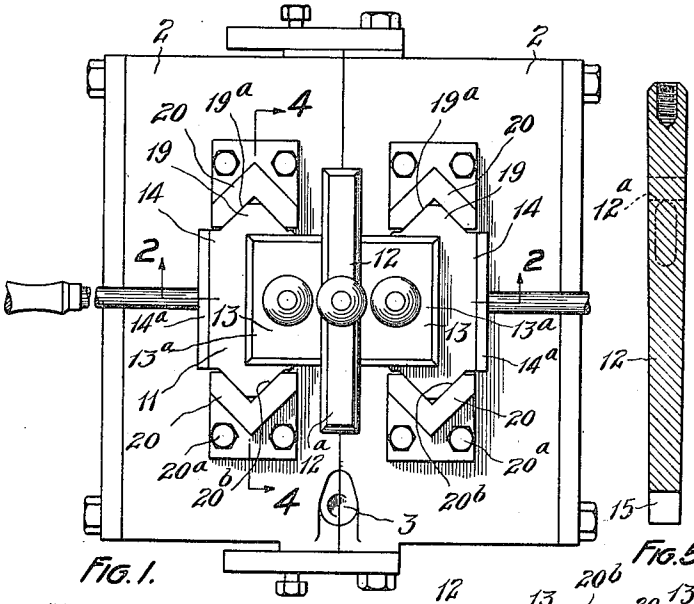


FIG. 1.

FIG. 5.

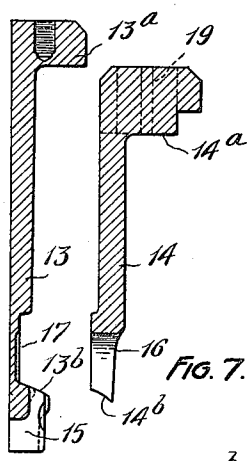


FIG. 6.

FIG. 7.

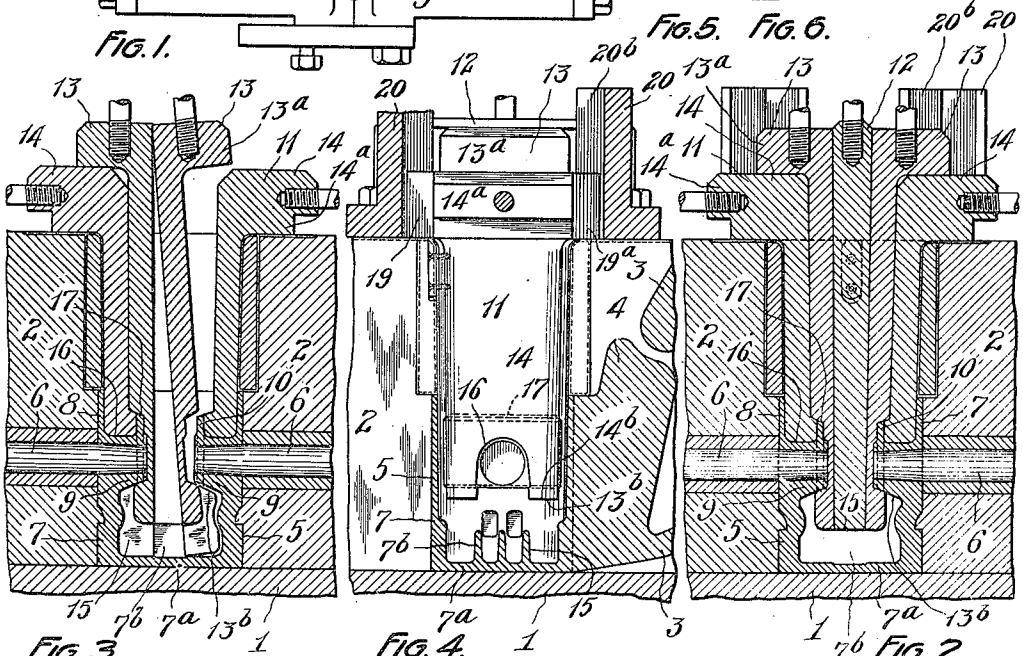


FIG. 3.

