May 19, 1936. J. VERDERBER ET AL 2,041,309

AUTOMATIC MACHINE

Filed June 22, 1932 7 Sheets-Sheet 1

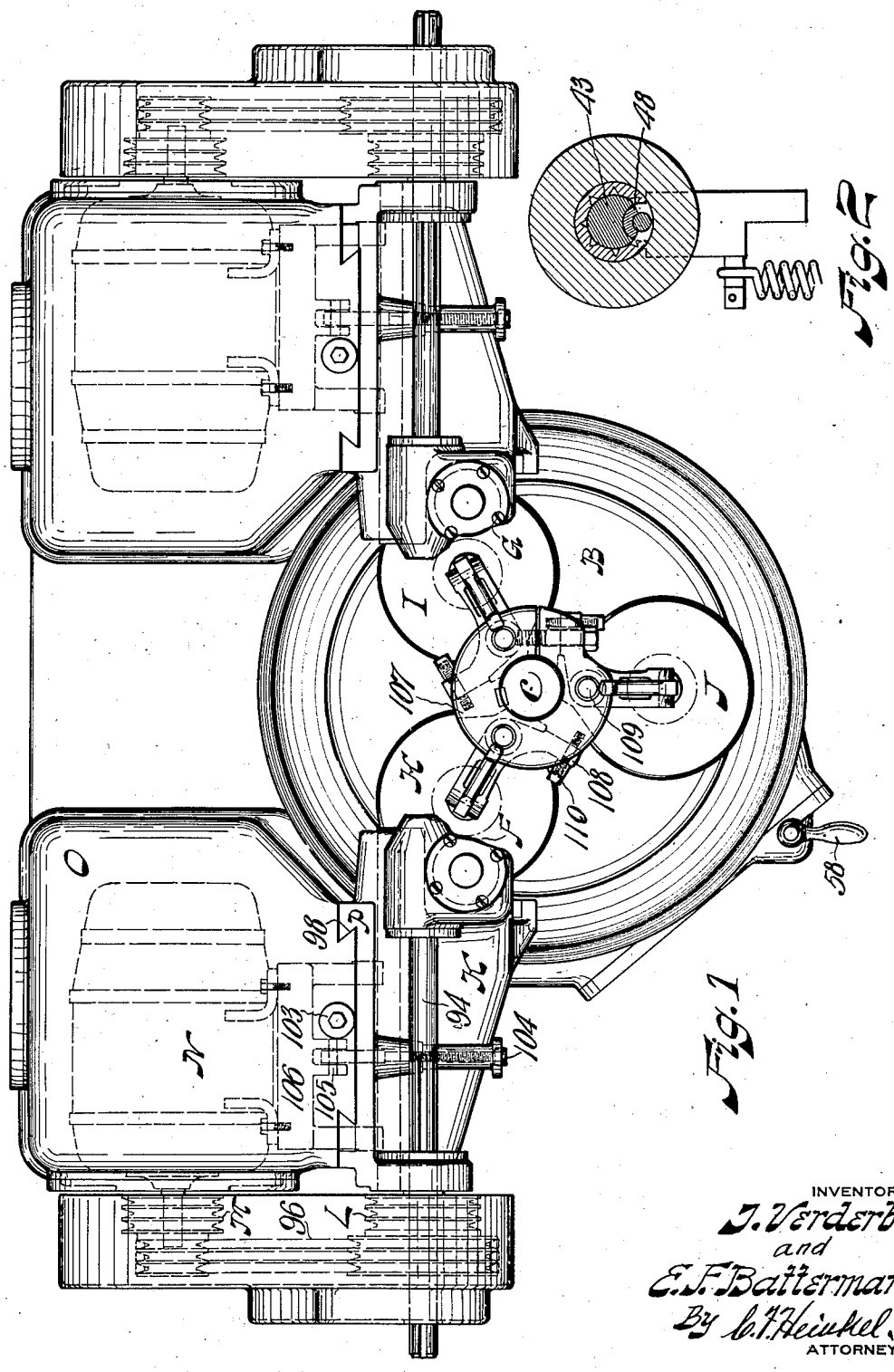


Fig. 2

Fig. 1

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AUTOMATIC MACHINE

Filed June 22, 1932 7 Sheets-Sheet 2

