Dec. 30, 1947. H. M. OLSON 2,433,576

MACHINE FOR SPLITTING PISTON RINGS

Filed April 1, 1946 4 Sheets-Sheet 1

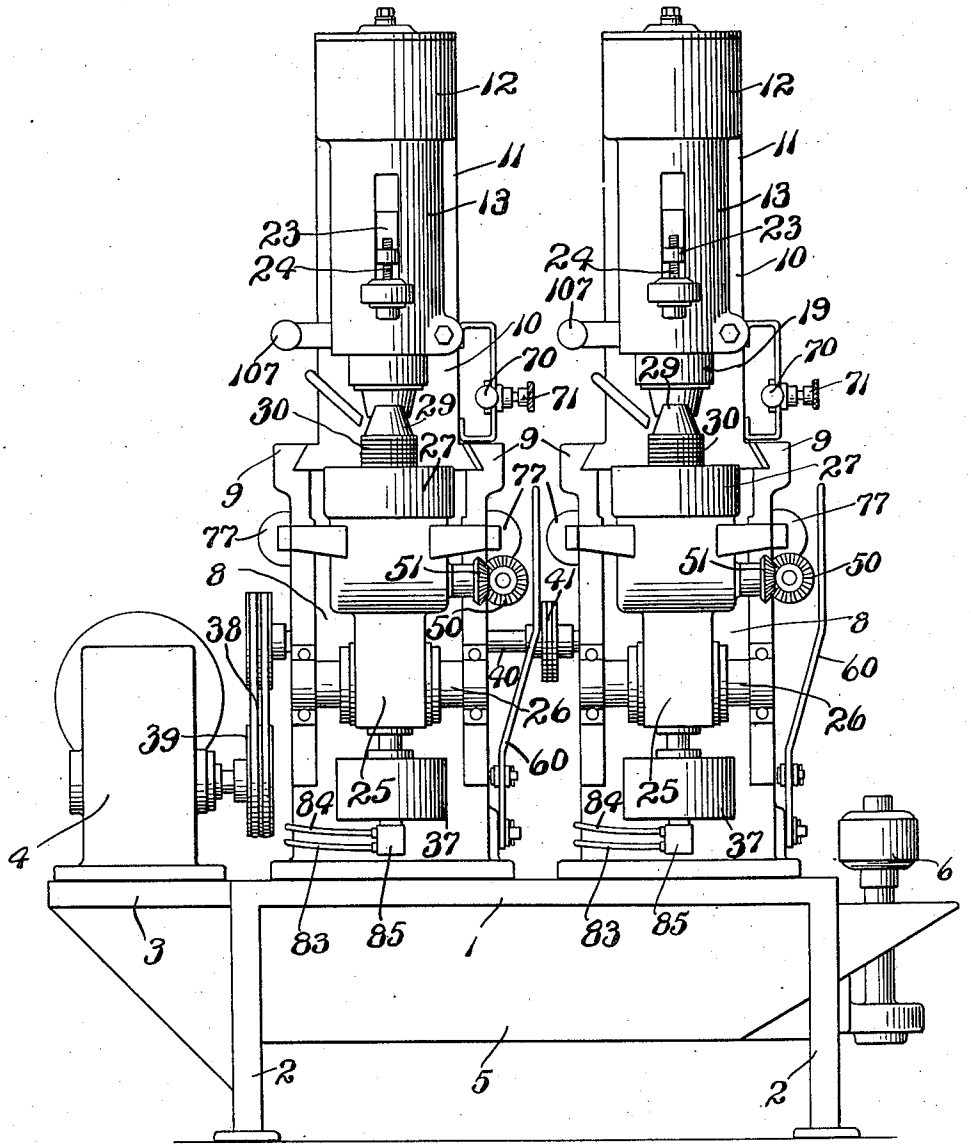


FIG. 1.