FIG. 4.

FIG. 2.

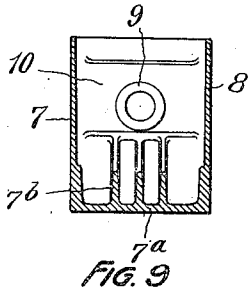


FIG. 9

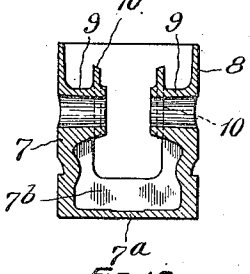


FIG. 10

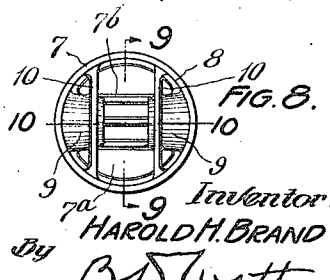


FIG. 8.

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METAL MOLD

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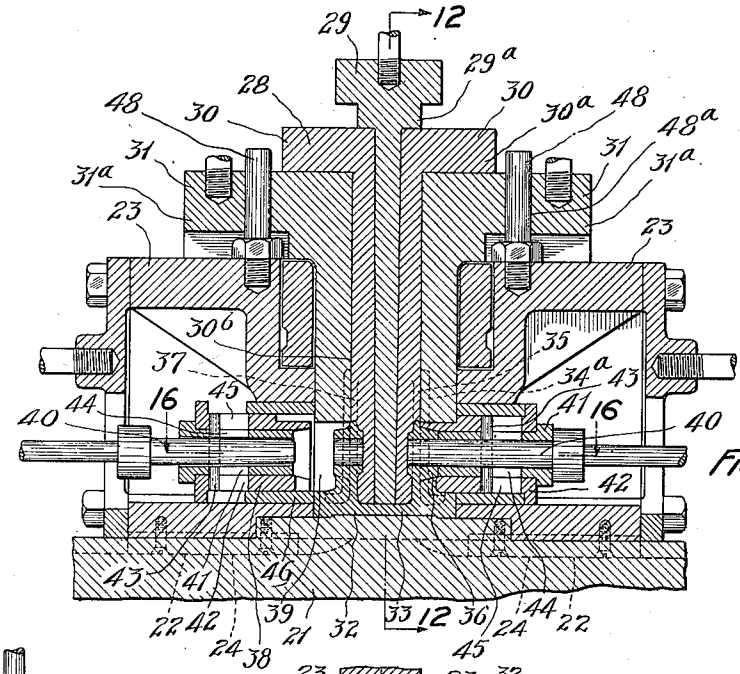


FIG. 11.

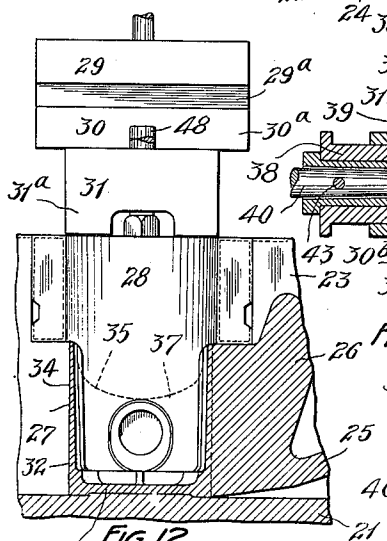


FIG. 12.

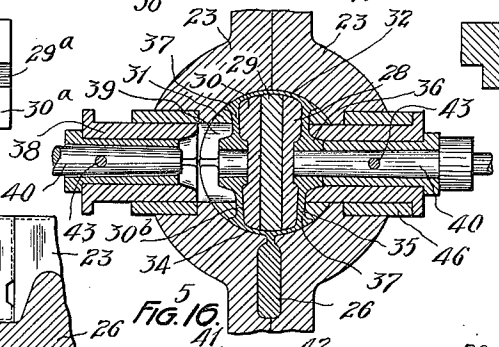


FIG. 16.

