Nov. 13, 1945. H. M. SCARFF 2,388,872

MILLING MACHINE

Filed Jan. 24, 1944 3 Sheets-Sheet 1

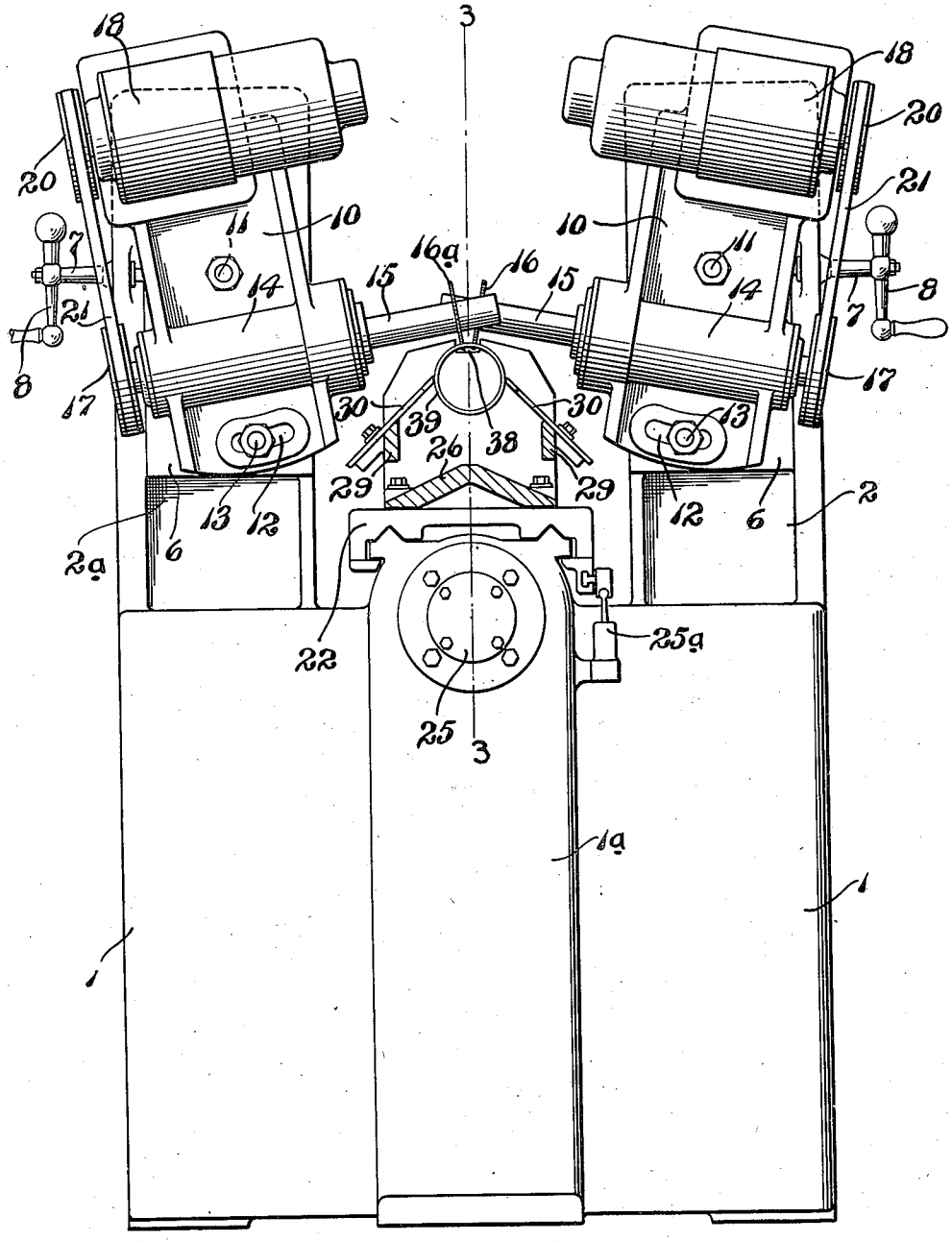

Fig. 1.