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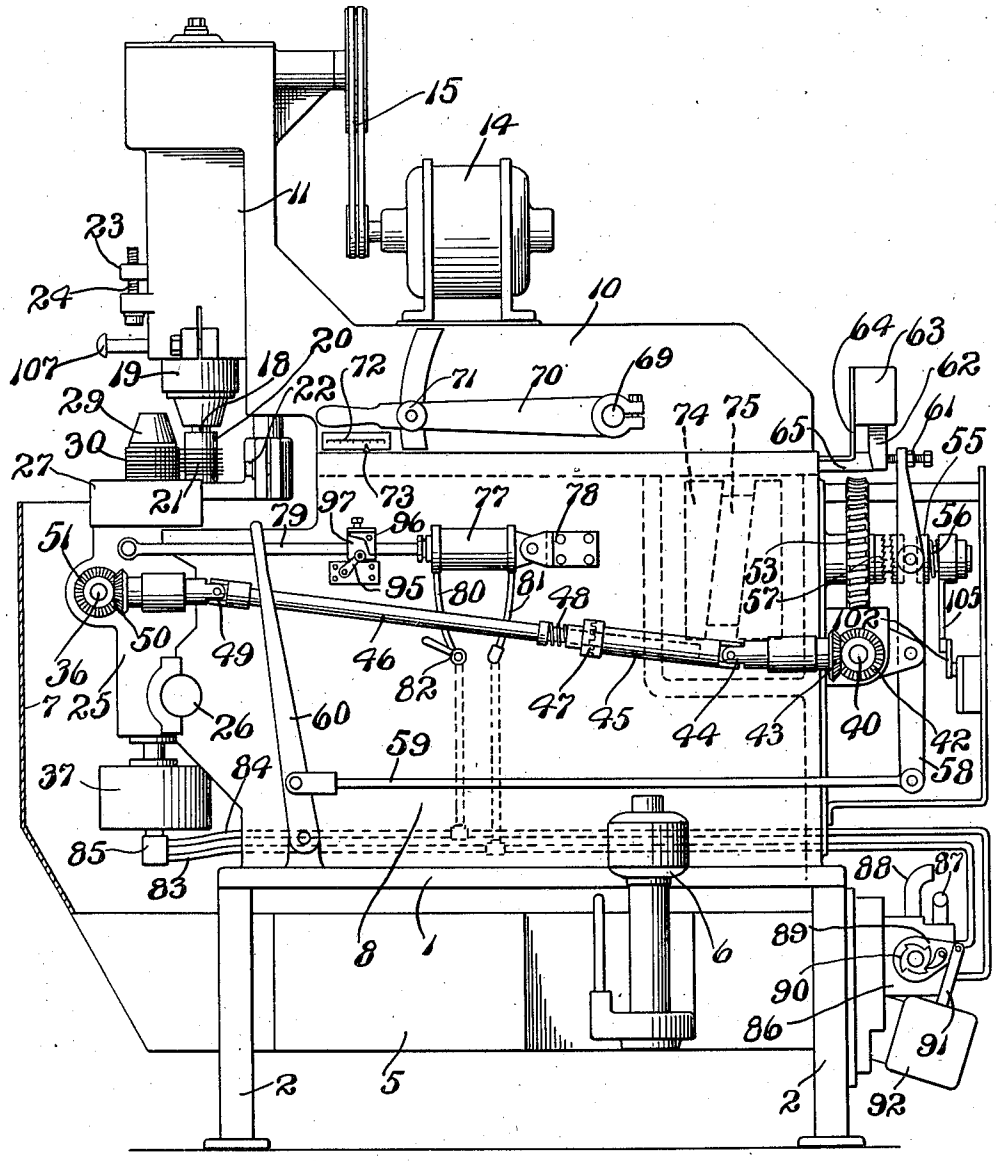


FIG. 2.

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MACHINE FOR SPLITTING PISTON RINGS

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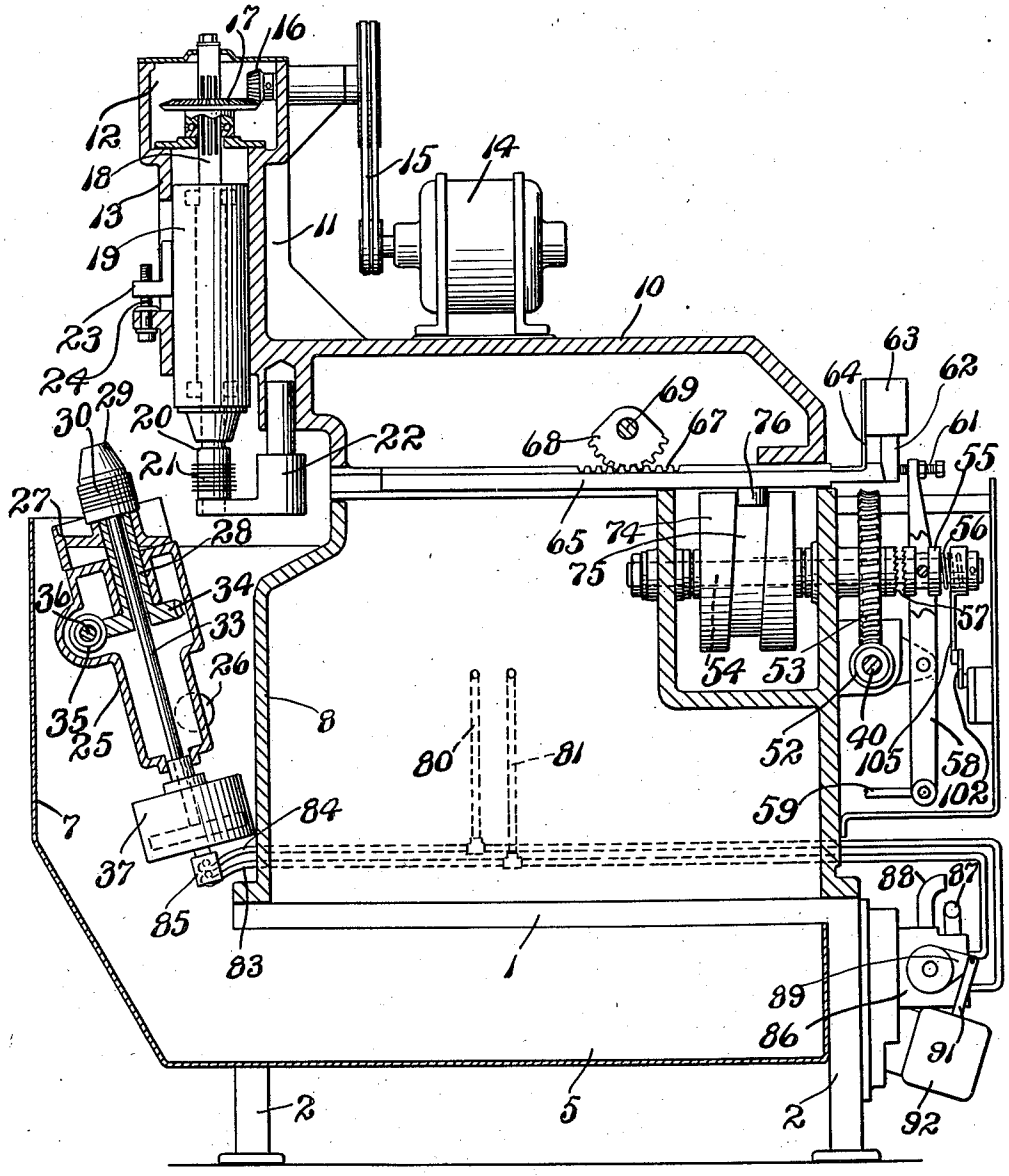


FIG. 3.