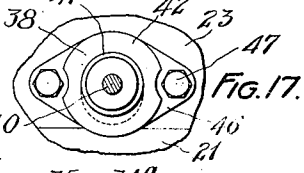


FIG. 17.

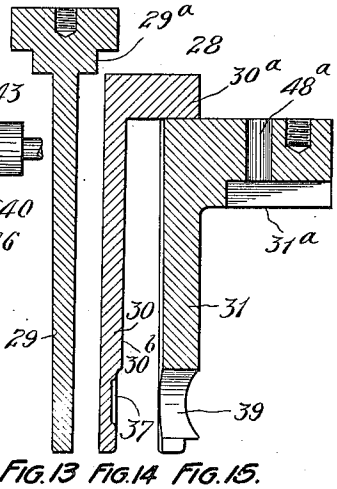


FIG. 13 FIG. 14 FIG. 15.

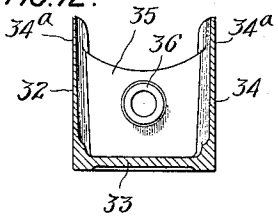


FIG. 20.

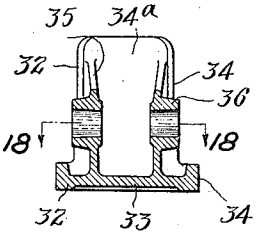


FIG. 19.

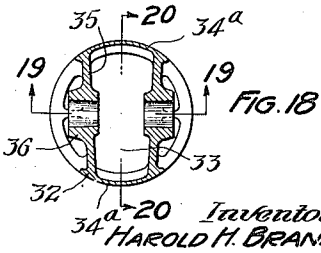


FIG. 18

Inventor:
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Patented July 31, 1923. 1,463,247

UNITED STATES PATENT OFFICE.

HAROLD H. BRAND, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ALUMINUM MANUFACTURES, INCORPORATED, OF CLEVELAND, OHIO, A CORPORATION OF DELAWARE.

METAL MOLD.

Application filed April 25, 1921. Serial No. 464,254.

To all whom it may concern:

Be it known that I, HAROLD H. BRAND, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Metal Molds, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to permanent molds for cup shaped castings and is especially concerned with molds for casting internal combustion engine pistons having cross webs or walls.

It has for its principal object the provision of a mold for cup shaped castings having cross webs, comprising sectional cores adapted to the formation of the said webs, and means for positively guiding certain of the core sections during their removal from engagement with the said webs to avoid injury thereto.

Another object is to construct a mold for pistons having cross webs, comprising cores which are arranged to form the desired webs or walls and which co-operate with the mold during removal from contact with the webs in a manner to prevent breakage of, or injury to, the latter.

Other objects will appear and be pointed out in the following specifications.

Molds and cores for cup shaped articles constructed heretofore, as typified by those disclosed in U. S. Letters Patent, 1,296,590, March 4, 1919, are not adapted to the casting of cup shaped articles, having webs extending across the hollow portion of the article. By sinking depressions in the surface of the core, it has been possible to form supporting ribs along the inner surfaces of the casting but, so far as I am aware, a mold and cores of permanent character have never been constructed in which could be cast, cup shaped articles having webs extending across the hollow portion of the article from side to side and well within the outer cylindrical contour of the article as distinguished from mere inwardly depressed walls. By my invention, however, it is now possible to make cup shaped articles provided with webs integral with opposite side walls and extending across the open space therebetween, which webs may be relatively narrow or may even be integral with the end wall and extended to the open end of the article.

The configuration and arrangement of parts by which these results are obtained will be set forth in detail hereinafter and claimed.

Certain practical embodiments of my invention will now be described, reference being had in the specification to the drawings attached thereto and forming a part thereof.

In the drawings:

Fig. 1 is a top plan view of a piston mold equipped with a sectional core and guides constructed in accordance with my invention.