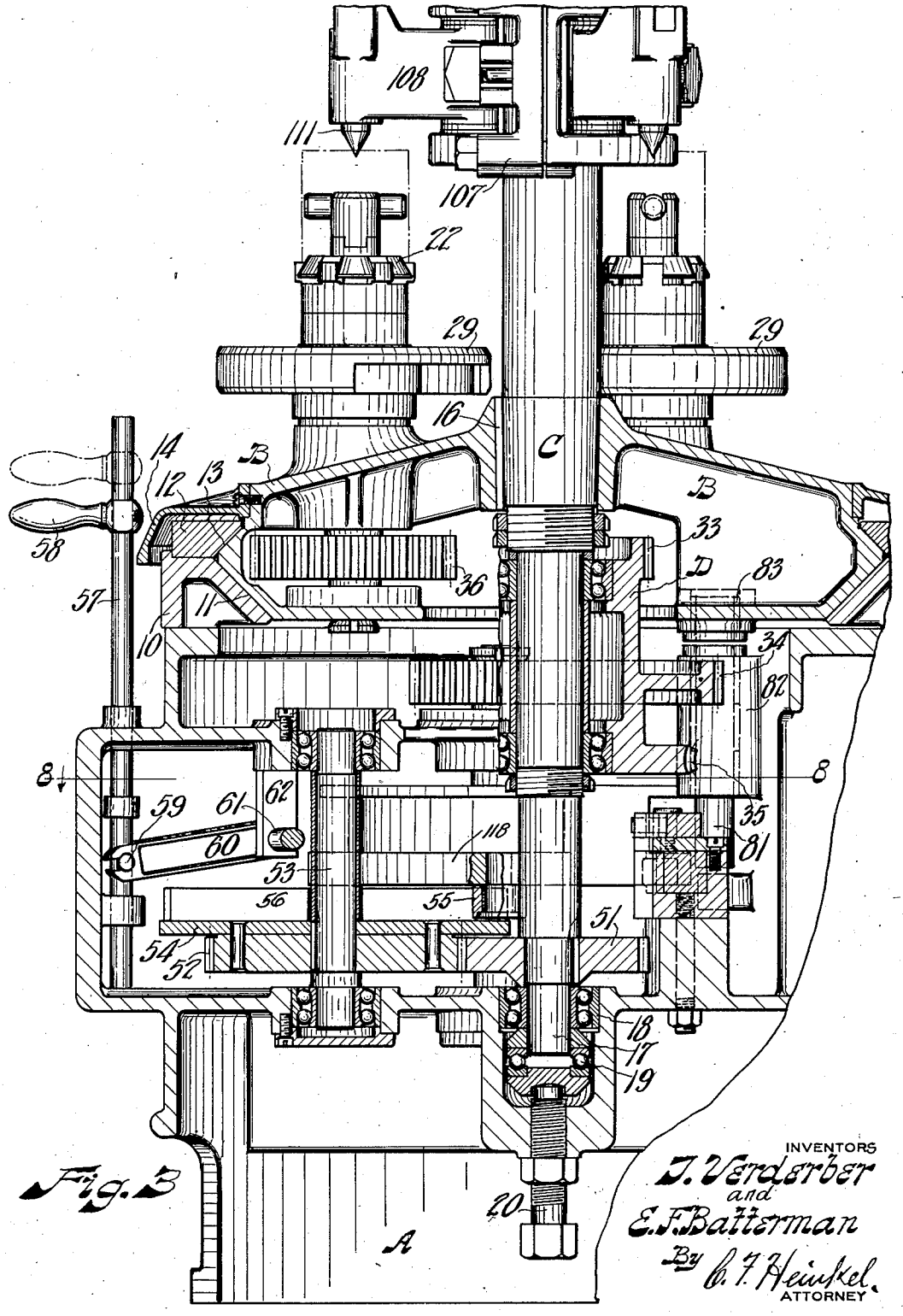


Fig. 3

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AUTOMATIC MACHINE

Filed June 22, 1932 7 Sheets-Sheet 3

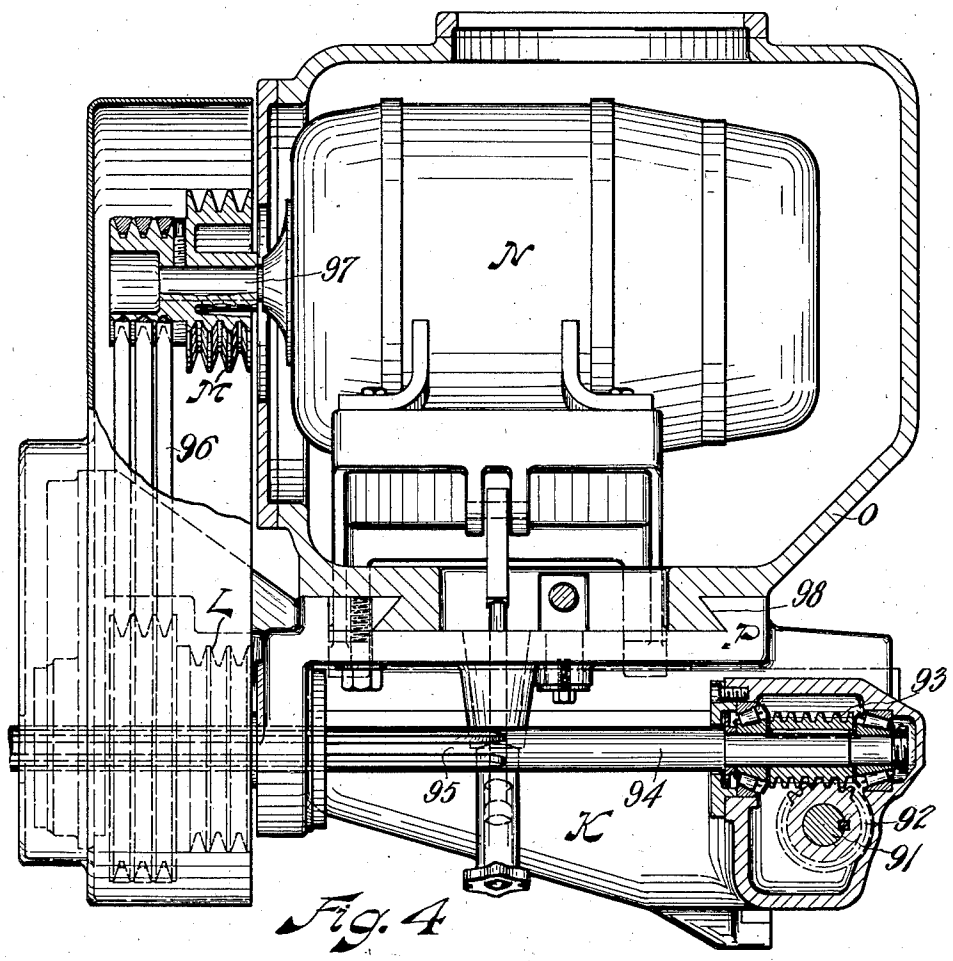


Fig. 4

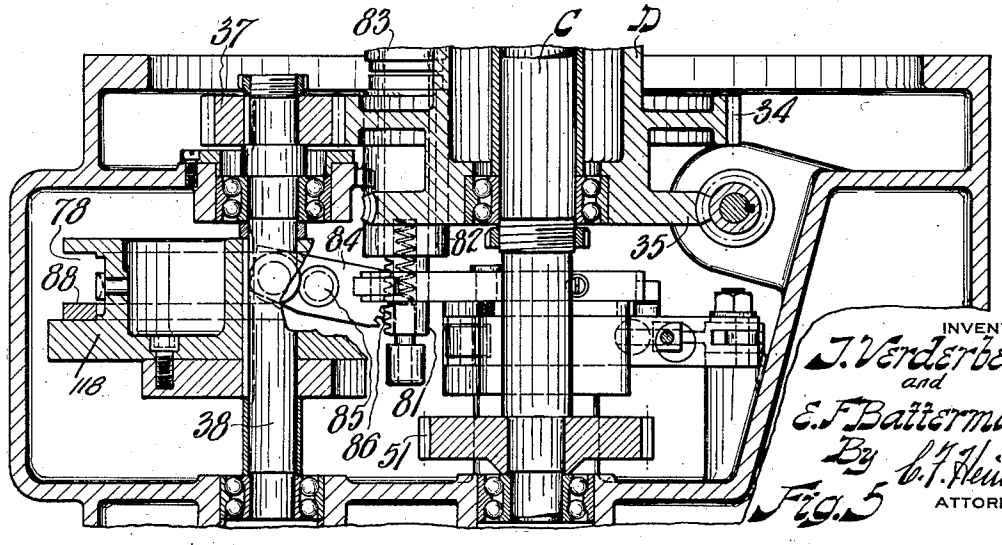


Fig. 5