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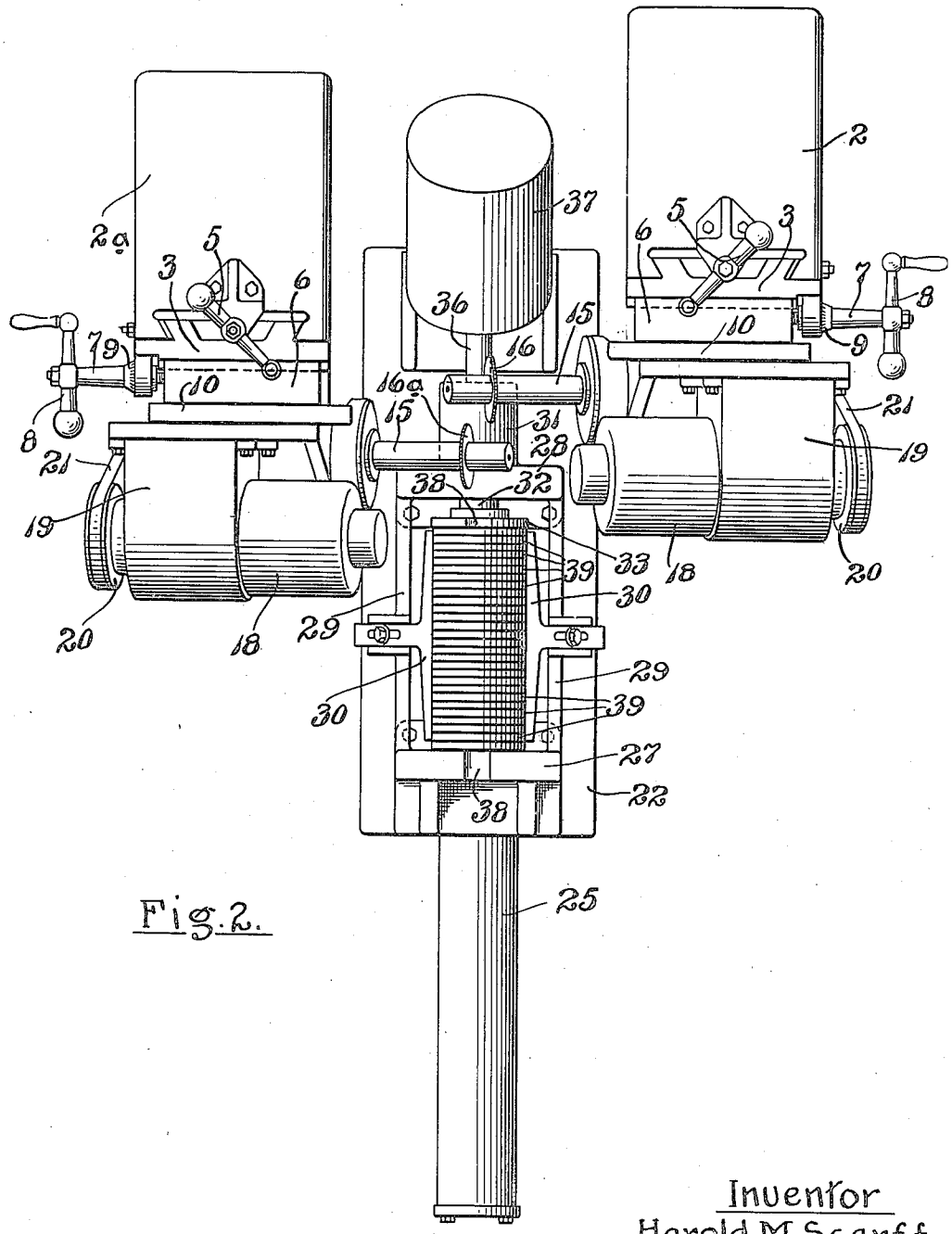

Fig. 2.