Fig. 2 is fragmentary view in cross section taken on line 2—2 of Fig. 1.

Fig. 3 is a view similar to Fig. 2 with the central core section withdrawn and showing the manner of removing the intermediate core sections.

Fig. 4 is a fragmentary view partly in section, taken on line 4—4 of Fig. 1.

Figs. 5, 6 and 7 are respectively vertical cross sectional views of the central, intermediate and outer core sections.

Fig. 8 is a plan view of the open end of the piston cast in the mold in Fig. 1.

Fig. 9 is a longitudinal section taken on line 9—9, Fig. 8.

Fig. 10 is a similar view taken on line 10—10, Fig. 8.

Fig. 11 is a view in cross section of a modified form of mold.

Fig. 12 is a fragmentary sectional view taken on line 12—12 of Fig. 11 but showing the main core in elevation.

Figs. 13, 14 and 15 are vertical sectional views of the central, intermediate and outer sections of the main core.

Fig. 16 is a cross section taken on line 16—16 of Fig. 11 showing details of the wrist pin and main cores.

Fig. 17 is an end elevation of the wrist pin core assembled in the mold.

Fig. 18 shows the piston cast in the mold in Fig. 11, the view being taken on a horizontal plane through the bosses, as line 18—18 of Fig. 19.

Fig. 19 is a sectional view taken on line 19—19 of Fig. 18.

Fig. 20 is a similar view but taken on line 20—20 of Fig. 18.

Inasmuch as my invention relates more particularly to main cores and wrist pin

cores for piston molds of the general type previously shown and fully described, as in the above mentioned patent, detailed description of the molds herein shown to which the improved cores are especially adapted will be resorted to only when necessary to disclose new elements or changes in the mold or to render clear the co-operation of the molds and the present cores.

In Figs. 1 to 4 inclusive, 1 designates a mold base supporting on its top surface a mold body composed of two halves 2. Gate, feeder or riser, and piston casting cavities indicated by numerals 3, 4 and 5 respectively are formed by recesses cut in the meeting faces of the mold halves. Core pins 6 carried in a horizontal position by the mold halves project into the casting cavity 5 and serve to core out the wrist pin bosses on the piston casting.

The piston casting 7, which is desired, is illustrated in Figs. 8, 9 and 10. It is cup shaped and hollow with substantially cylindrical side walls 8, from opposite points of which, wrist pin bosses 9 extend inwardly. A plurality of reinforcing ribs integral with the head or end wall 7^a and side walls 8 of the casting support the bosses 9 and join the said walls and bosses in a rigid unitary structure. Cross webs 10 are cast integral with opposite parts of side walls 8 and extend across the space between the walls, engaging and being integrally united with the inner ends of the bosses. These webs 10 may, obviously, vary in width but, as shown, are considerably wider than the bosses 9, one edge being flush with one side of a boss.

The core 11 adapted to forming piston 7 is shown in Figs. 1 to 7 inclusive. It comprises a relatively thin central section 12 extending across casting cavity 5, two intermediate sections 13, one on each side of the central section and extending across the casting cavity, and two outer sections 14, engaging the outer sides of the intermediate sections, all sections being arranged in a line across the casting cavity. When assembled with the mold, core sections 12 and 14 are supported on the top surface of the mold halves 2 by outstanding flanges 12^a and 14^a respectively on the said core sections. Sections 13 have similar flanges 13^a which engage with the top surface of sections 14 and thus support the sections.

The core 11 extends into the casting cavity 5 between the mold halves, its outer surface providing the inner wall of the casting cavity. Suitable recesses 15 in the end and sides of the core form ribs 7^b on the inner surface of the casting while other inwardly extending recesses 16 form bosses 9. Between the meeting faces of each intermediate section 13 and the adjacent outer sections 14, a recess 17 extends thru the core. It may be formed partly in each of the meeting faces of the sections or in either face alone, as is shown in the drawings, where the recesses are cut entirely in the outer faces of the intermediate sections. The recesses 17 by being open at each end and extending thru the core communicate with and form a part of the casting cavity, thus permitting the formation of cross webs 10 integral with the casting.