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AUTOMATIC MACHINE

Filed June 22, 1932 7 Sheets-Sheet 4

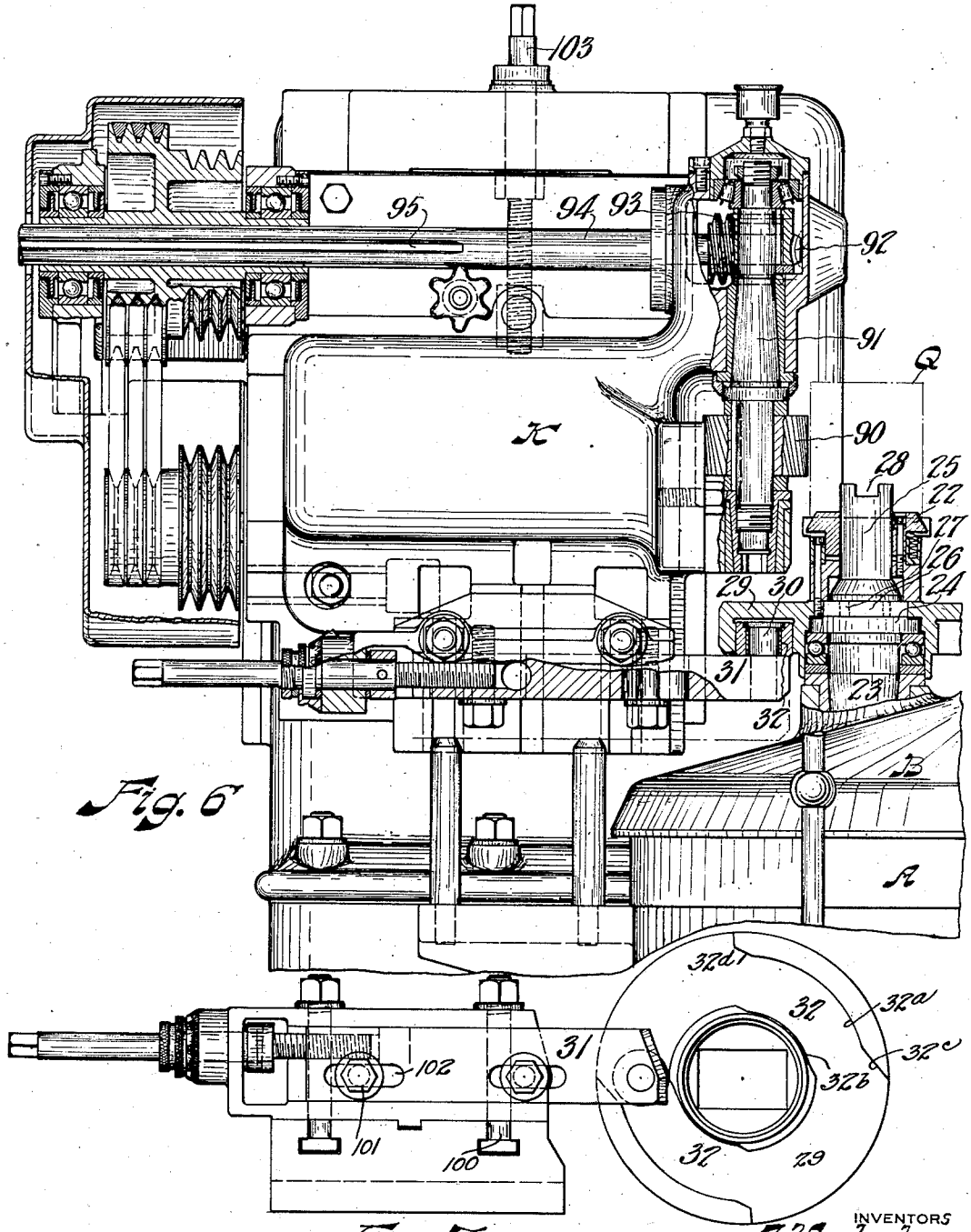


Fig. 6

Fig. 7

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AUTOMATIC MACHINE

Filed June 22, 1932 7 Sheets-Sheet 5

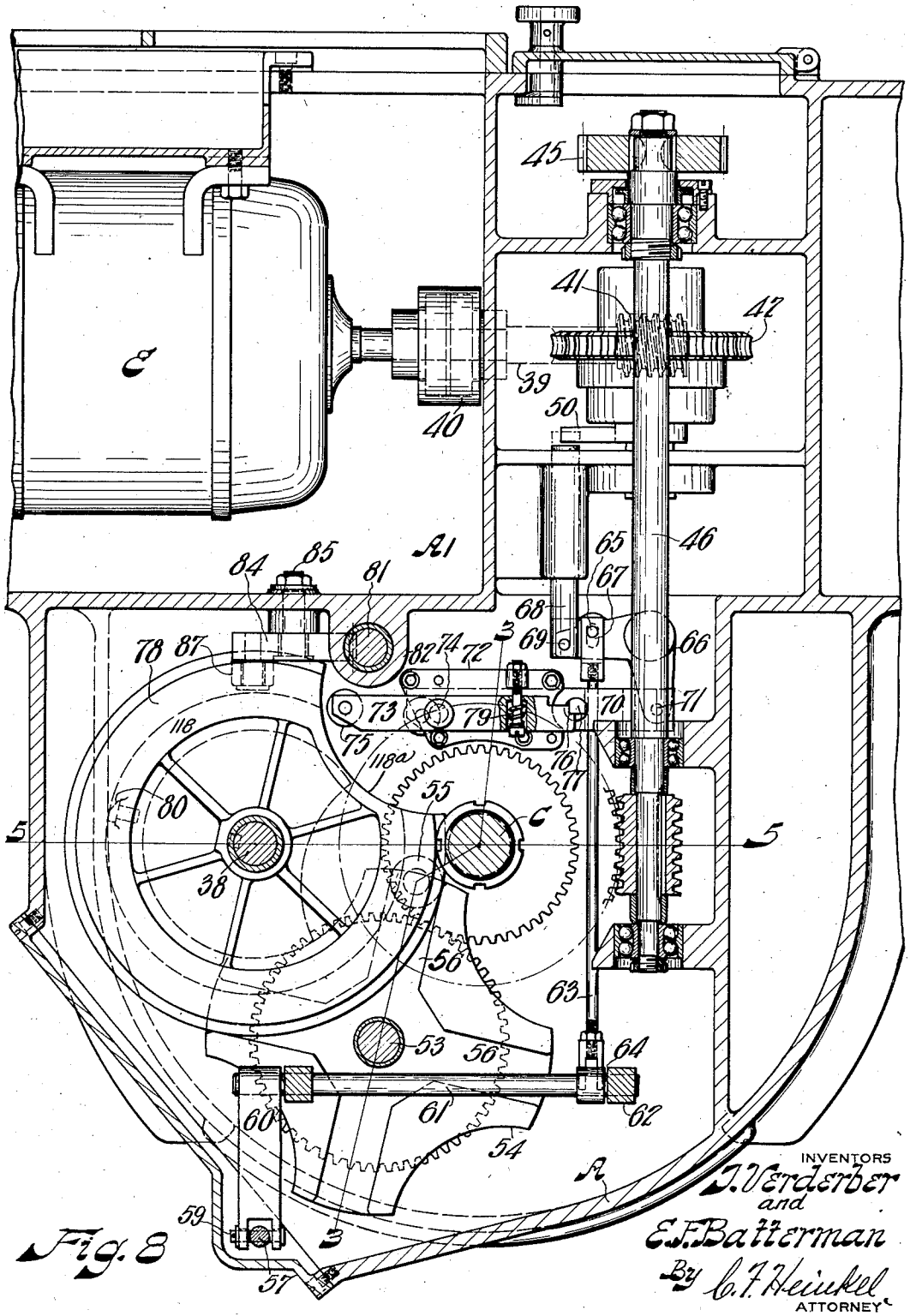