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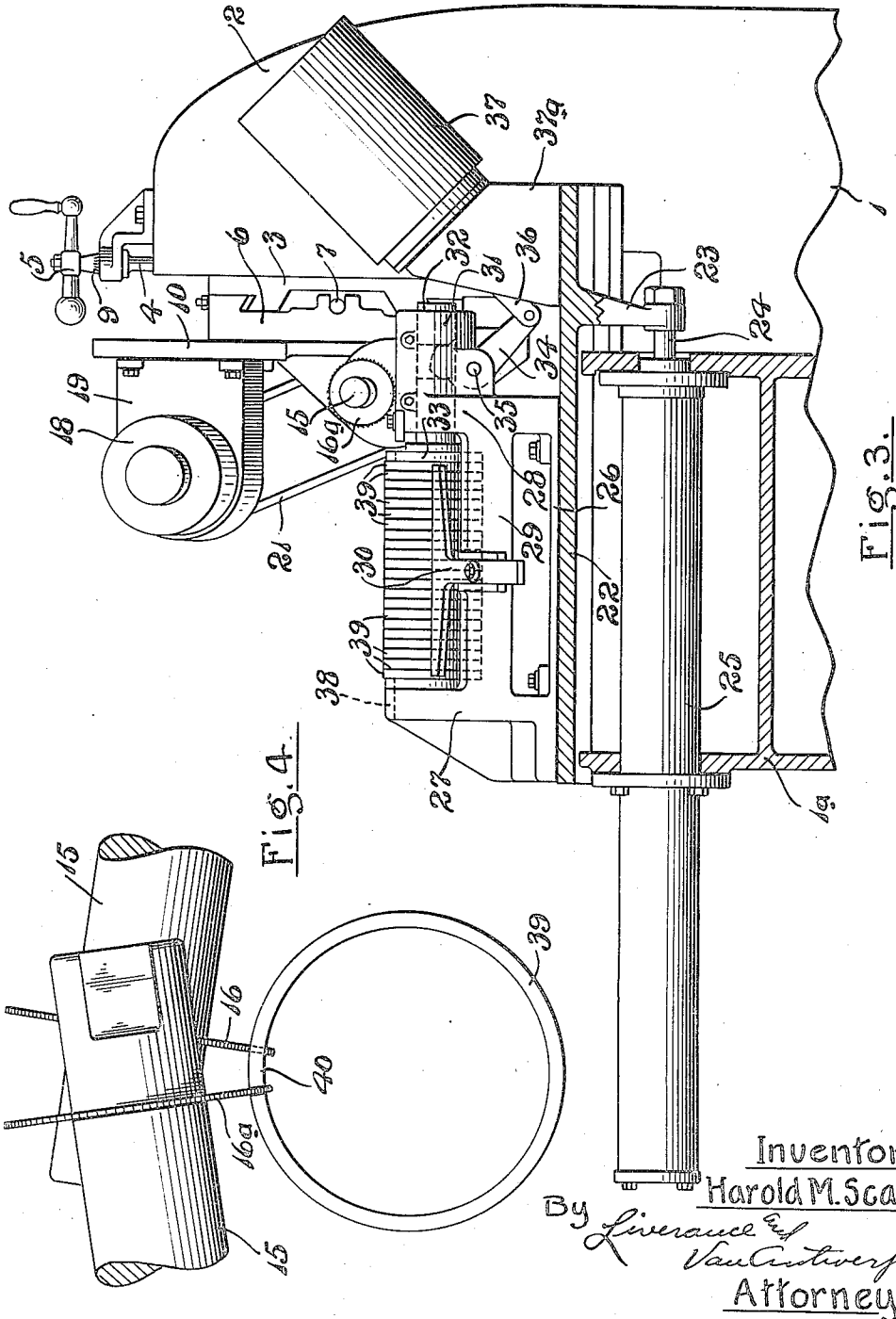

Fig. 3.

