

Dec. 16, 1952

A. TOWNHILL
PISTON CASTING MACHINE

2,621,380

Filed Nov. 16, 1949

5 Sheets-Sheet 1

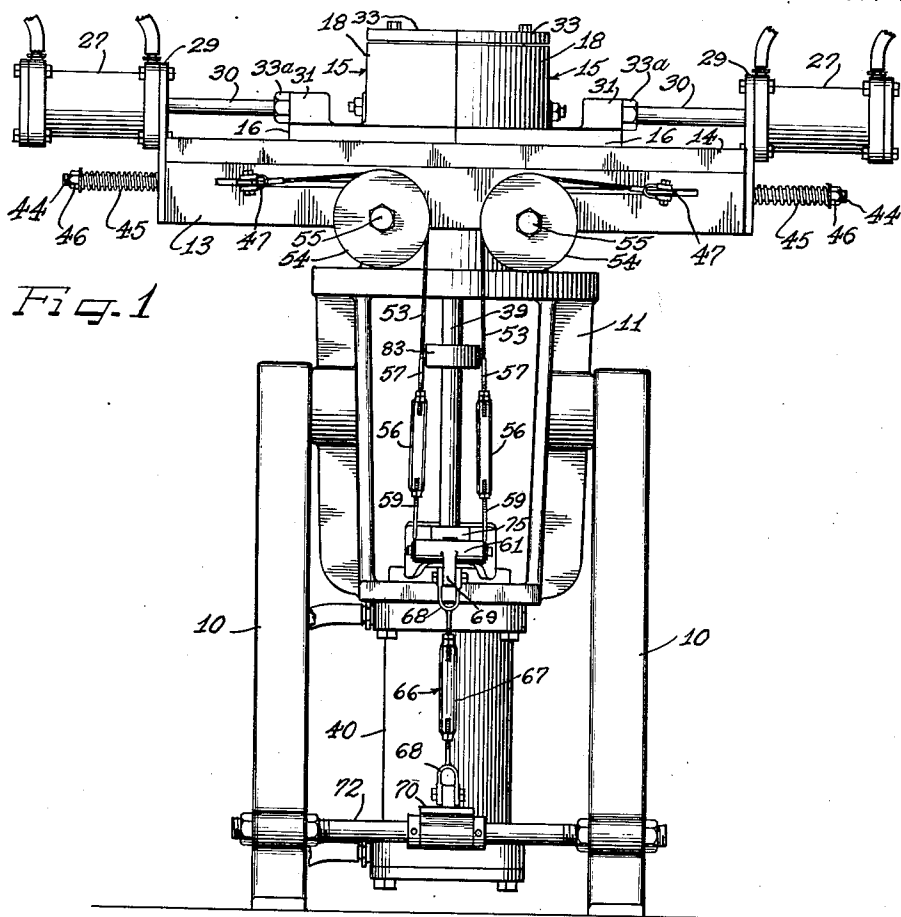


Fig. 1

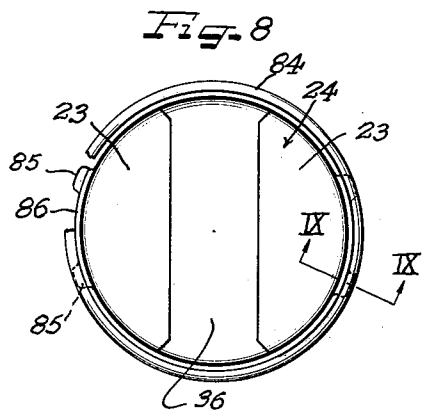


Fig. 8

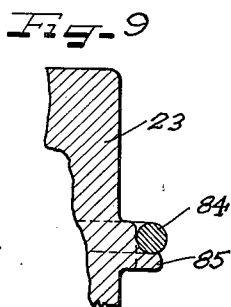


Fig. 9

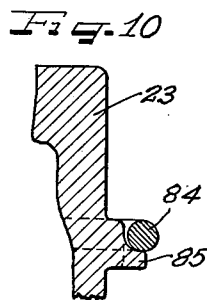