Fig. 8

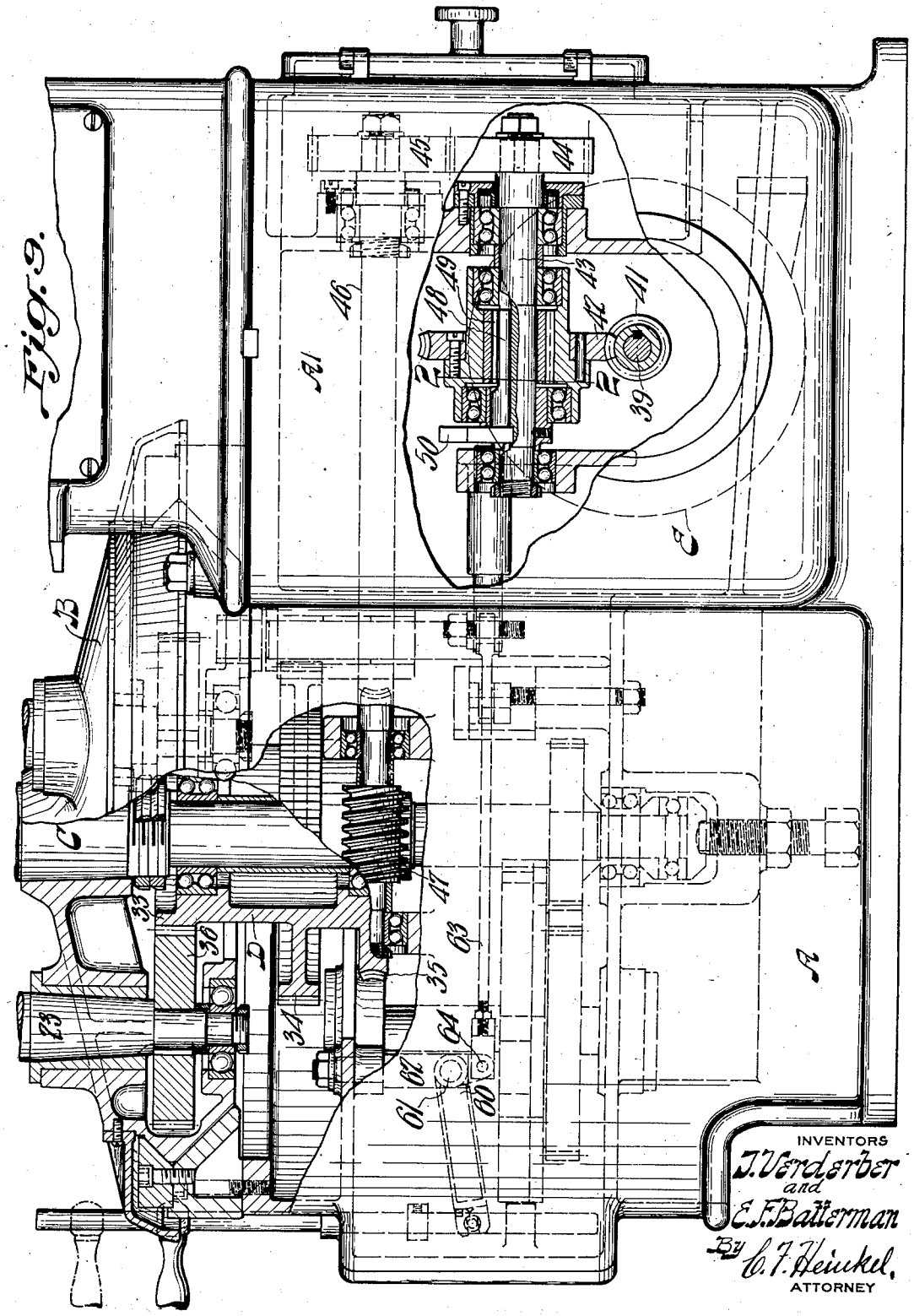
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AUTOMATIC MACHINE

Filed June 22, 1932 7 Sheets-Sheet 6

Fig. 9.



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May 19, 1936. J. VERDERBER ET AL 2,041,309