Fig. 4.

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Patented Nov. 13, 1945

2,388,872

UNITED STATES PATENT OFFICE

2,388,872

MILLING MACHINE

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Application January 24, 1944, Serial No. 519,474

4 Claims. (Cl. 29—70)

This invention relates to milling machines. One place where the milling machine of the present invention is very useful is in cutting the gap piece partings or segments from piston ring castings, it being understood that the ring castings are of an out-of-round form and of a character such as made by cutting a circular pattern of the proper dimensions at one side and inserting a short segment between the ends of the pattern and casting the rings from the out-of-round pattern thus produced. In finishing the piston rings a segment or gap piece comparable to the segment which was inserted in the pattern is removed in order that the finished rings when closed at the parting thus made will have a circular form and conform to the walls of the cylinder in which they are used and with the ends of the ring brought substantially together. Furthermore, the cutting of the gap piece segment initially does not complete the finished machining of the ends of the piston ring and in a further step of the process of the completing of the finishing of the piston rings, it is desirable that the ends of the ring be finished machined and the present invention is useful for that purpose. While the machine disclosed as an embodiment of the invention is one which is in daily use for the purposes stated with reference to piston ring production, there are many other places of use for the invention and the invention is not to be considered as restricted solely to piston ring manufacture.

It will be apparent that to cut the gap piece or segment from the piston ring castings on radii of the casting, when the two ends are brought together they will not come into direct abutting engagement but the space between the ends of the piston rings will be wider at one side than the other and though the difference in width is small and measured in thousandths or ten-thousandths of an inch, such character of parting in a piston ring is undesirable and is not as good as one in which the ends of the piston rings when brought together are substantially exactly parallel. With the present invention such parallelism is obtained and at the same time a high quantity production is possible, the segments being milled from the piston ring castings rapidly and accurately and also the finish machining.

An understanding of the invention may be had from the following description taken in connection with the accompanying drawings of a practical and in use embodiment of the invention in which,

Fig. 1 is a front elevation of the milling machine.

Fig. 2 is a plan view thereof.

Fig. 3 is a vertical section from front to rear of the upper part of the machine, substantially on the plane of line 3—3 of Fig. 1, and

Fig. 4 is a view enlarged, showing the manner of milling the gap piece from a piston ring casting.

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

In the construction a lower base support having lateral wings 1 and a central support 1a extending forward of the wings is provided. At the upper ends of the lateral wings 1 housing supports 2 and 2a extend upwardly and are spaced apart from each other as best shown in Fig. 1, the support 2 being located rearward of support 2a.

At the front side of each of the housing supports 2 and 2a a vertical member 3 is mounted for sliding adjustment and is raised and lowered by means of a screw shaft 4 at the upper end of which a manually operable crank or handle 5 is secured. At the front side of each of the members 3 a horizontal slide 6 is mounted thereon and is adjusted to different positions by means of a screw shaft 7 operated by a crank or handle 8. The extent or amount of adjustment in each case is indicated by suitable indicating scales shown at 9.

At the front of each of the slides 6 a generally vertical plate 10 is pivotally mounted on the slide 6 on a pivot 11 between its upper and lower ends (Fig. 1). Adjacent its lower end each of the plates 10 has an arc-shaped slot 12 through which a bolt 13 extends from the lower part of the associated slide 6 to receive a nut whereby the plates 10 may be angularly adjusted about the pivots 11 and fixedly secured in any position to which adjusted.

The plates 10 between the pivots 11 and the bolts 13 are provided with transverse journals 14 in each of which a shaft 15 is mounted for rotation. As shown the housing support 2 is disposed back of the support 2a, therefore the shaft 15 carried by support 2a is located in front of the shaft 15 carried on the support 2 as in Fig. 2. Adjacent the free ends of the shafts 15, said shafts extending toward and passing by each other, a milling cutter 16, 16a is releasably secured. As shown in Fig. 1 the two cutters, one located back of the other are disposed in planes each at an acute angle to a vertical plane between them. At the outer end of each of the shafts 15

a driven pulley or wheel 17 is secured. At the upper ends of each of the plates 10 and at the front thereof an electric motor 18 carried on a supporting bracket 19 has its shaft equipped with a driving pulley or wheel 20 which, through an endless belt 21 passing around it and the wheel 17 below, operates to drive a shaft 15. Each of the shafts are independently driven as is evident.