Fig. 10

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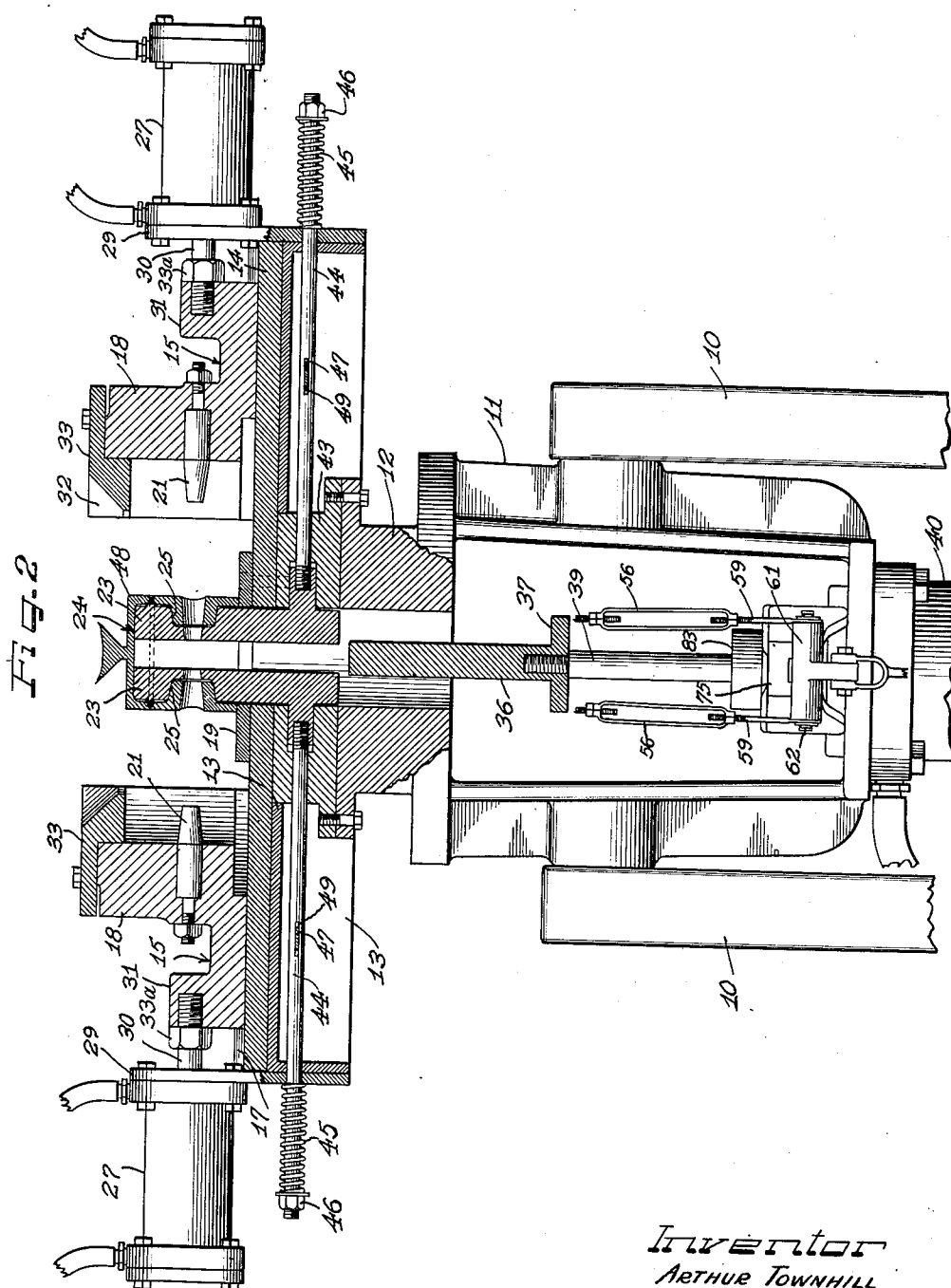
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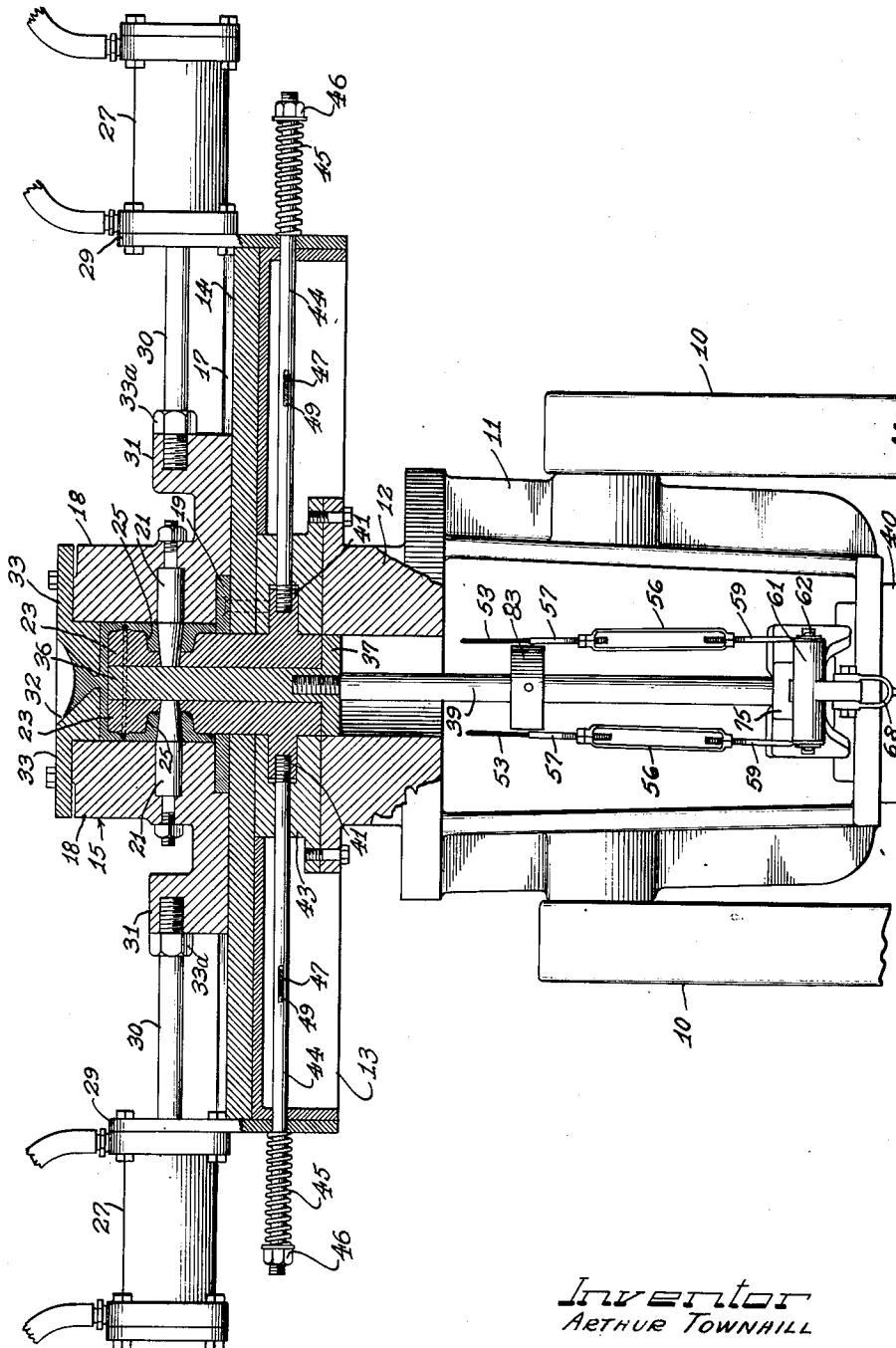
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FIG. 3



