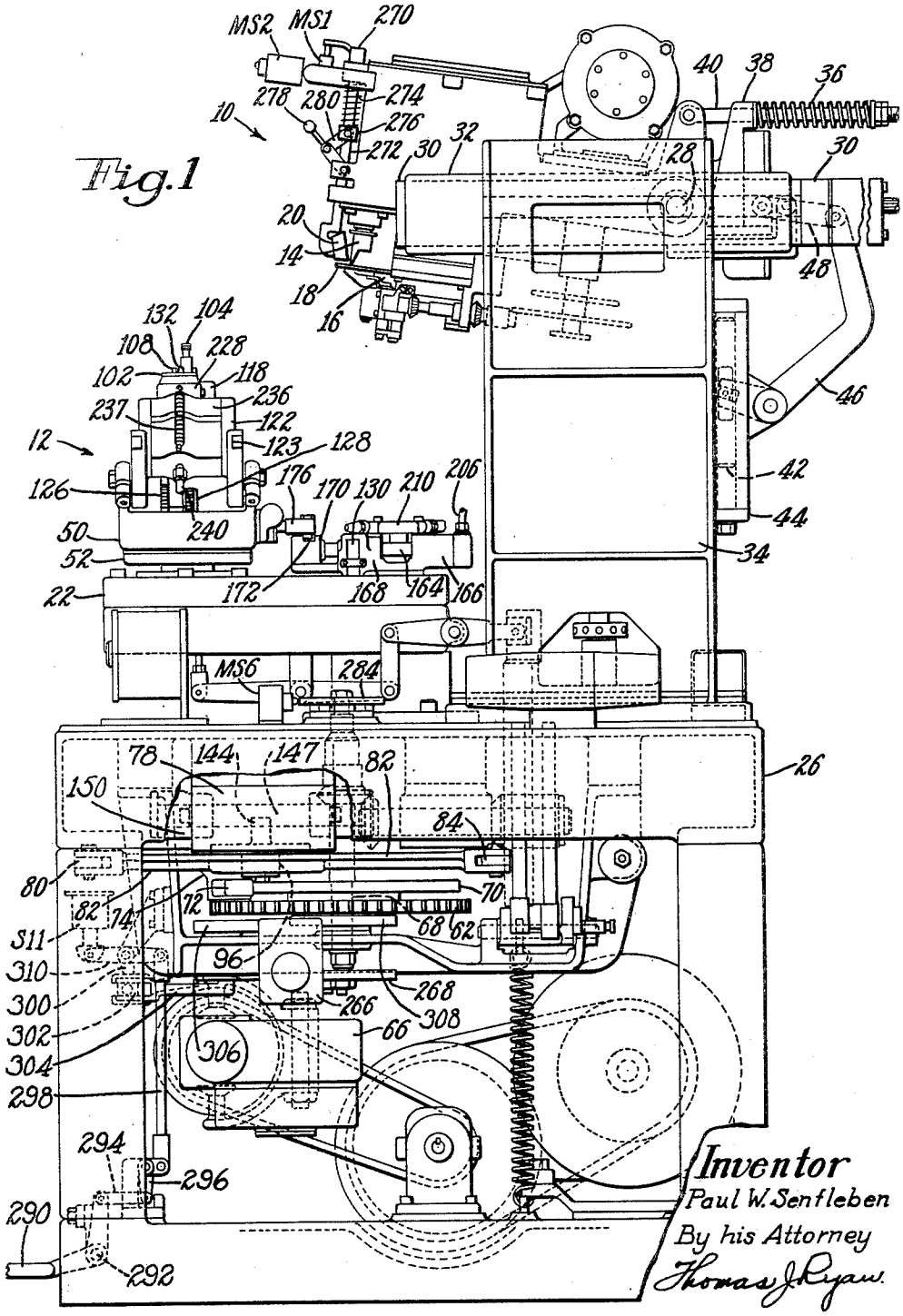
Feb. 6, 1962 P. W. SENFLEBEN 3,019,461

SOLE ROUNDING MACHINES

Filed May 12, 1960 9 Sheets-Sheet 1

Fig. 1



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SOLE ROUNDING MACHINES