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Dec. 30, 1947. H. M. OLSON 2,433,576

MACHINE FOR SPLITTING PISTON RINGS

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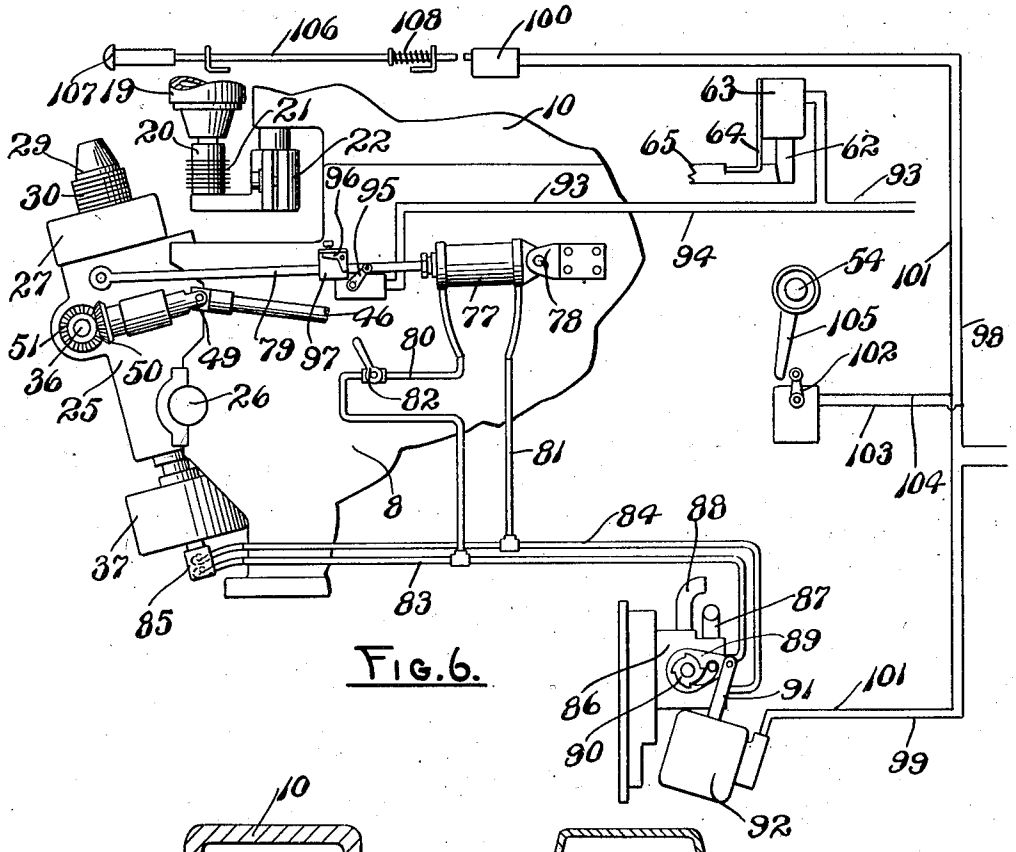


FIG. 6.

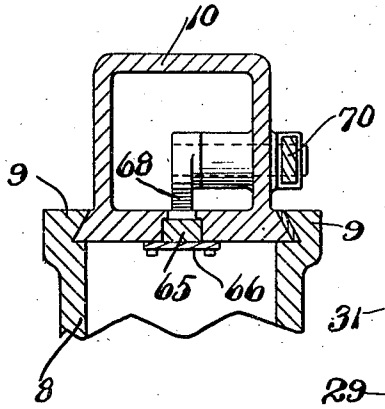


FIG. 4.

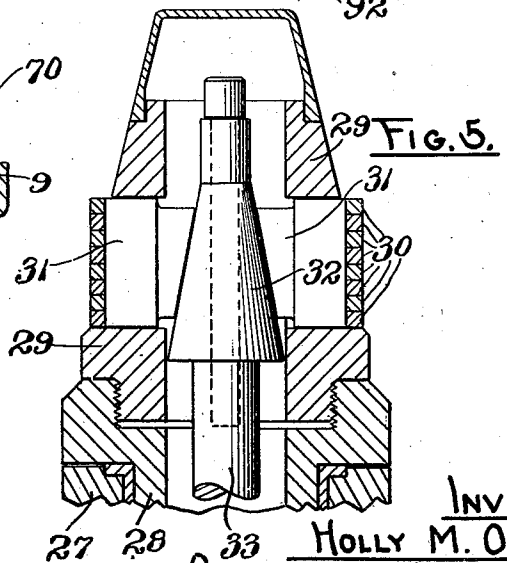


FIG. 5.

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2,433,576

UNITED STATES PATENT OFFICE

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MACHINE FOR SPLITTING PISTON RINGS

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Application April 1, 1946, Serial No. 658,816

12 Claims. (Cl. 29—70)

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This invention relates to a machine for the splitting or dividing of piston ring castings.