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Fig. 4

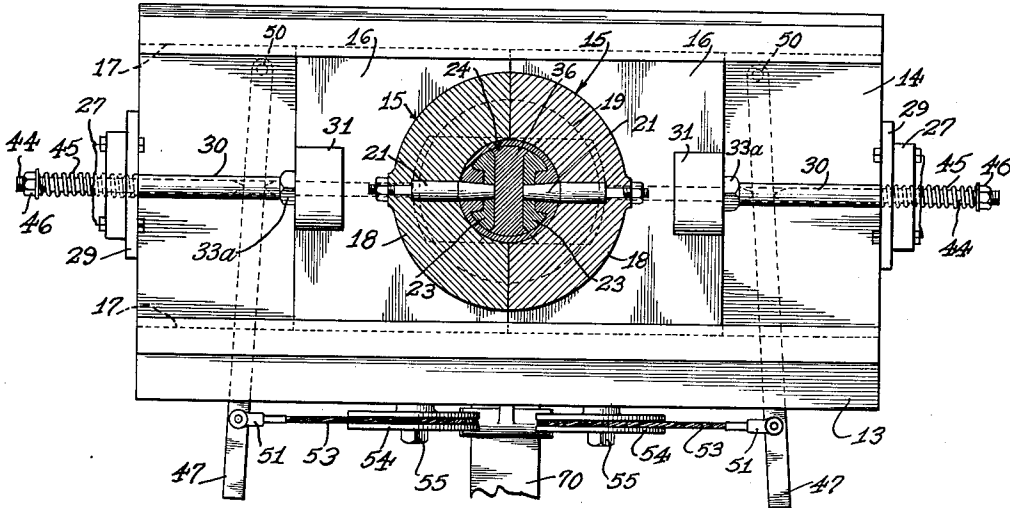
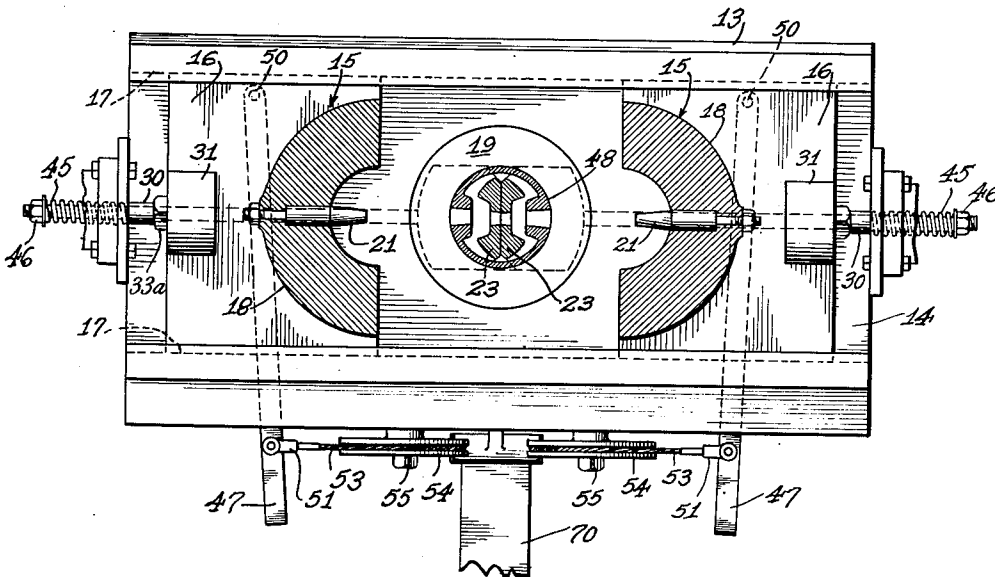