AUTOMATIC MACHINE

Filed June 22, 1932 7 Sheets-Sheet 7

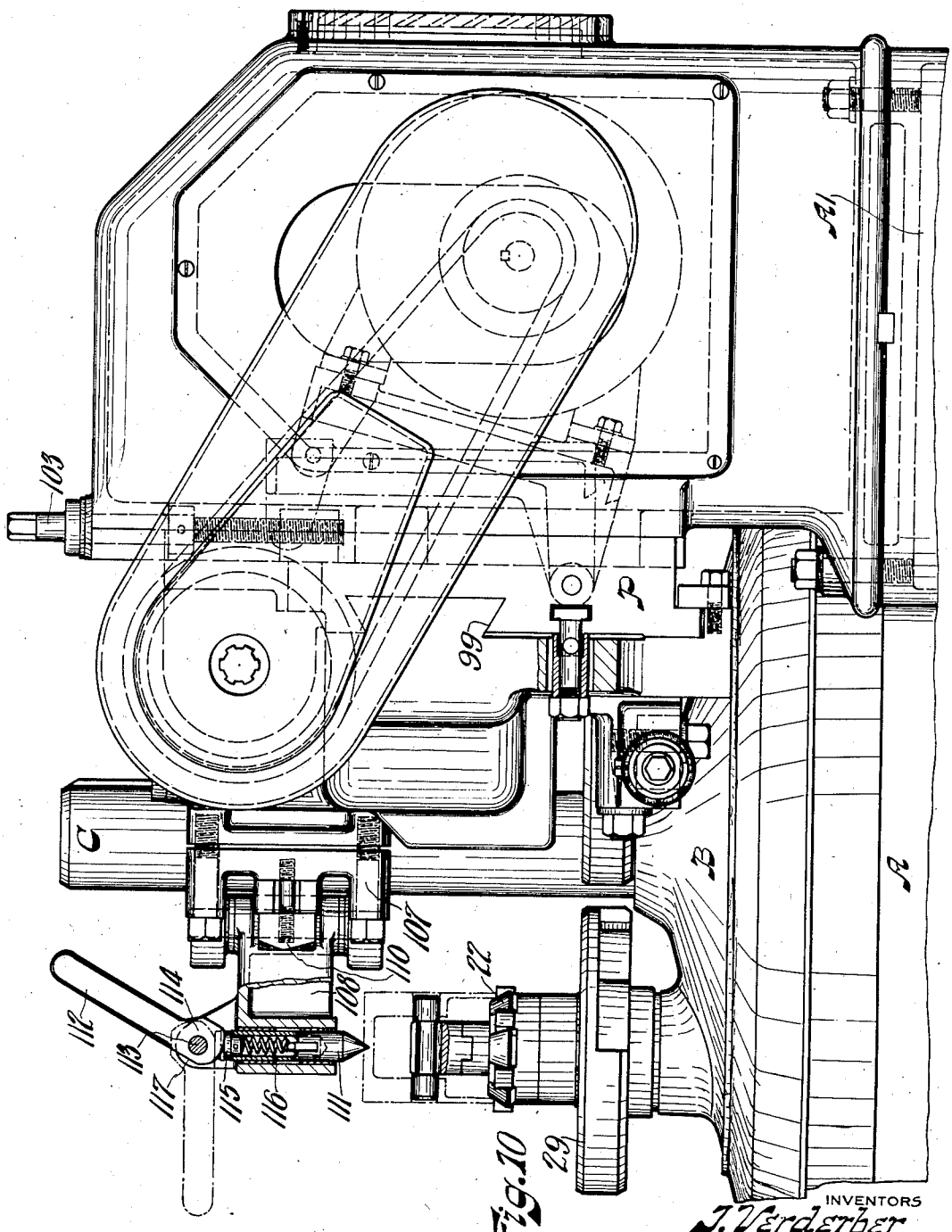


Fig. 10

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Patented May 19, 1936 2,041,309

UNITED STATES PATENT OFFICE

2,041,309

AUTOMATIC MACHINE

Joseph Verderber, Cleveland, and Elmer F. Batterman, East Cleveland, Ohio

Application June 22, 1932, Serial No. 618,740

29 Claims. (Cl. 29—38)

Our invention relates to machines for automatically performing machining operations on articles.

The object of our invention is to provide a simple, and efficient machine to perform machining operations on articles and to make the machine automatic as far as possible so that an operator needs only to load and unload the machine with and of articles and stop and start the machine.

We attain our object by the machine illustratively shown in the accompanying drawings wherein:

Fig. 1 is a plan view of a machine embodying our invention for automatically relieving pistons.

Fig. 2 is a section of the clutch mechanism taken on line 2—2 of Fig. 9.

Fig. 3 is a vertical section taken on line 3—3 of Fig. 8.

Fig. 4 is a plan view of the cutter driving and adjusting means, partly in section.

Fig. 5 is a partial vertical section, taken on the line 5—5 of Fig. 8.

Fig. 6 is a vertical section of the cutter adjusting and driving means.

Fig. 7 is a partial side view of cutter adjusting means and the cutter guide groove.

Fig. 8 is a transverse section taken on the line 8—8 of Fig. 3.

Fig. 9 is a partial front view partly in section to more clearly show the driving means.

Fig. 10 is a side view of the upper part of the machine of Fig. 1.

Similar reference characters refer to similar parts throughout the views.

It has been found in practice that pistons work better and produce better results when the sides thereof, where the hole for the wrist pin enters, are relieved.

Various machines and devices have previously been made to relieve pistons but all so far made require too much time to relieve pistons.

Our invention provides a machine wherein the relieving is done automatically and all an operator needs to do is to take a relieved piston out of the machine and to place an unrelieved piston into the machine while the machine relieves other pistons therein.

The machine illustrated relieves both sides of one piston but it appears to be quite obvious that the same machine with suitable modifications can be built to relieve two or more pistons on both sides at the same time and, likewise, can perform machining operations on other articles with suitable modification of the machine.

The machine specifically shown in the drawings will now be described.

The base and table

The base or bed A rests on a floor and is of sufficient height to bring the top of the table B to a convenient height for convenient operation and has the column part A1 at the rear thereof.

The annular member 10, Fig. 3, is secured to the top of the base and has the taper bore 11. The annular member 12 is secured to and centralized on the member 10 and has the taper bore 13.

The table B has oppositely tapered sides fitting to the bores 11 and 13 and is centralized thereby. The annular flange 14 is secured to the table and vertically covers the joints between the base and the members 10 and 12 and table.

The table shaft or spindle C has the table keyed thereon at 15 and has the part 17 journaled on the bearings 18 in the base. The end thrust bearing 19 is adjustable longitudinally of the table shaft by means of the adjusting screw 20 threaded into the base and supporting the table shaft endwise.

The table B, in this instance, has three stations or pistons holding or locating means thereon. Each of these stations has the taper member 22, Fig. 6, to receive and centralize pistons and also has the shaft 23 extending down into the table and the flange 24 on the upper end thereof.

Each of the stubs 25 is separate from the shaft 23 and has the flange 26 on the lower end thereof to contact the flange 24 with the locating dowel pins 27 between the flanges so that the stubs can be removed and replaced with other stubs suitable for different pistons. Each of the taper members 22 is also removable to be replaced by different locating means for different pistons. The upper end of the stubs have the grooves 28 to receive a pin suitable to these grooves and the wrist pin bore in the piston to hold the pistons against rotation thereof.

The flanges 29 inclose the working parts of the piston locating mechanism and the pins 30 in the below described bars 31 operate in the grooves 32 formed by the walls 32*a* and 32*b* to move the below described relieving means toward and away from the pistons to relieve pistons where desired and not relieve them at other places. The walls 32*a* and 32*b* do not extend all the way around the flange 29 so that the pin 30 will clear the walls 32*a* and 32*b* during indexing of the table. The outwardly inclined surfaces 32*c* and 32*d* tend to lead the pin 30 into the groove 32.

The table and its operating means

The table B is keyed onto the shaft or spindle C and rotates therewith. The sleeve D is journaled on the spindle C, Figs. 3 and 5, and has the spur gear 33, the spur gear 34, and the worm wheel 35.

The gear 33 meshes with the gears 36 keyed onto the piston rotating shafts 23. The gear 34

meshes with the gear 37 (Fig. 5) keyed onto the below described shaft 38.

The table driving motor E, Fig. 9, is mounted in the part A1 and the armature shaft thereof is coupled to the shaft 39 by the coupling 40 and has the worm 41 thereon meshing into the worm wheel 42 normally rotatable on the shaft 43. The speed change gear 44 keyed onto the shaft 43 meshes with speed change gear 45 keyed onto the shaft 46 which extends forwardly and into the bed or base A below the table.

The worm 47 is keyed onto the shaft 46 and meshes with the worm wheel 35 on the sleeve D.

The clutch mechanism, Figs. 2 and 9, here comprises the cross-sectionally half round key or member 48 disposed in the round bottom groove 49 in the shaft 43 and having the lever 50 thereon to rotate the member 48 in the groove and thereby bring the half round part of the key out of the groove and into driving relation with the worm wheel 42.

When the key is in the position shown in Figs. 2 and 9 and the motor E is started, the worm wheel 42 merely rotates on the shaft 43. When the key 48 is rotated in the groove by means of the lever 50, one edge of the half round part of the key will rise out of the groove and engage the worm wheel 42, the shaft 43 will then rotate and will rotate the shaft 46 through the change gears thereon and will rotate the worm 47.