The outer sections 14 closely engage with sections 13 thruout their length except where recesses 17 are located but the inner end of each section 14 is bifurcated to provide a recess 16 for bosses 9. Contrasted with outer sections 14, central section 12 and intermediate sections 13 may be considered and referred to as inner sections. The bifurcated ends 14^b seat against enlarged portions 13^b of the intermediate sections 13 at points between the end wall of the casting and the bosses 9, thus coring out the space around the bosses, and between webs 10 and the outer wall of the casting.

Removal of the core sections from the casting is accomplished as follows. Central section 12 is withdrawn by vertical upward movement. Intermediate sections 13 are, one at a time, tilted inwardly at the top and then the inner or bottom ends are moved transversely of the casting sufficiently to permit endwise withdrawal without contact with the inner ends of the bosses 9. Outer sections 14 must be moved vertically upward without tilting to prevent damage to the webs 10, this being accomplished by lifting each section between guides which will now be described.

Each outer core section 14 has an outstanding supporting flange 14^a which is adapted to rest on the top of the mold body. The opposite sides of these flanges are provided with V shaped projections 19 having vertical side surfaces 19^a. Adjacent each projection 19 is located a guide 20 which is secured to the mold body by screws 20^a or otherwise. These guides have vertical surfaces 20^b suitably inclined to conform to the surfaces 19^a of projections 19. When core sections 14 are in assembled position in the mold, projections 19 are in guides 20, the surfaces 19^a of the former being in slidingly close contact with surfaces 20^b of the latter. As the core sections 14 are withdrawn from the mold and casting they are guided by guides 20, and are maintained by the sufficiently elongated guide surfaces 20^b in a substantially vertical position without side twisting until the inner end of the section clears the top of cross web 10. After removal of the core sections, the mold halves may be separated and, the core pins having been previously removed, the casting can be lifted from the mold base.

It will be evident that all core sections are movable out of the casting in a manner to

prevent all danger of injury to the casting and especially the webs 10.

Modified forms of main core, core guides and core pins for casting a modified form of piston are shown in Figs. 11 to 17 inclusive, the piston being disclosed in Figs. 18, 19 and 20.

21 designates the usual mold base, which, however, has parallel slots 22 cut in its upper surface as indicated in dotted lines in Fig. 11. Mold halves 23, comprising a mold body, seat upon base 21 and carry elongated tongues 24 which have a close sliding fit in slots 22, the tongues and grooves constituting guides which permit the halves to move toward and away from each other only along the same straight line and without twisting or sidewise movement. The usual gate, feeder or riser, and casting cavities 25, 26 and 27 respectively are formed by recesses in the meeting faces of the mold halves.

The main core, designated as an entirety by numeral 28 is quite similar to main core 11. It comprises a relatively thin central section 29 extending across the casting cavity 27, intermediate sections 30 or either side of the central section each extending across the casting cavity, and outer sections 31 engaging the intermediate sections 30, all the sections being arranged in a single line across the casting cavity. Sections 29 and 30 may also be called inner sections in contrast with sections 31 which have been referred to as outer sections.

The assembled core is supported on the mold body by outstanding flanges 31^a of the outer sections 31. Similar flanges 30^a on intermediate sections 30 rest on the top surfaces of sections 31 to support sections 30 while flanges 29^a on the central section 29 are supported on the tops of the intermediate sections 30.

The piston casting 32, which is desired, is illustrated in Figs. 18, 19 and 20. It has a head or end wall 33 from the periphery of which depends a cylindrical wall 34. At opposite points this wall is cut away or abbreviated. The remaining, elongated sections 34^a of wall 34 are joined to each other by cross webs 35 which are integral with the end wall 33 and which are located well within the outer cylindrical contour of the casting. Wrist pin bosses 36 are carried by the webs 35.