Fig. 5



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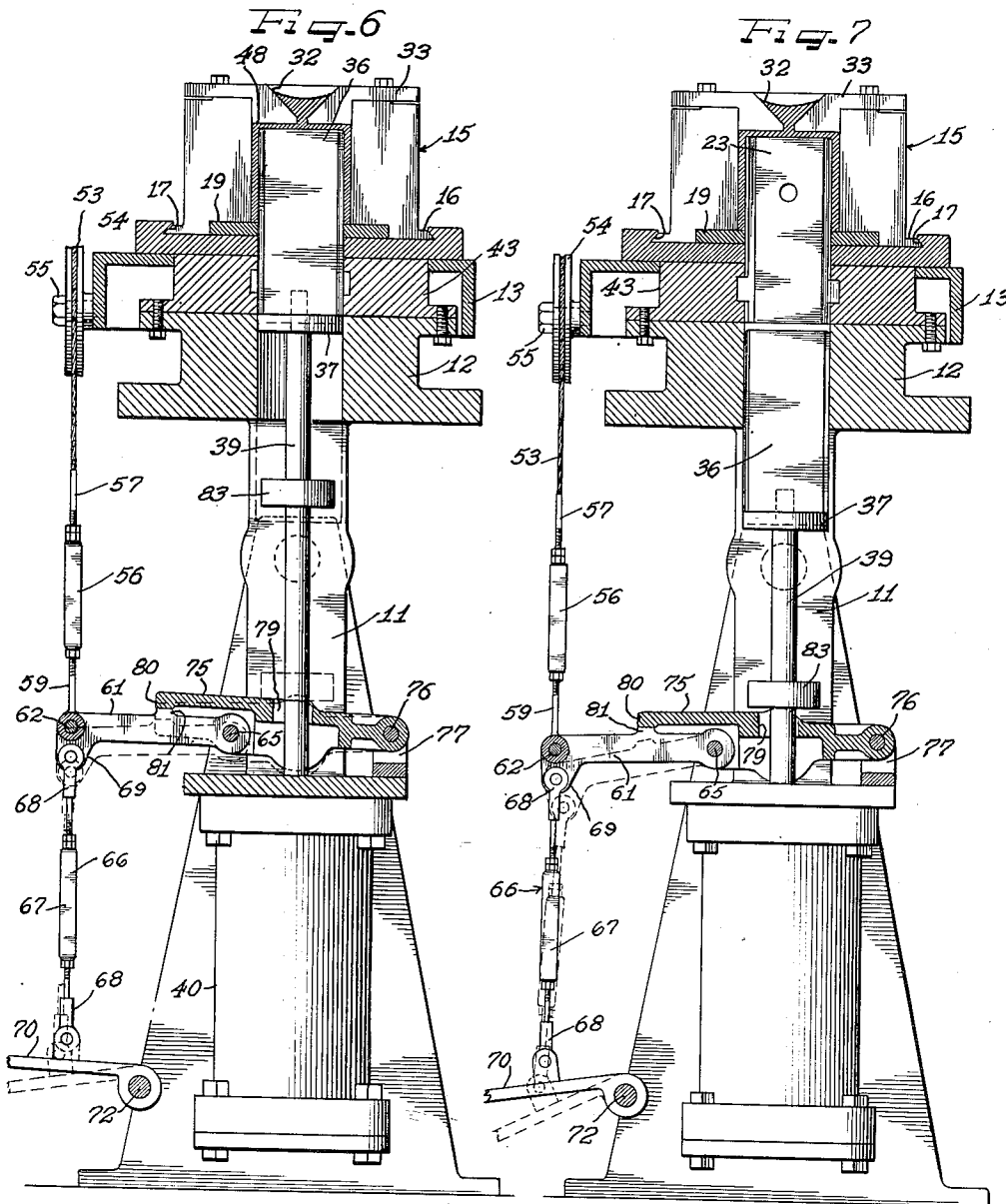
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,621,380

PISTON CASTING MACHINE

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Application November 16, 1949, Serial No. 127,535

6 Claims. (Cl. 22—93)

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This invention relates to improvements in casting machines and more particularly to an improved machine for the casting of pistons from aluminum and similar metals and alloys.

An object of my invention is to provide a simplified form of casting machine having a sectional core and having a novel form of means for freeing the core sections from the casting in a simple and expeditious manner with no manual effort.