The worm 47 will then rotate the sleeve D through the worm wheel 35 so that the gear 33 will rotate the gear 36 and the shaft 23 and the piston thereon.

The gear wheel 34 will rotate the gear wheel 37, Fig. 5, and the shaft 38 and the index member 118 connected therewith.

The gear wheel 51 is keyed onto the spindle C and meshes into the gear wheel 52 keyed onto the shaft 53 and secured to the grooved index member 54. The roller 55 is guided in the grooves 56 of the member 54, Fig. 3 or 8. The supporting pin for the roller is driven into the bottom of the circularly grooved member 118 located just above the member 54.

There is a continuous and direct drive from the sleeve to the piston station to rotate the pistons, to the shaft 38 to operate the indexing means, from the indexing member on the shaft 38 to the grooved indexing member 54 through the roller 55, and from the gear 52 on the groove member 54 to the gear 51 on the spindle C. In view of this interconnection, all elements must move in unison.

The control means

The shaft 57 is longitudinally movable and guided in the base A and has the handle 58 on the upper end thereof and the pin 59 near the lower end thereof.

The bell crank lever 60 is secured to the shaft 61 journaled in the brackets 62.

The rod 63 is adjustable lengthwise and has one end thereof pivoted onto the shorter leg 64 of the bell crank lever and the other end thereof extends backwardly and is pivoted at 65 to one leg of the bell crank lever 66 which is pivotally supported in the base. The end of the shaft 63 is slotted at 67 to provide cut out clearance.

The shaft 68 is pivoted onto the end 69 of the bell crank lever 66 and extends into the compartment A1 and up the lever 50 to operate the clutch.

The bar 70 has one end thereof pivoted on the leg 71 of the lever 66 and is slidable longitudinally in the bracket 72. The bar 73 is pivoted onto the slidable bar 70 at 74 and carries the roller 75 at one end thereof and has the notch 76 at the other end thereof to engage the pin 77 so that, normally, the roller 75 travels in the groove 78 and lets the motor E rotate the mechanism.

When the handle 58 is moved upwardly, the bar 63 moves forwardly and moves the end 71 of the bell crank lever 66 to the right as viewed in Fig. 8 and thereby separates the lock between the notch 76 and the pin 77 so that the spring 79 pivots the bar 73 to throw the roller 75 downwardly and into the path of the cut out cam lug in the groove 78 which thereafter moves the roller 75 and mechanism connected therewith into the position shown in Fig. 8.

The index pin 81 is slidable longitudinally in the bracket 82 and the table has three suitably spaced bushings 83 thereon to receive the end of the index pin 81 when one of the bushings is opposite the same.

The lever 84 is pivoted to rock on the pin 85 and has the gear teeth 86 on one end thereof engaging corresponding teeth on the pin 81 and also has the roller and pin 87 on the other end thereof in contact with the cam 88 which is so formed that the lever 84 moves the pin 81 out of the bushings 83 at the start of table indexing movement and into the bushings at the end of table indexing movement.

The cutter and operating mechanism

There are two piston relieving tool means F and G on the top of the machine opposite the two rear stations H and I. The third station J, the one in the front, is the loading and unloading station (Fig. 1).

Both of the piston relieving means are shown as substantial duplicates of each other and each comprises:

The tool or cutter 90 (Fig. 6) is mounted on the shaft or spindle 91 journaled vertically in the head K. The worm wheel 92 is keyed to the spindle 91 to rotate the same and meshes into the worm 93 which is keyed to the shaft 94 journaled horizontally in the head K.

The shaft 94 extends through the head K and has the keyways 95 in the outer end thereof. The two step pulley L is splined onto the outer end of the shaft 94. These pulleys are grooved for round or V belts 96 although other belt means or equivalents can be used.

The pulley M lines up with the pulley K and is keyed onto the armature shaft 97 of the motor N so that rotation of the armature shaft will rotate the shaft 94 and the spindle 91 and the cutter thereon.

The housing O, containing the motor N, is adjustably mounted in the vertical slide 98 on one side of the block P extending from the column A1 for such purposes as tightening the belts and the head K is mounted in the horizontal slide 99 on the other side of the block P for movement of the head by the bar 31.

The bar 31 is individually slidable on the head F for adjustment of the cutter in relation to the piston Q and the bolts 100 hold the casing O tightly to the block P while the screws 101, passing through the elongated slots 102 hold the head K to the block P so that the cutter 90 may travel back and forth as occasioned by the bar 31 being moved according to the grooves 32 to feed the cutter into the piston Q to a desired depth of cut

and to a desired distance around the piston as the piston is rotated by the gears **33** and **36**.

The adjusting screws **103** are threaded into the block P for vertical adjustment and the threaded member **104** engages the hinge pin **105** to hold the motor supporting block **106** in position.

The piston steadying means

The piston steadying means, as shown, comprises:

The bracket **107** keyed onto the shaft C and having the three duplicate arms **108** pivoted thereon by means of the pivot pins **109**. The studs **110** are provided to afford adjustment for the arms to adjust the piston steadying members or centers **111** laterally into correct relation to the axis of the shaft **23**.

A hand lever **112** is pivoted onto each of the arms by means of the pivot pins **113** and has a polygonal eccentric end **114** to abut the head **115** of the member **111** to lock the same in piston steadying position. The spring **116** abuts the head **115** and the member **111** and normally forces the center-like lower end thereof into contact with the usual center holes in pistons and thereby steadies the piston.

Operation

When the arms **108** reach the loading station due to the rotation of the shaft C as explained above, the operator pulls the hand lever **112** toward himself and thereby rotates the polygonal end **114** so that the face **117** contacts the head **115** and the spring and the center is released for removal and insertion of pistons; the position of the handle in piston releasing position is shown in dot and dash lines in Fig. 10.

After a new piston is inserted into the machine, the operator pulls the handle **58** upward whereupon the bell crank lever **60** and the mechanism connected therewith is moved to start rotating the table for indexing as is explained above to move the pistons to new stations.

The sleeve D and the gears **36** keep on rotating and rotate the pistons at the stations H and I. The bars **31** are moved by the rollers thereon engaging the walls **32***a* and **32***b* of the grooves **32** to move the cutter **90** into and out of contact on one side of the piston at station H and on one side of another piston at station I so that, after indexing the table, the cutter of the relieving means F relieves one side of the piston at station H while the cutter of the relieving means G relieves the other side of the piston at the station I, the one side of which piston was previously relieved at the station H.

Upon indexing the table, the piston at station H is moved to station I for relieving of the other side thereof; the piston at the station J is moved to the station H for relieving of one side thereof; and the piston at the station I is moved to the station J for removal thereof and insertion of a new piston so that each indexing of the table produces a relieved piston in an automatic manner.