In constructing core 28 for piston 32, the outer side surfaces 30^b of sections 30 are relieved from edge to edge and lengthwise sufficiently to provide a recess 37 between sections 30 and 31 which will be open at each end and suitable to the formation of cross webs 35 and the inner ends of bosses 36. Outer sections 31 have their inner and end faces relieved to form (in part) the desired outer side surface of cross webs 35 and to core out the casting between the abbreviated portion of wall 34 and cross webs 35.

Auxiliary cores in the form of sectional core pin assemblies co-operate with outer sections 31 to complete the outer mold wall for cross webs 35 and bosses 36. These assemblies 38 which project thru an oval like opening 39 in core sections 31, comprise a core pin 40 for coring out the bosses 36, an intermediate bushing 41 around pin 40 and an outer bushing 42 surrounding bushing 41, the inner end surfaces of the two bushings co-operating with the inner surfaces of main core sections 31 to form the outer wall of the casting cavity in which cross webs 35 are cast.

The bushings 41 and 42 are united to core pin 40 for movement therewith by a pin 43 passing thru pin 40 and into elongated slots 44 and 45 in bushings 41 and 42 respectively. This permits a limited lengthwise movement of pin 40 in bushing 41 and also simultaneous movement of both bushings and core pin. Bushing 46 secured to each mold half as by screws 47 furnishes a wearing surface within which the core pin assemblies can slide.

A modified form of guide for the outer core sections 31 consists of vertical posts 48 secured to the top of the mold body and passing thru closely fitting holes 48^a in flanges 31^a of sections 31. One or more such posts may be employed as desired.

After a casting has been made in this mold, the cores are removed from the casting and the latter taken from the mold as follows. The clamps (not shown) holding the mold halves together are loosened. Core pins 40 are pulled endwise out of bosses 36, and after clearing the bosses and due to the contact of pin 43 with the ends of slots 44 and 45, the continued endwise movement of core pin 40 removes bushings 41 and 42 from engagement with webs 35 and pulls them out of the mold halves entirely clear of all parts of the casting cavity, as is shown in Fig. 11. Next, central section 29 of the main core is removed by vertical endwise movement and intermediate sections 30 are tilted out of engagement with bosses 36 and then withdrawn vertically.

Outer sections 31, guided in a vertical line and prevented from sidewise twisting or tilting movement by posts 48 are elevated to such an extent that the inner ends clear the top surface of the abbreviated portions of wall 34 of the casting. While held in this position the mold halves are separated, being guided by tongues 24 and grooves 22 thus moving core sections 31 clear of the casting, which can then be lifted from the mold base 21.

It will be noted that provisions have been

made to guide positively the removal of all core sections which engage with the cross webs 35 in a manner to avoid damage thereto. The core pins 41 are pulled out of boss 36 while the bosses 36 and webs 35 are still supported by outer sections 31 and bushings 41 and 42. When pins 41 are clear of the bosses, bushings 41 and 42 are pulled away from webs 35 without lateral movement which could injure the webs. Finally sections 31 are guided upwardly along webs 35 without any lateral movement and when clear of wall 34 are moved bodily away from the webs 35 along a straight line by the guiding action of the tongue and groove connection of the mold halves and base.

It will be noted that in each of the molds I have constructed a mold equipped with sectional cores suitably formed for making cup shaped castings having cross webs extending across the hollow portion of the casting and well within the outer cylindrical contour of the casting. Means have also been provided for removing the cores from engagement with the said webs in a manner effectively to prevent injury to or breakage of the latter.

These webs may, as shown, comprise the true outer side walls of the casting or auxiliary supporting webs variously disposed inside the regular outer walls and may obviously be of various sizes, dimensions and locations dependent upon the size and number of core sections.

Although I have shown several modifications of my invention I have done so for purposes of illustration and do not wish to be limited thereto. The scope of my invention is limited and defined by what is claimed.