Another object of my invention is to provide a new and improved casting machine for pistons including a sectional core within the inner margins of the mold for the piston and consisting of two outer core sections and a central core section spacing the outer core sections apart, and having a novel form and arrangement of operating means therefor arranged to automatically break the outer core sections from the cast piston by power.

A further object of my invention is to provide a piston casting machine having a sectional core within the margins of the mold for the piston formed of two outer core sections and a central core section withdrawable from the space between the outer core sections after completion of the casting operation, together with means operatively connected with the central core section and engaging the operating means for the outer core sections, for automatically breaking the outer core sections from the cast piston upon completion of the withdrawal of the central core section therefrom.

A further object of my invention is to provide a piston casting machine including two outer core sections and a central core section vertically movable into the space between the outer core sections, to complete the core and hold said core sections in spaced apart relation during the casting operation and to provide operating and control means for the outer core sections engaged by the means for operating the central core section and held thereby in a slightly contracted position for the insertion of an expansion control band thereon to be cast integrally with the piston, until movement of the central core section toward the outer core sections to complete the core, and also breaking the outer core sections from the piston upon complete withdrawal of said central core section from said outer core sections.

These and other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

On the drawings:

Figure 1 is a view in side elevation of a piston casting machine constructed in accordance with:

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my invention showing the mold in a closed position;

Figure 2 is a fragmentary longitudinal sectional view taken through the machine shown in Figure 1 and showing the mold in an open position and the outer sections of the core broken from the piston;

Figure 3 is a fragmentary longitudinal sectional view somewhat similar to Figure 2 but showing the mold and core in a closed position;

Figure 4 is a fragmentary plan view of the piston casting machine shown in Figure 1 with certain parts thereof broken away and showing the mold and core in horizontal section in a closed position;

Figure 5 is a fragmentary plan view somewhat similar to Figure 4 but showing the mold in an open position and the core in a contracted position, to enable the piston to be removed therefrom;

Figure 6 is a transverse sectional view taken through the mold and core of the machine shown in Figure 1 and showing the core in an expanded position;

Figure 7 is a view somewhat similar to Figure 6 but showing the central section of the core withdrawn from the mold and showing the outer sections of the core broken from the piston;

Figure 8 is a detail plan view of the sectional mold showing an expansion controlling ring supported thereon with certain parts of the ring broken away in order to show certain details of the support therefor;

Figure 9 is a fragmentary sectional view taken substantially along lines IX—IX of Figure 8; and

Figure 10 is a fragmentary sectional view somewhat similar to Figure 9 but showing the core in a slightly contracted position and showing the expansion control ring initially placed thereon, prior to completion of the core by movement of the central core section into the space between the outer core sections.

As shown on the drawings:

The casting machine is mounted between a pair of upright standards 10—10 on a yoke-like structure 11, disposed therebetween and suitably supported thereon, and extending upwardly and downwardly therefrom. The yoke-like structure 11 terminates at its upper end into an annular flanged plate 12 having a frame structure 13 supported thereon and extending therefrom in opposite directions, and having a mold supporting table 14 extending along its upper side and forming a support for two translationally movable mold sections 15—15.

Each mold section 15 has a substantially rec-

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tangular base portion 16 guided at its outer edges in inwardly recessed inclined guides 17—17, formed integrally with the table 14 and forming a dove-tail retaining guide for each mold section (see Figure 6). Each mold section 15 also has a segmental portion 18 projecting upwardly from the base portion 16, and formed in the form of half of a segment of a cylinder, the inner walls of which form an inner wall of the mold, when the two mold sections 15—15 are in abutting relation with respect to each other. The bottom of each segmental mold portion 18 is herein shown as being recessed to receive a plate 19 mounted on the top of the table 14 and having a central apertured portion conforming to the inside diameter of the piston skirt and forming the bottom of the mold when the mold sections 15—15 are moved into abutting relation with respect to each other.

Each segmental mold portion 18 also has a core pin 21 mounted therein and extending inwardly from the inner wall thereof, and coming into engagement with an outer core section 23 of a sectional core 24 upon closing of the mold. The core pin 21 forms a core for one of the wrist pin bosses, the boss of which is formed by an inwardly recessed portion 25 of the outer core section 23.

A double acting cylinder 27 having a piston (not shown) therein, is mounted on each end of the table 14, on an upright bracket 29, and projects outwardly therefrom. A piston rod 30 is extensible from each cylinder and is herein shown as being threaded in a boss 31 projecting upwardly from the base portion 15 of the mold portion 14, and shown as being locked thereto by a nut 33a, threaded on said piston rod.

The admission and release of fluid under pressure to and from the opposite ends of the cylinders 27—27 may be controlled by suitable valve means which are not herein shown or described since they form no part of my present invention.

A pouring gate 32 for the mold is shown as being formed from two semi-circular closure members 33—33 secured to the top of the segmental portions 18 of the mold and extending downwardly along the inner walls thereof for a short distance. Each of said closure members has a recessed semi-conical inner wall portion forming a funnel shaped pouring gate for the metal when the two mold sections and closure members are in abutting relation with respect to each other.