Above the central forwardly extending supporting member 1a of the main base support a horizontal table 22 is mounted on suitable guides or ways for reciprocation from front to rear. Near the back end of the table an integral arm 23 extends downwardly therefrom and is connected with a piston rod 24 which enters a horizontal cylinder 25 and is connected with a suitable piston therein (not shown). The entrance of pressure alternately at opposite sides of the piston within the cylinder serves to reciprocate the rod 24 with an accompanying reciprocatory movement of the table 22. The entrance of the fluid pressure into the cylinder at either side of the piston 25 may be controlled automatically by a suitable control 25a mounted at a side of the supporting member 1a and engaged by an operating block adjustably mounted at a side of the table 22 as shown in Fig. 1. The detail of the control of the table through said piston cylinder apparatus is not shown as it is old and well known and available to those skilled in the art.

At the upper side of the table 22 a fixture 26 is bolted, having two spaced vertical ends 27 and 28 and horizontal side bars 29 extending between the ends to each of which a member 30 is adapted to be adjustably secured. Said members 30 extend upwardly and at an angle toward each other and at their upper portions are provided with relatively long contact blades adapted to come one at each side of a plurality of piston ring castings located between them.

The inner or rear end 28 of the fixture has a cylindrical guide 31 cast integral therewith through which a plunger 32 is mounted for sliding movement, at its inner end being equipped with a head 33. The plunger 32 is operated by means of a bell crank 34 engaging at one end with the plunger and pivotally mounted between its ends at 35 on the rear end 28 of the fixture. The end of the other arm of the bell crank 34 is pivotally connected to a piston rod 36 which extends into a cylinder 37 and is connected with a piston therein (not shown), the cylinder 37 being mounted on a suitable bracket 37a carried by and movable with the table 22. Said cylinder 37 is adapted to have a fluid pressure medium conducted to it at either side of the piston therein for moving the plunger 32 and attached head 33 in desired directions.

In the upper side of the front end 27 of the fixture and in the upper edge of the head 33 notches 38 (Fig. 1) are cut for the reception of a flat bar or other like support on which a plurality of piston ring castings 39 may be disposed with their sides in engagement. The piston ring castings will be located on the bar from which they are suspended with all of the segment portions thereof over the bar. It is to be understood that in casting the piston ring castings the places where the segments or gap pieces are to be milled therefrom are properly marked in casting as, for example, by a groove at the inner side of the segment portion extending from one side of the ring to the other so that the one who loads the ring castings on the bar can readily dispose the segments which are to be milled at their proper places. The bar with the plurality of ring castings thereon is laid at its end portions in the wide slots or notches 38 and fluid pressure is introduced into the cylinder 37 below the piston therein to force the head 33 against the ring casting at the inner end of the plurality of ring castings, clamping them snugly against each other and against the front end 27 of the fixture described. The ring castings are held clamped against each other and are ready to have the milling operation performed thereon for removal of the segments or gap pieces.

While I have described the specific and particular fixture which is used in the initial milling of the gap piece segments from piston ring castings, it is to be understood that the fixture 26 which is bolted to the upper side of the table 22 is removable from the table and may be replaced by other fixtures of like nature for different sizes of piston ring castings; or by fixtures of a different nature for the handling of the piston rings after the gap piece segments have been initially cut therefrom and the ends of the rings are to be finished milled.