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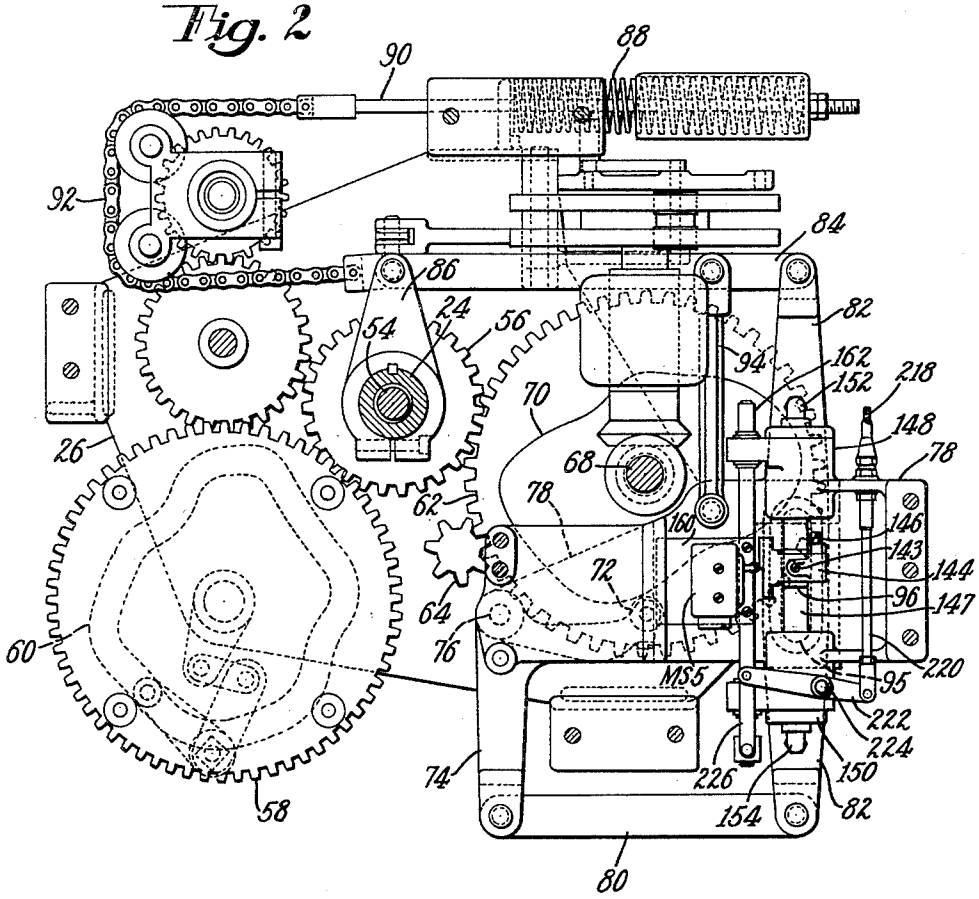
Fig. 2



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SOLE ROUNDING MACHINES

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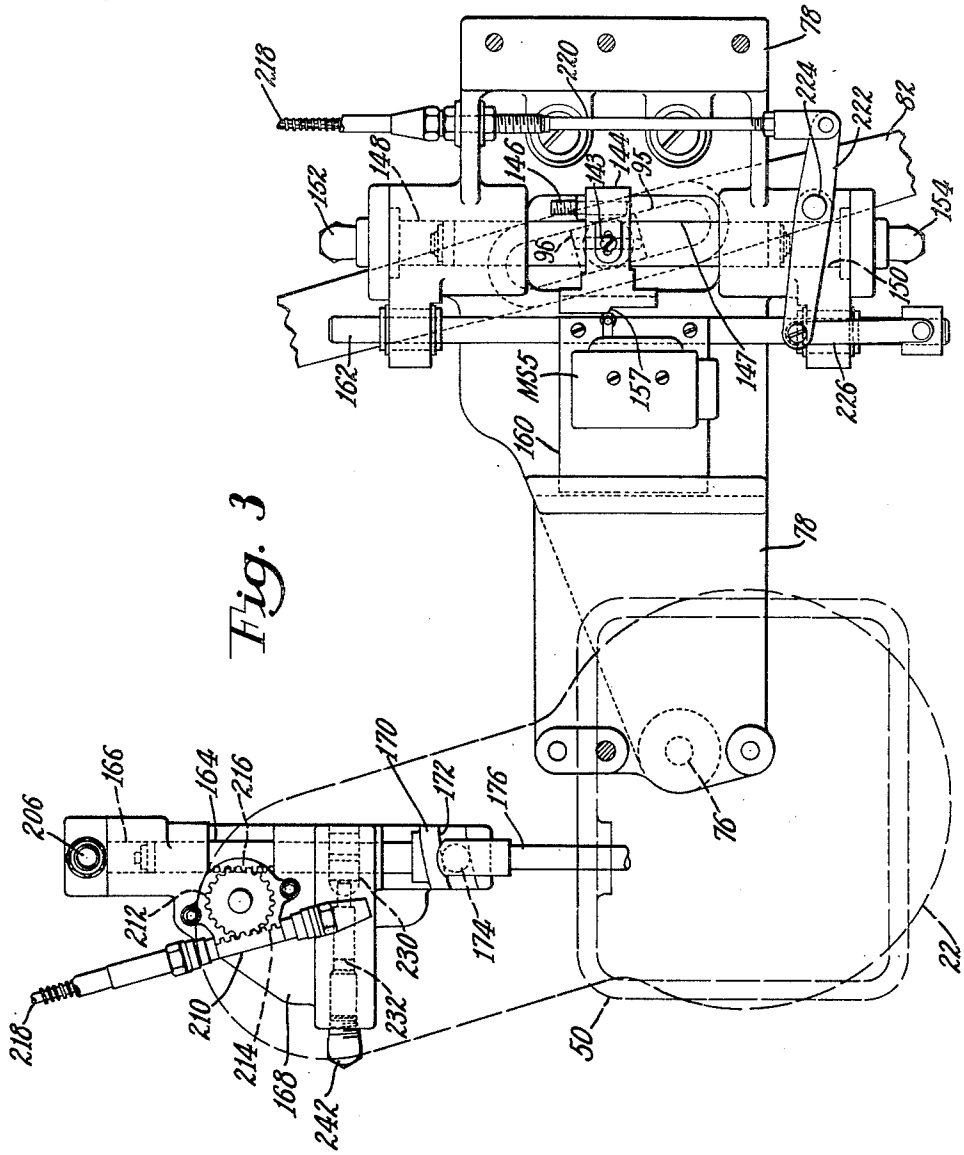