The sectional core 24 is formed by the two outer core sections 23—23 extending through registering central apertured portions of the table 14 and plate 19 and guided at their lower ends in an annular guide plate 43. The sectional core 24 is completed by a central core section 36 movable into the space between the outer core sections 23—23 and holding said core sections in spaced apart relation with respect to each other against the margin of the apertured portion of the plate 19. The central core section 36, as herein shown, has a substantially T-shaped lower end portion 37 threaded on the upper end of a piston rod 39. The piston rod 39 is extensible from a double acting cylinder 40, suitably secured to and depending from the bottom of the yoke-like structure 11 between the standards 10—10. The cylinder 40 and piston rod 39 are adapted to move the central core section 36 into the space between the outer core sections 23—23, to complete the core, upon the admission of fluid under pressure to the head end of said cylinder, and to withdraw the central core sections 23—23 into the position

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shown in Figures 2 and 7 upon the admission of fluid under pressure to the piston rod end thereof.

Each outer core section 23 depends beneath the table 14 a substantial distance and has an outwardly extending boss 41 slidably guided in the guide plate 43. Said guide plate is supported on the top of the flanged plate 12 of the yoke structure 11 and has the table 14 resting thereon. A core draw bar 44 is threaded at its inner end in the boss 41 and is slidably guided in and extends outwardly from the guide plate 43. The core draw bar 44 also extends outwardly through a depending outer side of the frame structure 13 and through the bracket 29, and is slidably guided therein. A compression spring 45 encircles the outer end of said core draw bar and is interposed between the outside of the bracket 29 and a nut and washer 46 threaded on the outer end of said core draw bar. The springs 45 thus urge and yieldably hold the outer core sections 23—23 in an extreme extended position with respect to the mold, to define the internal cavity of the piston 48.

Each core draw bar 44 has a lever arm 47 extending through a slotted portion 49 thereof. Each lever arm 47 is pivoted at its inner end on a pivotal pin 50 suitably supported in the frame structure 13 (see Figure 4). Said lever arms extend laterally from the pivotal pins 50—50 through the slotted portions 49—49 of the lever arms 47—47 and beyond the opposite side of frame structure 13 from the pivotal pins 50—50. A clevis 51 is pivoted to each lever arm 47 adjacent the outer margin of the frame structure 13, inwardly of the outer end of said lever arm, so as to leave an end of said lever arm which may be gripped by the operator, if desired.

A separate flexible cable 53 is suitably secured to the clevis 51. Said cables extend inwardly from said clevises around direction changing pulleys 54—54 journaled on the frame structure 13 on pivotal pins 55—55. From thence the cables 53 extend downwardly to turnbuckles 56—56 and are secured thereto as by threaded rods 57—57 secured to the ends of said cables and forming a part of the turnbuckle.

An eyebolt 59 forms the other adjustable member of each turnbuckle 56 and depends therefrom. The eye of each eyebolt 59 is pivotally connected to the outer end of an actuating lever 61 on a pivotal pin 62. The actuating lever 61 is pivoted at its inner end to the yoke structure 11 adjacent the outer side thereof on a longitudinally extending pivotal pin 65. An adjustable link 66 formed by a turnbuckle 67 having clevises 68—68 extending from opposite ends thereof connects a depending portion 69 of the actuating lever 61 to a foot pedal 70 pivotally mounted on a rod 72 extending across the standards 10—10 and secured thereto at its opposite ends. Pressure of the foot on the pedal 70 will thus move the outer core sections 23—23 toward each other into the position shown in Figure 5, to permit removal of the cast piston 48 therefrom. Upon release of foot pressure from the pedal 70, the springs 45—45 will return the outer core sections 23—23 into the partially expanded position shown in Figure 2.

The means for initially breaking the outer core sections 23—23 from the inside of the cast piston, after withdrawal of the central core section 36 therefrom, and for holding said core sections in a partially contracted position until movement of the central core section in a direction to complete the core comprises a breaker block 75 en-

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gaging the actuating lever 61. The breaker block 75 is pivotally mounted on the yoke-like structure 11 on the side thereof opposite the point of pivotal connection of the actuating lever 61 thereto on a transverse pivotal pin 76, mounted at its ends in upright ears 77—77, extending upwardly from the lower portion of the yoke-like structure 11 (see Figure 6). The breaker block 75 has a hollow central portion 79 extending around the piston rod 39 and has an engaging end portion 80 adapted to engage a bearing pad 81 extending upwardly from the upper side of the actuating lever 61. The breaker block 75 is adapted to be engaged by a block 83 mounted on the piston rod 39 immediate the ends thereof and secured thereto. The block 83 is adapted to come into engagement with the breaker block 75 as the center core section is withdrawn from the outer core sections 23—23 and engage said breaker block and depress the actuating lever 61 with a hammer-like jarring action moving said actuating lever from the position shown by solid lines in Figure 6 to the position shown in dotted lines in this figure and by solid lines in Figure 7. This will thus move the outer core sections 23—23 inwardly toward each other to the slightly contracted position shown in Figure 2. The slight contraction of the core sections 23—23 effected by jarring engagement of the breaker block 75 by the block 83 upon withdrawal of the central core section 36 serves to initially break the outer core sections from the cast piston 48 so as to permit their ready contraction by foot pressure on the foot pedal 70. The breaker block 75 likewise holds the actuating lever 61 and the outer core sections 23—23 in a slightly contracted position against the compression springs 45—45 to permit an expansion controlling ring 84 to readily be inserted and supported on said outer core sections, and be cast integrally with the piston.