The ring castings 39 clamped together in side by side relationship and lying with their axes horizontal are centered by the engagement of the members 30 against opposite sides thereof (Fig. 1). On rearward movement of the table 22 the ring castings are brought successively to the milling cutters 16a and 16, and the gap piece segments shown at 40 in Fig. 4 are cut in succession one from each of the ring castings. The lower edge portions of the milling cutters pass through the slots or recess at 38 as shown in Fig. 1. Because of the adjustment of the plates 10 about the axes of the pivots at 11 the milling cutters 16 may be located at desired selected angles to the vertical such that the two ends of a ring casting after the gap piece segment has been removed will come into direct abutting engagement upon contracting the ring casting, and the surfaces of said ends will lie in parallel relation to each other.

It is further apparent that because of the vertical adjustment provided by the mounting of the members 3 on the housing supports 2 and 2a the milling cutters may be adjusted vertically for ring castings of different diameters; and that because of the horizontal adjustment of the slides 6 upon the members 3 the milling cutters may be adjusted inwardly or outwardly for the milling of any desired or preselected width of gap. The machine, therefore, is useful in its milling operations for a large number of sizes of ring castings, having a wide range of adjustment to take care of different sizes or diameters of the castings and of different lengths of parting segments to be cut therefrom. And with any ring castings of whatever diameter being processed and with whatever length of segments is cut the milling cutters may be located in a proper angular position so that the ends of the ring castings after the parting segments have been removed will come together when the casting is closed without the two ends disposed at an acute angle to each other but in parallel relation.

The construction described is in practical use and operation and is completely satisfactory for the purposes for which it is designed. It is used for the initial milling of the gap segments and also for the final or finished milling of the ends of the piston rings at the partings or gaps.

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 milling machine, horizontally spaced vertical supports each having a vertical front face and one of said supports being located back of the other, a member mounted for vertical sliding adjustment on the front face of each support, means for adjusting said member, a slide mounted at the front of each of said members for horizontal adjustment, means for adjusting said slides, a vertical plate pivotally mounted between its ends on each of said slides to turn about a horizontal axis, said plate having a transverse journal, a shaft mounted for rotation in said journal, means for holding each of said plates at any position to which it may be turned about its pivot, a milling cutter mounted on and rotatable with each shaft, said shafts extending toward each other and one being located back of the other, and means mounted on each of said plates for driving its associated shaft.

2. In a construction of the class described, spaced vertical supports each having a substantially vertical front face, the face of one of said supports being located in a plane back of the face of the other support, a vertical member mounted for vertical sliding movement on each of said supports of said face, manually operable means for adjusting each of said members, a slide mounted for horizontal movement on each of said members, means for manually adjusting said slides to predetermined selected positions, a vertical plate pivotally mounted between its ends on and at the front of each slide to turn about a horizontal axis, a transverse journal on each of said plates located below its pivot, a shaft mounted for rotation on and extending through each journal, said shafts carried by said plates extending toward each other with one located back of the other, milling cutters mounted on the adjacent end portions of said shafts, means for holding each of said plates in any selected position to which it may be turned about its pivot, and means mounted on each of said plates for driving the shaft carried thereby.

3. In a construction of the class described, two rotatably mounted shafts, said shafts occupying a generally angular position to the horizontal, said shafts extending toward each other and with their axes located in different vertical planes one back of the other, milling cutters secured to and rotatable with the shafts and connected to said shafts at their overlapping end portions, means for driving said shafts, and individual means for changing the shafts in vertical position, in angular position and in relative horizontal position, each of said means being separately operable, as specified.

4. In a milling machine, a horizontal reciprocable table upon which work is adapted to be held and mounted for milling operations, two shafts extending toward each other with one back of the other located over said table and underneath which the work is adapted to be passed, means for mounting said shafts for rotation, a milling cutter secured to each shaft, said cutters being secured to the shafts at their adjacent end portions, means for adjusting and securing the shafts at selected angular positions to the horizontal, means for moving said shafts bodily in vertical directions and means for adjusting said shafts horizontally to different relative positions with respect to each other.

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