It is an object and purpose of the invention to produce a ring casting splitting or dividing machine of the type named, in which a plurality of the ring castings may be mounted on an arbor, with the arbor located in a predetermined position, and out of the way of the dividing saws which are used, and thereafter, by starting the machine in operation, moving the arbor with the ring castings thereon to a vertical position and move a plurality of saws toward and through the ring castings for splitting the castings. Said saws rotate about a vertical axis and when moved toward and into operative engagement with the castings divide them into two parts preferably, from each of which subsequently a piston ring is produced.

Further objects of my invention are to provide a machine, of which a battery of them may be mounted side by side, each being independently loaded with ring castings and each of which will automatically stop when the dividing sawing has been accomplished, the arbor being tilted outwardly when the dividing is done for removal of the split rings and replacement thereof by a successive plurality of ring castings for repetition of the cycle, to divide them in the same manner.

With the present invention a very heavy quantity production is secured. The machine which has been developed also has provisions for the necessary adjustments to adapt the machine for different sizes and widths of ring castings within prescribed limits, the machine not being restricted solely to the splitting of one diameter and thickness of ring casting. Many other objects and purposes will be understood from the following description, taken in connection with the accompanying drawing, in which,

Fig. 1 is a front elevation showing a battery of two of the machines of my invention located side by side.

Fig. 2 is a side elevation of the machine.

Fig. 3 is a vertical section from front to rear through the machine.

Fig. 4 is a fragmentary transverse section through the upper portion of the machine to illustrate the mounting of the movable saw carrying carriage.

Fig. 5 is a fragmentary vertical section through a ring holding arbor at the upper portion thereof.

Fig. 6 is a partial fragmentary side elevation and diagrammatic view of the electric and fluid pressure controlling circuits of the machine.

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Like reference characters refer to like parts in the different figures of the drawings.

A suitable horizontal supporting table or platform 1 is carried above the floor by vertical posts 2, upon which table one or more of the machines of my invention are mounted. In practice a battery of said machines may be located side by side, two of the machines being shown in Fig. 1. However, by enlarging the supporting table 1 the number of machines in a battery may be increased to any number desired.

At one end of the supporting structure a bracket 3 is secured for carrying a driving motor 4. A tank 5 for holding a cooling liquid is mounted underneath the table and is equipped with the usual pump 6 for circulating the liquid to desired portions of the machine. A front shield 7 (Figs. 2 and 3) reaches substantially to the ring casting carrying arbors, it being understood that the cooling liquid is pumped to and delivered on the ring casting while they are being saw divided into their parts.

The machine of the present invention includes a supporting body or housing 8 having spaced vertical sides and front and rear ends, said sides at their upper edge portion being provided with spaced horizontal guides 9 for the slidable mounting of an elongated housing 10 as shown in Figs. 3 and 4. Said upper housing 10 has substantially the same length of the lower housing 8, and its front end portion is extended upwardly as indicated at 11. It has a gear box 12 at the upper end thereof (Fig. 3) from which a sleeve 13 extends downwardly. A motor 14 secured at the upper side of the housing 10, through belts and pulleys 15 drives a beveled pinion 16 within the gear box 12 which is in mesh with a beveled gear 17, also located within the gear box, and through which a splined vertical shaft 18 extends. The shaft 18 passes downwardly through the sleeve 13 through a cylindrical body 19, within the sleeve 13 carrying suitable bearings for the shaft 18. The shaft 18 at its lower end is provided with a gang saw head 20 which carries a large number of spaced parallel circular metal cutting saws 21 which are driven by the motor 14 to turn rapidly about the vertical axis of the shaft 18. The lower end of said shaft below the saws is supported by bracket 22, adjustably mounted on a post extending downwardly from the housing 10. A bracket 23 is connected to the member 19 and extends through a vertical slot in the sleeve 13 and has a screw 24 passing through it, said screw having free rotation through a lug extending outwardly from the sleeve 13 as shown in Fig. 3.

With this construction, the saws 21 are adjustable vertically for a limited distance, sufficient to take care of the range of ring castings which may be processed on the machine and to properly locate the saws so that they will divide all of the ring castings which they process substantially midway between their opposite flat sides.

At the front end of the machine an arbor carrying housing structure 25 is mounted upon suitable trunnions 26 which turn about a horizontal axis, being mounted in bearings at their ends carried at the front of the supporting housing 8. The housing 25 is of a generally cylindrical form and at its upper end has a member 27 of a somewhat similar form located. A hollow spindle 28 passes through bearings therefor in the member 27 and housing 25 as shown in Fig. 3. Said spindle at its upper end is adapted to have a ring casting carrying arbor detachably connected therewith.

The detailed construction of said arbor is the subject matter of another application for a patent and its specific structure need not be entered into in detail. It includes a body 29 of a generally cylindrical form, having a detachable threaded connection of the upper end portion of the spindle 28, around which a plurality of ring castings 30 (Fig. 5) may be placed in superimposed relation to each other, the lowermost casting resting upon the lower end enlarged portion of the arbor body. Radially expanding ring casting engaging members, generally indicated at 31, are carried by the body 29 and are forced outwardly on longitudinal upward movement of an actuating member 32 which has inclined surfaces to engage complementary surfaces at the inner edges of the member 31. The member 32 is connected at the upper end of a rod 33 which passes through the hollow spindle 28 and through the lower end of the housing 25.