The expansion controlling ring 84 is provided to cause the upper part of the skirt of the piston to contract across its major diameter, as the temperature of the head of the piston rises. The ring 84 thus balances this contraction against the expansion caused by the heat from the head of the piston, so that the major diameter of the top of the piston will stay constant in spite of variations in temperature of the head. The skirt of the piston may therefore bear against the cylinder at both sides even when cold, and may expand without binding as has been shown and described in Patent No. 2,262,132 which issued on November 11, 1941, to Otto Carter Berry.

The expansion controlling ring 84 is shown in Figures 8, 9 and 10 as being supported on the sectional core 24 on spaced ears 85—85 extending outwardly from the outer core sections 23—23, above but adjacent the recessed portion 25 forming the bosses for the wrist pin. As herein shown, a rib 86 connects each pair of ears 85—85 together to form a narrow shelf-like support between the ears 85—85 and also to form a recess in the inner wall of the piston just above the wrist pin bosses thereof, and opening to the expansion controlling ring 84. The purpose of this is to permit ready withdrawal or breaking of the outer core sections 23—23 from the cast piston without disturbing the expansion controlling ring 84.

In operation of the machine considering the mold sections 14—14 to be in an open position and the central core section to be withdrawn from the space between the outer core sections 23—23, in this position the block 83 will be in

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engagement with the breaker block 75 and will hold the actuating lever 61 and flexible cables 53—53 in position to slightly contract said outer core sections.

The expansion control ring 84 may then be placed on the outer core sections 23—23 and be supportingly engaged by the ears 85—85 in the position shown in Figure 10. In this position, the outer core sections are moved inwardly a distance sufficient to support the band on the ears 85—85 but not place tension thereon thus permitting the band to be readily placed on said core sections. Fluid under pressure may then be admitted to the head ends of the cylinders 27—27 to move the mold sections 14—14 to a closed position. At the same time fluid under pressure may be admitted to the head end of the cylinder 40, to move the central core section 36 upwardly. As the block 83 moves away from the breaker block 75 the springs 45—45 will urge the central core sections 23—23 outwardly and separate the outer core sections 23—23 a distance sufficient to permit the central core section 36 to move upwardly therebetween and positively engage the outer core sections 23—23 with the apertured portion of the plate 19 to complete the core and mold and also to tighten the expansion control band 84 on the core.

The mold may then be poured through the pouring gate, the mold then staying closed until the casting is chilled. The time for chilling may be controlled by a suitable timer and valve (not shown) in the circuit supplying fluid under pressure to the cylinders 27—27 and 40. This circuit is not shown herein since it forms no part of my present invention.

When the casting is chilled, fluid under pressure may be admitted to the piston rod ends of the cylinders 27—27 to separate the mold sections 14—14 and open the mold. At the same time, it may be admitted to the piston rod end of the cylinder 40 to withdraw the central core section from between the outer core sections 23—23. As the central core section is completely withdrawn, the block 83 will engage the breaker block 75 with a jarring action and bring said breaker block into depressing engagement with the actuating lever 61, and move the end sections 23—23 of the core inwardly a distance sufficient to break them from the inside of the casting. The operator may then put his foot on the foot pedal 70 and exert pressure thereon to bring the two parts of the core together to the position shown in Figure 5. The piston 48 may then readily be removed from the machine. As the foot of the operator is removed from the foot pedal 70, the outer core sections 23—23 will return to the slightly contracted position shown in Figure 2, said outer sections being held in this position by engagement of the block 83 with the breaker block 75.

Another expansion controlling band 84 may then be placed in position on said outer core sections to start the next operating cycle.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In a piston casting machine, a sectional core including two outer core sections and a central core section vertically movable into position between said outer core sections, yieldable means urging said outer core sections to move away from each other, means for moving said outer

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core sections against said yieldable means toward each other upon withdrawal of said central core section including an actuating lever and operative connections between said lever and said outer core sections including separate pivoted levers connected with said core sections and operated by said actuating lever, a cylinder having a piston rod extensible therefrom and having said central core section mounted thereon to move said central core section into the space between and withdrawing it from said outer core sections, a pivoted breaker block having a free end portion supportedly engaging said lever arm, an abutment member on said piston rod engageable with said breaker block upon complete withdrawal of said central core section from said outer core sections, and moving said breaker block and actuating lever with a jarring action a distance sufficient to break said outer core sections from the cast piston and cooperating with said actuating lever and outer core sections to hold said outer core sections against said yieldable means from completely expanding until movement of said central core section toward said outer core sections.