We are aware that our invention can be embodied in machines for performing machining operations on articles other than relieving pistons by providing suitable modifications therein and that changes and modifications can be made in the shown and described structure and arrangements of parts or elements or groups of parts within the spirit and intent of the invention and the appended claims; therefore, without limiting ourselves to the precise application of our invention as shown and described nor to the precise structure and arrangement of parts or elements or groups of parts as shown and described, we claim:

1. In an automatic machine, a table, a plurality of article holding means on said table each rotatable to rotate the article thereon, a tool means for each of said article holding means except one, each of said tool means mounted to slide sidewise toward and away from said holding means to operate on surfaces spaced different distances from the axis of said holding means, cam-like means to move each of said tool means to operate on the article only during a part of a revolution thereof, means to index said table to successively bring each one of said holding means to where there is no tool means for loading and unloading, means to operate said tool means, and means to rotate said article holding means.

2. In a piston relieving machine, a bed, a main spindle journaled in and extending above said bed, a table on said bed and keyed to said spindle to rotate therewith, a plurality of holding means for pistons on said table, piston relieving means on said bed for each of said holding means except one, a sleeve rotatable on said spindle, a gear connection between said sleeve and said holding means for rotation of said holding means, an indexing mechanism for said table in said bed, a gear connection between said spindle and said indexing mechanism to operate the latter, and a motor to operate said sleeve for rotation of said holding means individually and conjointly with rotation of said spindle and said table thereon and for operation of said indexing means.

3. In a piston relieving machine, a bed, a table on said bed and adapted to be indexed, individually rotatable piston locating means on said table, a steadying means for the pistons opposite each of said locating means, piston relieving tool means adjacent to each one of said holding means except one, a power means to drive each of said tool means, an adjusting means for each of said relieving means to adapt the device for variously sized pistons and to various depths of relieving, an indexing means for said table to bring a piston on said locating means successively into operative relation with each of said relieving means, and a power means to rotate said piston locating means and said table and to operate said indexing means.

4. In an automatic machine, a table to receive articles to be machined, means for periodically indexing said table, tool means on said machine to operate on different sides of the articles on said table, a cam element positionally fixed on said table and engaging a part of said tool means to bring the same into and out of machining relation with the articles by and during the indexing of said table, and power means for operating said tools and said indexing means.

5. In an automatic machine, a table to receive articles to be machined, tool means on said machine to operate on different sides of the articles on said table, indexing means for said table, a cam element positionally fixed on said table and engaging a part of said tool means to bring the same into and out of machining relation with the articles by and during the indexing of said table, and power means to index said table and operate said tool means and to move said tool means into machining relation to the articles at the termination of the indexing of said table and out of machining relation to the

articles at the beginning of the indexing of said table.

6. In an automatic machine, a table to receive articles to be machined, tool means on said machine to operate on different sides of the articles on said table, indexing means for said table to periodically bring the articles thereon into and out of machining relation with said tool means, a cam element positionally fixed on said table and engaging a part of said tool means to move the same into and out of cutting relation with the articles by and during the indexing of said table, and power means to operate said tool means, to index said table periodically, to move said tool means into machining relation with the articles on said table at the termination of the indexing of said table, to move said tool means out of machining relation with the articles on said table at the beginning of the indexing of the table, means to automatically stop the operation of the machine after each article is machined, and means to selectively start the operation of the machine after an article is placed on the table thereof.

7. In an automatic machine, a table adapted to receive articles to be machined and to be indexed, tool means adapted to operate on different sides of the articles, means for automatically indexing said table to bring an article thereon into machining relation with said tool means, cam and operating mechanism between the receiving means of the articles and said tool means operated by and during the indexing of said table for automatically moving said tool means into and out of machining relation with the indexed article, means operated by and during the indexing of said table to automatically stop the indexing of said table after said tool means is out of machining relation with the indexed article, and means to selectively start the operation of the machine.

8. A table adapted to be indexed, article holding means each periodically individually rotatable on said table to rotate the article thereon, a tool means sidewise adjacent of each of said holding means except one and of a width to cover the width of the surface to be machined for machining thereby on different sides of articles, and mechanism to index said table and automatically set in motion, in timed relation therewith, the rotation of said holding means and moving said tool means for operation on the respective sides of the articles.

9. A table adapted to be indexed, a plurality of article holding means on said table, each periodically and individually indexable, each individually rotatable to rotate the article thereon, a rotating tool means of a width to cover the width of the surface to be machined for each of said holding means except one, and power driven mechanism to automatically index said table and set in motion, in timed relation therewith, the means for rotating said holding means and to move said tool means into and out of operative relation to different sides of the articles on said holding means and to successively bring each one of said holding means to where there is no tool means for loading and unloading of said holding means, and means to rotate said tool means.

10. A table adapted to be indexed, article holding means on said table and being periodically rotatable to rotate the article thereon, tool means movable into and out of stock removing relation with respective sides of the articles, and mechanism comprising interconnected elements operating automatically to periodically rotate said holding means, to periodically index said table, to periodically move said tool means laterally out of stock removing relation with the article during the indexing of said table, to move said tool means laterally into stock removing relation with the article after said table has indexed, and to stop operation of said mechanism after said tool means has finished operation on said articles.

11. A periodically rotatable shaft, a table on said shaft to rotate therewith, a periodically rotatable article holding mechanism circularly spaced on said table, a continuously rotating driven sleeve journaled on said shaft, a rotating member adjacent said shaft, a rotated member adjacent to said shaft and to said rotating member and to said holding mechanism, a driving connection between said sleeve and said rotating member, a driving connection between said rotating and rotated members, and a driving connection between said rotated member and said shaft.

12. A rotatable table adapted to be indexed periodically, periodically rotating article holding means on said table, an indexing mechanism for said table and for rotation of said article holding means comprising a driven driving member, a driven member operated periodically by said driving member, a driving connection between said driven member and said table to index the same when said driving member operates said driven member, and a power means to drive said driving member to index said table and to rotate said article holding means in timed relation, in combination with a tool means movable laterally by said mechanism and each to operate on one of the sides of articles in said holding means.

13. A rotatable table adapted to be indexed periodically, periodically rotatable article holding means on said table, rotating tools spaced laterally about said table to remove stock from respective sides of the articles in said holding means, an index mechanism for said table comprising a driven driving member, a driven member periodically operated by said driving member, a driving connection between said driven member and said table to index the same when said driving member operates said driven member, and power means to drive said driving member to periodically index said table and to periodically feed the articles in stock removing relation with said tool means for removing stock from respective sides of the articles and to periodically rotate said article holding means.

14. A rotatable table adapted to be indexed, rotatable article holding means on said table, rotating tools spaced laterally about said table, an index mechanism for said table comprising a driven driving member, a driven member periodically operated by said driving member, a driving connection between said driven member and said table to index the same when said driving member operates said driven member, power means to drive said driving member to index said table, to feed the articles past said tool means for machining thereby, and to rotate said article holding means, clutch means in said power means, and a cam means on said driving member to disengage the members of said clutch means to stop said power means from operating said driving member after said tool means have completed operation on the article.