The spindle 28 at its lower end is equipped with a worm gear 34 which is in mesh with a worm 35, secured to a short shaft 36 mounted on and extending through the sides of the housing 25, whereby on driving the shaft 36, the arbor and the ring castings carried thereby are turned about the axis of spindle 28. The rod 33 at its lower end extends into a short cylinder 37 connected with the lower end of the housing 25 and, as indicated in dotted lines in Fig. 3, a piston is secured to the lower end of the rod 33 within the cylinder. It is evident that on the application of fluid pressure at the lower side of the piston, rod 33 and the member 32 will be elevated and when entered at the upper side of the piston, such rod and member will be withdrawn or lowered with a consequent release of the ring castings 30, this in practice occurring after they have been divided substantially midway between their upper and lower sides.

The driving motor 4, through belts 38 and pulleys 39 drives a horizontal shaft 40 which is coupled by a suitable coupling 41 (Fig. 1) with a like shaft for each of the ring casting splitting machines which are mounted side by side in a battery of such machines, two thereof being shown in Fig. 1. The shaft 40 at the back of the housing 8 (Fig. 2) is provided with a beveled gear 42 in mesh with a second beveled gear 43 connected with a short shaft which at its front end, through a universal joint 44, is connected with the rear end of a sleeve shaft 45. A shaft 46, at its rear end, has a telescopic entrance into the sleeve shaft 45 at the front portion thereof, the two shafts 45 and 46 are equipped with complementary clutch elements 47 so that when such clutch elements are engaged and held in engagement by the spring 48 shown, the shaft 46 will be continuously driven by the continuously rotating shaft 40. Shaft 46 at its front end has a universal joint connection at 49 with a short shaft equipped with a beveled pinion 50 which has meshing engagement with a similar gear 51 secured at one end of the previously described shaft 36. Thus when the clutch at 47 is in operatively connected relation, shaft 36 by means of the worm 35 thereon drives the arbor carrying spindle 28 in continuous rotation.

The trunnion mounting at 26 of the arbor carrying housing 25 permits said housing and the arbor carried thereby a forward tilting movement from vertical position. In the vertical position, as shown in Fig. 2, the clutch at 47 is connected but in the forwardly tilted position, shown in Figs. 3 and 6, shaft 46 is bodily moved in a forward direction and clutch 47 is disconnected, whereupon the motor driven shaft 40 may continue to rotate but the arbor and the ring castings thereon are at rest.

The shaft 40 (Fig. 3) carries a worm 52 which is in mesh with a worm wheel 53, mounted for free rotation on a shaft indicated by dotted lines 54, which extends through the rear end of the housing 8 and is mounted at its front end in a suitable housing carrier therefor cast integral with the housing 8. A collar 55 is splined on shaft 54 back of the gear 53. Said collar and the worm gear have cooperating clutch elements 57 which, when the collar is free to move, are brought together by a coiled pressure spring 56. A vertically positioned lever 58 is pivotally mounted between its ends back of the shaft 40 and the housing 8. At its lower end a rod 59 is pivotally connected and extends forward and is connected with a hand lever 60 pivotally mounted at one end on the base of the machine housing, the rod 59 being attached between the ends of said hand lever. Lever 58, between its ends, has an operative connection with the collar 55 for moving it on turning. Said lever 58 and at its upper end is equipped with an adjustable screw 61 which passes through it from rear to front, and normally bears at its front end against the rear side of an armature 62 depending from and below a vertical solenoid 63.

Solenoid 63 is secured to a bracket 64 which is mounted on a bar 65 located lengthwise of and at the under side of the housing 10 being held in place by the under plate 66 (Fig. 4). When the armature 62 is in its lowermost position as in Figs. 2 and 3, it bears at its front lower portion against the rear end of the bar 65.

The bar 65 at its upper side is provided with a consecutive series of rack teeth 67. A segmental gear 68 is in mesh with the rack teeth and is secured to a short shaft 69 which passes through and has bearing on a side of the housing 10. A hand lever 70 is securely connected at the outer end of said shaft (Fig. 2), on which a holding member 71 is mounted and which may be releasably secured at a side of the housing 10 to hold the hand lever 70 in any position to which it may be adjusted. In such adjustment, a graduated indicating scale 72 on the housing 10, and a pointer 73 on the lower housing 8 are referred to for a proper adjustment of the saws 21, so that they cut through the ring castings 30 sufficiently but not too far in the machine operation. When the adjustment is made and the hand lever 70 secured against movement, the bar 65 and the

housing 10 are secured and must move simultaneously together.

A drum 74 (Fig. 3) is keyed or otherwise secured on shaft 54 to turn with it. It has a continuous annular cam groove 75 around it in which a downwardly extended plug 76 fixed to the under side of the bar 65 enters. Thus on the drum 75 being turned through a complete revolution, the upper housing 10 is moved back and forth in a complete reciprocation, moving the saws 21 forward to cut through the ring castings 30, and retracting them to disengage therefrom after the splitting operation has been completed. As will hereinafter be described, the turning of the shaft 54 is only through one revolution in each cycle of operations of the machine.

The arbor carrying housing 25 is tilted back and forth between inclined and vertical positions by means of pressure cylinders 77, one at each side of the machine, pivotally mounted at their rear ends on supporting brackets 78. Each has a piston therewithin, and a piston rod 79 extending from the piston forwardly to connect with the arbor carrying housing 25 above its trunnion axis of turning.