2. A casting machine comprising a frame, a sectional contractible core mounted on said frame and including two horizontally movable outer core sections and a central core section vertically movable in position between said outer core sections to complete the core, yieldable means connected with each outer core section and urging said outer core sections to move away from each other, a pivoted operating lever, means connecting said lever with said outer core sections to move said outer core sections against said yieldable means upon operation of said lever, a power operated member having said central core section mounted thereon and movable axially with respect to said outer core sections to move said central core section between and withdraw it from said outer core sections, an engaging block on said axially movable member, a breaker block pivoted on said frame and supported at its free end on said operating lever, said breaker block being disposed beneath and in alignment with said engaging block and being engaged thereby upon withdrawal of said central core section from said outer core sections, and striking said breaker block to depress said operating lever by power for a portion of its stroke length and holding said lever in such a position until said axially movable member moves toward said outer core section.

3. In a casting machine, a support frame, a sectional core including two outer core sections slidably mounted on said frame for rectilinear movement toward and from each other, a central core section vertically movable into the space between said outer core sections, to complete the core, a power operated vertically movable member connected with said central core section to move said central core section into the space between and to withdraw it from said outer core sections, the improvements comprising an actuating lever pivoted on said frame beneath said outer core sections, means operatively connecting said actuating lever with said outer core sections to move said outer core sections toward each other upon depression of said lever, and an engaging connection between said vertically movable member and said actuating lever, for depressing said actuating lever a limited amount with a jarring action upon withdrawal of said central core section from said outer core sections

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including an abutment member on said vertically movable member and a breaker block pivotally mounted on said frame and engaging said actuating lever, said breaker block being engaged by said abutment member to initially break said outer core sections from the casting and hold said outer core sections from complete expansion by the action of said yieldable means until movement of said central core section in a direction to complete the core structure.

4. In a casting machine including a frame, two outer core sections slidably mounted on said frame, an inner core section movable between said outer core sections to hold said outer core sections in separated expanded relation, a cylinder disposed beneath said outer core sections, a piston rod extensible therefrom and having said inner core section mounted thereon, an axially movable rod connected with each of said outer core sections, springs means connecting with said rods and biasing said rods and outer core sections into an expanded condition, lever means pivotally mounted on said frame and having engagement with said rods for moving said core sections into a retracted condition against said spring means, an operating lever pivoted on said frame beneath said lever means, means connecting said operating lever with said lever means to move said core sections against said spring means toward each other upon depression of said operating lever, means actuated upon movement of said inner core section out of the space between said outer core section for initially breaking said core sections from the casting with a jarring action and holding said core sections in contracted positions including a breaker bar pivoted on said frame for movement about an axis parallel to the axis of movement of said lever and spaced therefrom and having a free end portion resting on said lever at a point spaced from its pivotal axis, and an engaging block on said piston rod engageable with said breaker block with a jarring action upon withdrawal of said center core section.

5. A casting machine comprising a frame, a sectional contractible core mounted on said frame comprising two outer core sections rectilinearly guided for movement toward and from each other and a third inner core section movable vertically between the outer core sections and maintaining the core in an expanded condition, means yieldably biasing said outer core sections in expanded relation with respect to each other, an operating lever pivoted on said frame adjacent one side thereof and operatively connected with said outer core sections to contract the core against the bias of said yieldable means, a power operated vertically movable extensible member on said frame having said inner core section mounted on the upper end thereof for upward movement between said outer core sections, a breaker block pivoted on said frame beneath said core sections on the opposite side of said extensible member from said lever arm, and extending across and beyond said extensible member into engagement with said lever arm, and a block on said piston rod engageable with said breaker block with a hammer-like jarring action upon retractible movement of said extensible member and withdrawal of said inner core section from said outer core sections, and effecting pivotal movement of said operating lever to initially contract said outer core sections at the end of the retractible stroke of said extensible member, and holding said lever in position to contract said core sections until movement of said

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extensible member to extend the inner core section.

6. A casting machine comprising a frame, a sectional contractible core mounted on said frame and having two rectilinearly guided outer core sections and a vertically movable inner core section movable between said outer core sections, spring means biasing said outer core sections in expanded positions, an operating lever pivoted on said frame adjacent one side thereof for movement about a horizontal axis and having operative connection with said outer core sections to contract the core against the bias of said spring means, a cylinder on said frame having a piston rod extensible therefrom, said piston rod having said inner core section mounted on the end thereof for extension between said outer core sections, a breaker block pivoted on said frame on the opposite side of said piston rod from the axis of connection of said operating lever to said frame, for movement about an axis parallel to the axis of pivotal movement of said operating lever, said breaker block extending across said piston rod and therebeyond and being supported on said operating lever at its free end, and a block on

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said piston rod spaced above said breaker block for engagement with said breaker block with a hammer-like jarring action upon retraction of said inner core section from said outer core sections, and depressing said operating lever to contract said outer core sections against the bias of said springs means, and said block holding said lever and core sections in contracted position until released therefrom by extensible movement of said piston rod from said cylinder.

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