What is claimed:

1. In a permanent mold for cup shaped castings in combination, a permanent mold body having a casting cavity, a sectional core supported on the mold body and extending into the casting cavity, open ended recesses in the side faces of certain of the said core sections for forming cross webs on the casting, and means engaging with and guiding certain of the said core sections during the removal of the said sections from contact with the said webs.

2. In a permanent mold for casting pistons provided with a piston casting cavity, in combination, a sectional core comprising inner and outer sections supported on the said mold and extending into the casting cavity, open ended recesses in the side faces of certain of the said inner core sections for forming cross webs on a piston casting, and means carried by the mold and engaging with and guiding the outer core sections during removal of the said sections from contact with the said webs.

3. In a permanent mold for casting pistons, in combination a permanent mold body having a piston casting cavity, a sectional core supported on the mold body and extending into the casting cavity, the said core comprising a plurality of sections arranged side by side and extending in a row across the casting cavity, open ended recesses formed in the side faces of certain of the said core sections for forming cross webs on a piston casting and means carried by the mold body engaging with and guiding certain of the core sections during removal of the said sections from contact with the said webs.

4. In a permanent mold for casting pistons in combination a permanent mold body having a piston casting cavity, a sectional core supported on the mold body and extending into the casting cavity, the said core comprising a central section, intermediate sections and outer sections arranged side by side and extending in a row across the casting cavity, open ended recesses formed in the outer side faces of the said intermediate sections, and means carried by the mold body engaging with and guiding the outer core sections during removal thereof from the casting cavity.

5. In a permanent mold for casting pistons in combination a permanent mold body having a piston casting cavity, a sectional core supported on the mold body and extending into the casting cavity, the said core comprising inner and outer sections arranged in a row across the casting cavity, openings extending thru the assembled core between the meeting faces of the said inner and outer core sections and means engaging with and guiding the said outer sections during removal thereof from the casting cavity.

6. In a permanent mold for casting pistons having cross webs carrying hollow wrist pin bosses in combination, a mold body provided with a casting cavity, a main core supported on the mold body and extending into the casting cavity, openings thru the said core, and wrist pin cores each comprising a core pin and a movable bushing extending into and co-operating with the said main core and the said openings therein, to form on the piston casting, cross webs carrying hollow wrist pin bosses.

7. In a permanent mold for casting pistons having cross webs carrying hollow wrist pin bosses, in combination, a mold body provided with a piston casting cavity, a main core supported on the mold body and extending into the casting cavity, openings thru the core, and wrist pin cores extending into and co-operating with the said main core and the said openings therein to form, on the piston casting, cross webs carrying hollow wrist pin bosses, each said wrist pin core comprising a core pin and a bushing surrounding

the said core pin and united thereto by a pin and slot connection for limited longitudinal movement of the core pin and bushing relative to each other.

8. In a permanent mold for casting pistons, in combination a permanent mold body having a piston casting cavity, a sectional core supported on the mold body and extending into the casting cavity, open ended recesses in the side faces of certain of the said core sections for forming cross webs on the piston casting, and means engaging with and guiding certain of the said core sections during removal thereof from contact with the said webs, said means comprising pairs of oppositely arranged guides, each guide, having longitudinally extending, V shaped surfaces adapted to engage with correspondingly shaped surfaces on a core section.

9. In a permanent mold for casting pistons, in combination, a permanent mold body having a piston casting cavity, a sectional core supported on the mold body and extending into the casting cavity, the said core comprising inner and outer sections arranged in a row across the casting cavity, openings extending thru the assembled core between the meeting faces of the said inner and outer core sections, vertical guide members secured to the mold body adjacent the said outer core sections, each guide member having longitudinally extending surfaces adapted to engage with correspondingly shaped surfaces on the said outer core sections.

10. In a permanent mold for cupshaped castings in combination, a permanent mold body having a casting cavity, a sectional core supported on the mold body and extending into the casting cavity, recesses in the core for forming webs on the casting, and means mounted on the mold body and engaging the core for positively guiding certain of the core sections during removal thereof from contact with the said webs.

In testimony whereof, I hereunto affix my signature.

HAROLD H. BRAND.