15. A rotatable table adapted to be indexed, rotatable article holding means on said table, individually movable tool means spaced laterally about

said table, an indexing mechanism for said table including a driving and a driven member, a cam means on each of said holding means, a connection between each of said cam means and the corresponding tool means to move the same for forming surface on articles on said holding means, and means to drive said driving member and thereby rotate said holding means and index said table and move said tool means according to said cam means.

16. A rotatable table adapted to be indexed, rotatable article holding means on said table, individually movable tool means spaced laterally about said table, an indexing mechanism for said table including a driving and a driven member, a cam means on each of said holding means, a connection between each of said cam means and the corresponding tool means to move the same for forming surface on articles on said holding means, means to drive said driving member and thereby rotate said holding means and index said table and move said tool means according to said cam means, clutch means in said power means, and a cam means on said driving member to disengage the members of said clutch means to stop said power means from operating said driving member after said tool means have completed operation on the article.

17. A table adapted for periodical rotatively indexing, individually periodically indexable and partly rotatable article holding means on said table, tool means movable to operate on different sides of articles on said holding means, a power means for driving said table and said article holding means, and an easily accessible control mechanism to manually set the same in motion to rotatively index said table, to individually rotate said holding means and the articles thereon, to move said tool means laterally into and out of stock removing relation with respective sides of articles on said holding means, and to automatically lock itself against indexing said table after each indexing of said table.

18. A bed, a table rotatable on said bed, indexing means to rotatively index said table through one third of a circle, three equi-distantly spaced, movable article holding means on said table, a machining tool means at each side of the axis of said table, each of said tool means being outwardly adjacent to one of said article holding means when said table is indexed, means for rotatively indexing said article holding means to successively present opposite sides of the articles for operation thereon by said tool means at each indexing of said table, and means for operating said tool means.

19. A bed, a table on said bed and indexable to a definite number of stops, a plurality of article holding means each rotatively indexable on said table and equal in number to said number of stops, each of said holding means to hold one of a plurality of similar articles, a machining tool means sidewise adjacent to each of said holding means except one, a double acting cam means on each of said holding means to move the corresponding one of said tool means into and out of machining relation with one side of the article held in the corresponding one of said holding means, and a power driven means mounted in said bed to index said table and to rotate said holding means and to move said tool means in timed relation with each other for automatically machining different sides of articles held in said article holding means except one during one indexing of said table

20. A bed, a table indexably rotatable on said bed, means for indexing said table to stops within one revolution thereof, an individually operated movable machining tool means laterally adjacent each of said stops except one, individually indexable and operable article holding means on said table equal in number to the number of said table stops, each of said tool means to machine a side of each of the articles in said holding means, double acting cam means each to move the corresponding of said tool means into and out of machining relation with the corresponding side of the articles in said holding means, and power means to index said table successively to said stops and to move said tool means and to individually operate said holding means in co-operative timed relation.

21. In a piston relieving machine, a bed, a table adapted to be indexed periodically, piston holding means on said table, individually movable independently operated machining tool means each for operating on a different side of articles between the indexing periods of said table, a cam element for each of said tool means to move the same into and out of machining relation with respective sides of said pistons by and during the indexing of said table, and means to release relieved pistons and install unrelieved pistons while said table is not indexing.

22. A rotatable table adapted to be indexed rotatively, a plurality of individually rotatable, individually indexable article holding elements on said table, and a driving means adapted to index said table and to simultaneously rotate and index said elements while said table is rotating for indexing thereof and to stop indexing of said elements and continue feeding rotation while said table is near the end of an indexing movement thereof and to start rotation of said elements near the beginning of an indexing movement of said table.

23. A rotatable, indexable table, a plurality of article holding elements each individually indexable on said table, and a driving means adapted to index said table and to simultaneously index said holding elements while said table is indexing and to stop indexing of said holding elements and start rotative feeding motion thereof while said table is near the end of an indexing movement thereof and to start indexing of said holding elements near the beginning of an indexing movement of said table.

24. A bed, a table rotatively indexable on said bed, a plurality of individual rotatively indexable article holding means on said table, a plurality of machining tools mounted on said bed to respectively operate on respective sides of articles in said holding means subsequent to an indexing movement of said table, and means controlled by the indexing of said table and of said article holding means to move each of said tool means into and out of respective machining relation thereof with articles in said article holding means, and means for operating said tool means.

25. A bed, a table rotatively indexable on said bed, a plurality of rotatively indexable article holding means mounted on said table, a plurality of machining tool means mounted on said bed, each to operate on a different side of the articles in said holding means, and a mechanism in said bed to rotatively index said table, to rotatively and simultaneously index all of said article holding means in time relation with the indexing of said table and to simultaneously and positively move all of said tool means respectively into and

out of machining relation with the respective articles in said holding means in time relation with the indexing of said table and with the indexing of said holding means.

26. A bed, a table rotatively indexable on said bed, a plurality of individually rotatively indexable article holding means on said table, a plurality of laterally movable machining tools mounted on said bed, each movable toward and away from respective articles in said holding means, and a control means in said bed and adapted to positively index said table and to rotatively index each of said holding means while said table is indexing, to positively move each of said tool means into and then hold the same positively in machining relation with articles in the respective holding means while said table is indexing.

27. A bed, a table rotatively indexable on said bed, a plurality of individually indexable, individually rotatable article holding means fixed in spaced positions on said table, a plurality of machining tool means mounted on said bed to move laterally toward and away from said article holding means, and a power driven mechanism in said bed and adapted to control and operate the rotation and the rotative indexing of said table and the individual rotation and the individual indexing of said article holding means and the lateral movement of said tool means in co-operating time relations for automatically machining different sides of the articles held in said article holding means during one indexing of said table.

28. A bed, a table rotatively indexable on said bed, a plurality of individually indexable, individually rotatable article holding means fixed in spaced positions on said table, a plurality of machining tool means mounted on said bed to move laterally toward and away from said article holding means, and a power driven mechanism in said bed and adapted to control and operate the rotation and the rotative indexing of said table and the individual rotation and the individual indexing of said article holding means and the lateral movement of said tool means in co-operating time relations for automatically machining different sides of the articles held in said article holding means during one indexing of said table and to stop operation of said mechanism upon completion of machining of one of the articles in said holding means.

29. A bed, a table rotatively indexable on said bed, a plurality of individually indexable, individually rotatable article holding means fixed in spaced positions on said table, a plurality of machining tool means mounted on said bed to move laterally toward and away from said article holding means, a power driven mechanism in said bed and adapted to control and operate the rotation and the rotative indexing of said table and the individual rotation and the individual indexing of said article holding means and the lateral movement of said tool means in co-operating time relations for automatically machining different sides of the articles held in said article holding means during one indexing of said table and to stop operation of said mechanism upon completion of machining of one of the articles in said holding means, and a manually operated means, co-operative with said mechanism to start operation of said mechanism.

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