The pistons within the cylinders 77 actuated by pressure fluid, such as compressed air or other equivalent conducting conduits 80 and 81 lead to front and rear ends of the cylinders 77, and in the conduits 80 a manually operable valve 82 is interposed. Such fluid pressure carrying conduits 80 and 81 are connected with other conduits 83 and 84, respectively, between their ends, and at the front ends such pipes 83 and 84 are connected with a member 85 at the lower side and depending from cylinder 37 and with suitable passages, which need not be described in detail, for the passage of the pressure fluid simultaneously to the rear ends of the cylinders 77 and above the piston in the cylinder 37 (Fig. 3), so as to retract and draw down the expanding mandrel 32 when the housing is tilted forwardly, when the pressure fluid passes through the pipes 80 to the forward ends of cylinders 77 there is a simultaneous passage of the fluid into cylinder 37 below its piston for expanding the radial members 31 against the ring castings 30 when the arbor is brought to its vertical position directly opposite the saws 21.

At their other ends the conduits or pipes 83 and 84 are connected with a suitable valve housing 86 which has air inlets and air exhaust connections 87 and 88 and within which is a rotary valve, alternately directing the pressure fluid into the pipes or conduits 83 and 84. To operate the valve, an arm 89 is loosely mounted on the valve shaft extending through at least one side of the housing 86 and on said shaft a ratchet wheel 90, with four equally spaced teeth is secured, a dog on the arm 89 bearing against said wheel. The arm is rocked by the connection, through a link 91, to an armature of a solenoid 92, so that when the solenoid is energized by closing an electric circuit in which the solenoid is located, said arm is rocked upwardly and thence downwardly and the valve turned through an arc of 90°. The valve has proper fluid pressure passages through it for conducting the pressure fluid through the conduit connections directed to the opposite ends of the cylinders 77 and 37.

The solenoid 63 previously described is in an electric circuit having wires 93 and 94 connected with the source of electric current, the solenoid being interposed in the length of the wire 93. Both the wires 93 and 94 lead to and are connected with a switch, the opening and closing of which is controlled by a movable lever 95 (Fig. 6). Such lever is in the path of movement of a bell crank actuator 96 pivotally mounted on a carrying plate 97 which is secured to the piston rod 79. With the arbor in inclined position as shown in Figs. 3 and 6, the rearward movement of the piston rod causes the switch arm to be momentarily turned clockwise to the rear to close the circuit and energize solenoid 63 to elevate the armature 62 which, being withdrawn, frees lever 58 to move under the pressure of the spring 56, whereupon the clutch elements at 57 are connected together and shaft 54 with its drum 74 rotated. The momentary clockwise turning movement of lever 95 closes the circuit as the ring casting carrying arbor 29 and the rings thereon come to operative vertical position shown in Fig. 2. After the lever 96 has passed over the switch arm 95, such switch arm returns to its normal position (Fig. 2) thereby breaking the circuit and permitting the armature 62 to drop. The drum 74 makes its complete revolution causing a forward movement of the housing 10 and the ring castings are sawed into two parts. The end of the screw 61 is stopped in forward movement after the clutch has engaged so that on release of the armature 62, it may move at its lower end between the rear end of the bearing 65 and the screw 61, whereby on the returned rear movement of the housing 10, after the ring castings have been sawed, lever 58 at its upper end is turned to the rear and the clutch disengaged. Therefore, the rotation of the drum 74 is a single rotation only until a repetition of the rear movement of the arbor carrying housing occurs. It is, of course, apparent that on an outward movement of the rod 79, the switch arm 95 is not actuated as the bell crank lever 96 rides freely thereof.

Before the described movements of the ring carrying arbor may take place, it is necessary to start the machine in operation and selectively direct the fluid pressure to the forward ends of the cylinder 77 through an energizing of the solenoid 92. To accomplish this, the solenoid is connected at one end of its winding with an electric circuit wire 99 which, together with a second wire 98, lead to a source of electric current. The wire 98 leads to a switch box 100 and connects to one side of the switch therein. Another circuit wire 101 connected to the opposite side of the switch leads to the opposite end of the solenoid winding 92, whereby when the switch at 100 is closed, solenoid 92 is energized. Connected to the wires 98 and 101 are branch wires 103 and 104 respectively which lead to opposite sides of a switch having an actuating lever or arm 102. The single rotation of the shaft 54 turns an arm 105 secured at the rear end thereof through a complete circumference, the free end of the switch arm 102 being in the path of movement of said finger or arm 105.

The switch at 100 is closed manually by pushing on a rod 106 which, at its front end, at the front of the machine has a push button head 107. When the rod is moved to the rear it closes the switch 100 as long as the rod is held against the spring 108 (Fig. 6), which spring will move the rod away from switch closing position as soon as pressure on the head 107 is removed. The momentary operation of the switch arm 102 occurs at the end of the single rotation of the shaft 54, or, as diagrammatically shown in Fig. 6, the finger 105 turning in a clockwise direction will en-

gage a switcharm 102 turning it to close the switch momentarily, after which the arm 102 returns to its initial circuit breaking position. This causes a second energizing of a solenoid at 92, at the end of a ring casting sawing operation, with a consequent reverse flow of liquid pressure to the cylinders 77 and an automatic tilting of the arbor to forward position as in Figs. 3 and 6.

In the use of the machine, assuming the arbor at 29 without ring castings thereon and in a forward tilting position as in Fig. 3 or 6, the machine operator places a stack of ring castings 30 over the arbor, this being readily done as the expanding mandrel 32 is withdrawn, and then presses upon the head 107 of the push rod 106. The circuit through the solenoid 92 is closed and the pistons within the cylinder 77 move to the rear automatically connecting the clutch at 47 substantially at the completion of such movement, and momentarily closing the switch controlled by the arm 95 with an elevation of the armature 62 and an automatic engagement of the clutch at 57. Thereupon the shaft 54 and drum 74 start turning their single revolution with a feeding forward of the dividing saws 21. Such forward feeding preferably is relatively slow and may be controlled by the shape of the groove 75. The finger 105 (Fig. 6) moves away from the switch arm 102. When the forward movement sufficient to carry the saws 21 through the ring castings 30 has taken place, the engagement of the projection or plug 76 in the groove 75 will return the carriage or housing 10 to the rear, the return preferably being more rapid than the forward movement and, of course, controlled by the shape of the groove 75, thereby withdrawing the saws. And the solenoid 63 having had its circuit broken, armature 62 will have dropped into the rearward path of the bar 65, and engaging the screw 61, will cause a disconnection of a clutch at 57. This stops the movement of the carriage 10 at the initial position which it occupied at the beginning of the cycle.

Immediately prior to such stopping of the rotation of shaft 54 the switch arm 102 will have been moved to complete the circut for a second time through the solenoid 92, thereupon reversing the flow of fluid pressure to the cylinders 77 and moving the arbor with the divided castings thereon outward into position for removal of the divided castings and their replacement by a new lot of double width ring castings. As previously stated the clutch at 47 will be disconnected and the arbor be at rest during such removal and replacement. Also, as previously described, the divided ring castings will be released for removal on such outward tilting of the ring arbor and the ring castings which are to be processed will be gripped and held to turn with the arbor when moved to vertical position for the following processing.

The manual levers 60 and 82 are for interrupting or stopping the normal substantially automatic movements, or for controlling them during the setting up of a machine for a particular size or dimension of ring casting to be processed. Each new set-up may require an adjustment of the housing 10 to the bar 65 and this is controlled by the handle 70. The flow of liquid to the front ends of the cylinder 77 may be cut off by closing the valve at 82, and the clutch at 57 may be controlled as to its opening or closing by the hand lever 60 in the setting up operation.

The construction is one with which is performed a very rapid splitting or dividing of the double width ring castings into two parts, from each of which a piston ring may be obtained. The machine attendant is required substantially only to place the ring castings to be processed on an arbor, push the switch closing head at 107, pass on to the next machines in succession and do the same things. After he has taken care of his battery of machines, he returns to the first machine, removes the divided castings and replaces them with a new number of castings to be processed, again starting the machine in operation by pushing on the head 107. This, of course, is done in succession with all of the machines which he attends.

While the disclosure has been made with respect to dividing the ring castings into two parts and, preferably, such division is one substantially universally used, of course, it is to be understood that wider castings may be divided into a larger number of parts without change in the invention; and the invention is not to be limited solely in use to the two part dividing or splitting of double ring width castings.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In a machine as described, an arbor mounted for tilting movement between a vertical and a forwardly inclined position, said arbor being adapted to hold a plurality of superimposed piston ring castings, continuously operated driving means for said arbor, means connecting the driving means with the driving arbor to drive it when in vertical position and automatically disconnect on movement of the arbor to tilted position, a vertically disposed shaft, a plurality of saws carried thereby one for each of said ring castings, means for continuously driving the shaft, a movable carriage on which said driving means and said shaft are mounted for movement toward and away from said ring castings when the arbor is in vertical position, and means for moving said carriage toward said ring castings, when the arbor is moved to vertical position to saw therethrough between the upper and lower sides of each of said castings, and for retracting the saws after said sawing through has been completed.

2. A structure as defined in claim 1, said means for moving the carriage including a shaft normally at rest, means for automatically connecting said shaft with said continuously operable driving means for the arbor substantially simultaneously with the movement of the arbor to vertical position, and means on return of the carriage to its initial position after the sawing through of the ring castings has been completed, and means for disconnecting said shaft after the rotation thereof through one complete turning about its longitudinal axis.

3. In a construction as described, an arbor, a spindle extending therefrom, a housing through which the spindle extends, means for tiltably mounting said housing to move between positions in one of which said arbor and spindle are vertically disposed, and in the other of which they are inclined to the vertical, means for driving the spindle, a rod associated with the arbor and extending therebelow, radial jaws associated therewith and carried by the arbor, moved outwardly on movement of said rod in one direction and released on movement thereof in the opposite direction, whereby a plurality of ring castings may be located over and around said arbor and releasably connected to turn therewith, pneumatic

means including a piston cylinder structure connected with said rod for moving it in opposite directions, a second pneumatic means connected with said tilting housing, including a piston and cylinder for controlling the flow of pressure fluid to said piston cylinder structures to simultaneously force out said ring casting engaging jaws upon operation of housing tilting piston cylinder structure to move the arbor to a vertical position, and for releasing said castings on operation of said piston cylinder structure to move the arbor to its tilted position.

4. A construction as defined in claim 3, said control means including a rotary valve, a solenoid and armature connected with the valve to alternately connect fluid pressure with opposite sides of said pistons in said piston cylinder structures, an electric circuit in which the solenoid is included having a normally open switch therein, manual means for closing said switch, a second normally open switch in said circuit, and a driving means including rotatable shaft and a finger extending therefrom to momentarily close the second switch on a complete rotation of said shaft.

5. In a machine as described, a supporting housing, an arbor carrying housing located at the front thereof and mounted on the first housing to tilt from a vertical to a forwardly tilted position and vice versa, a vertically positioned arbor mounted for rotation at the upper end of the arbor carrying housing, a continuously operable driving means, means for releasably connecting and disconnecting said driving means with said arbor to rotate the arbor about a vertical axis when its auxiliary housing is located in a vertical position and to disconnect the arbor from said driving means when in forwardly tilted position, said arbor adapted to be located therearound a plurality of superimposed piston ring castings, a carriage mounted at the upper side of the housing for forward and rear movements, a vertical shaft mounted for rotation on the carriage at the front portion thereof, positioned back of and parallel to the vertical axis of rotation of said arbor when said arbor is in vertical position, a plurality of horizontally spaced casting cutting saws mounted on said shaft, means to continuously drive the shaft, means normally disengaged from said continuous driving means, the operation of which will move said carriage, a predetermined distance in a forward direction and back to initial position, means for moving the arbor to vertical position and back to tilted position, and manually operable means for substantial simultaneously rendering said last tilting means operable to move the arbor to vertical position from its tilted position and for connecting the carriage moving means with said continuously driving means, combined with means operated by said carriage moving means for rendering the arbor tilting means operative a second time when the carriage has made a reciprocable movement forward and a return reciprocable movement to its initial rear position.

6. A construction as defined in claim 5, combined with means for connecting said piston ring castings with the arbor simultaneously with the movement of said arbor to vertical position, and for releasing said castings upon movement of the arbor to its tilted position.

7. In a machine as described, a support, a housing tiltably mounted at the front of the support for rocking movement about a horizontal axis, a driven arbor mounted at the upper of the housing adapted to be located with its axis vertical with the housing in one position, a piston rod connected with said housing, a cylinder into which the piston rod extends, means for alternately conducting a pressure fluid to opposite ends of the cylinder to move the piston rod longitudinally and change the position of the said housing from vertical to inclined and vice versa, a rotatable shaft normally at rest, continuously operable driving means adapted to be connected with said shaft, a clutch for connecting said driving means with the shaft, an electric circuit including a solenoid and armature, said armature in one position holding the clutch disengaged, means mounted on said piston rod to move said armature into clutch freeing position to connect said shaft with the driving means occurring on moving said housing to vertical position, a plurality of saws mounted to turn about a vertical axis, a moveable carriage therefor, interengaging means on said carriage and shaft for moving the saws toward the arbor and returning the saws to the initial position, said armature on said return being freed to occupy its initial position to free disconnect said clutch to free the shaft from said driving means.

8. In a construction of the class described a support, a housing mounted for tilting movement on said support for movement between vertical and forwardly inclined positions, a ring casting holding arbor mounted for rotation about a vertical axis located at the upper end of said housing, a carriage slidably mounted on said support for forward and backward reciprocating movements, a vertical shaft mounted at the front end of said carriage, a plurality of spaced horizontal saws at the lower end of said shaft back of said arbor when it is in vertical position, fluid pressure piston cylinder means connected with said housing for moving it to vertical and inclined positions, means for entering said fluid alternately to opposite ends of said piston cylinder means effective to move alternately said housing to vertical and inclined positions, a rotatably mounted shaft, a continuously operable driving means, releasable clutch means for connecting said shaft and driving means interposed in the path of said carriage, interengaging means for moving the carriage forward and thence rearwardly when the shaft is driven by connection to said driving means, and means for connecting the clutch to effect such action upon movement of the housing and arbor to vertical position, said clutch being disconnected by movement of the carriage upon return thereof to rear position where said shaft has turned one complete revolution.

9. A construction as defined in claim 8, and a driven spindle to which said arbor is connected, gearing and shaft means between said spindle and the driving continuous means including telescoping shaft members brought together when the housing is moved to vertical position and separated when said housing is moved outwardly to tilted position.

10. In a machine as described, an arbor mounted for tilting movement between two angular positions, said arbor being adapted to hold a plurality of piston rings in side by side relation to each other, continuously operated driving means for said arbor, means connecting the driving means with the arbor to drive it when in one position and automatically disconnect it on movement of the arbor to the other position, a shaft disposed in parallelism to the axis of the arbor when said arbor is driven, a plurality of saws carried thereby, one for each of said ring castings, means for

continuously driving the shaft, a movable carriage on which said shaft is mounted, movable toward and away from said castings when the arbor is in its driven position and means for moving said carriage toward said ring castings when the arbor is moved to its driven position to saw through between the opposed flat side of each of said castings, and for retracting the saws after said sawing through has been completed.

11. In a machine as described, a driven shaft, a plurality of spaced saws carried thereby, means for driving the shaft, a movable carriage upon which said shaft and said driving means are mounted, a ring casting carrying arbor, means for mounting said arbor for movement from one position in which its axis is substantially parallel to said shaft to another inclined thereto with the arbor moved away from said saws, said arbor being adapted to carry a casting to be sawed through from its outer to its inner curved side by said saws, means for driving said arbor when in

the first mentioned position, said means being disconnected when the arbor is in the second position, and means for moving said shaft and saw carrying carriage toward the arbor and the casting thereon when the arbor is moved to the first mentioned position and for retracting them after the casting has been sawed through by said saws.

12. A construction as defined in claim 11, and means for moving the arbor to the second mentioned position upon said saws being retracted.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,900,755	Bruce	Mar. 7, 1933
2,364,432	Farkas et al.	Dec. 5, 1944
2,373,907	Olson	Apr. 17, 1945