Fig. 3

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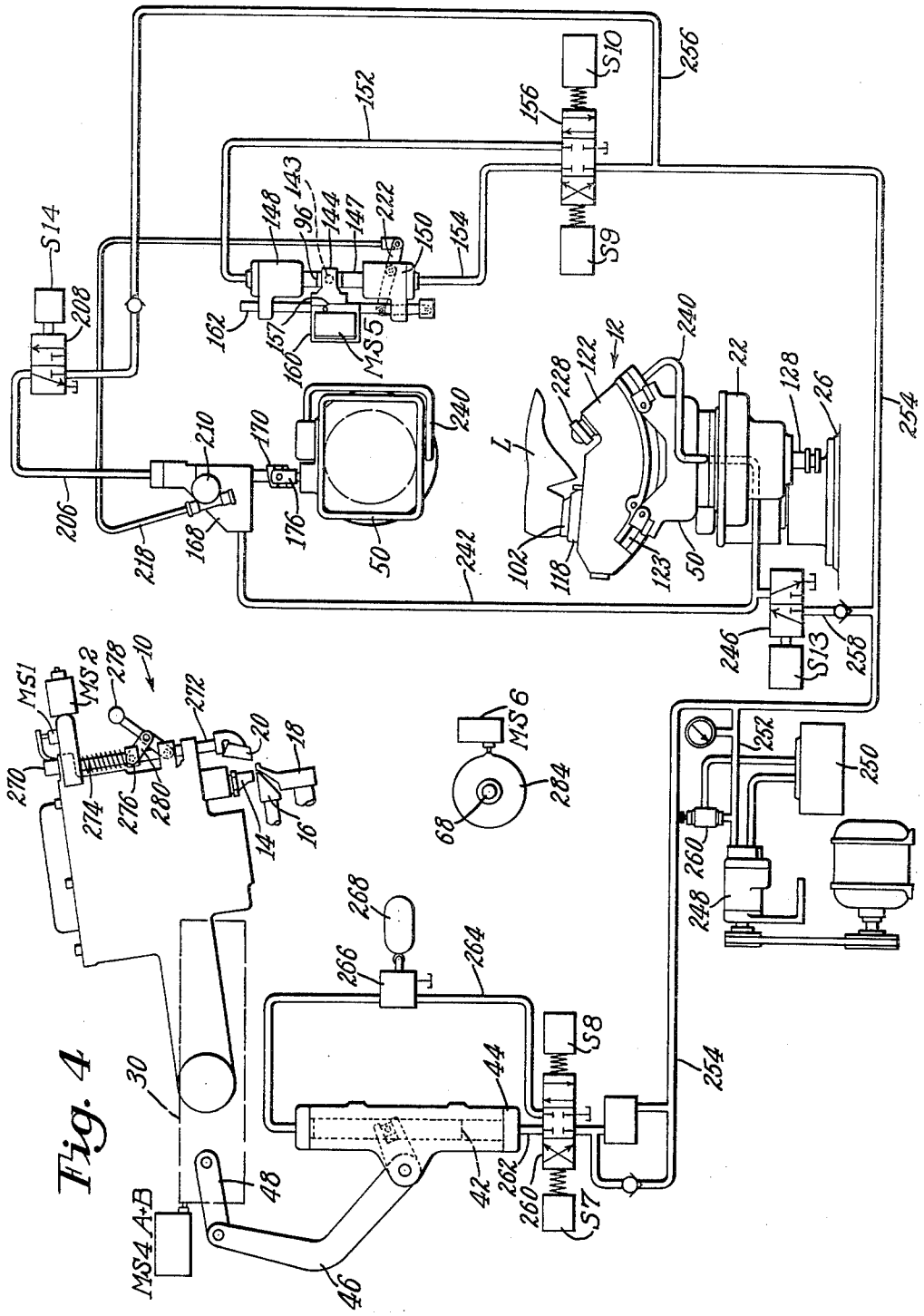

Fig. 4

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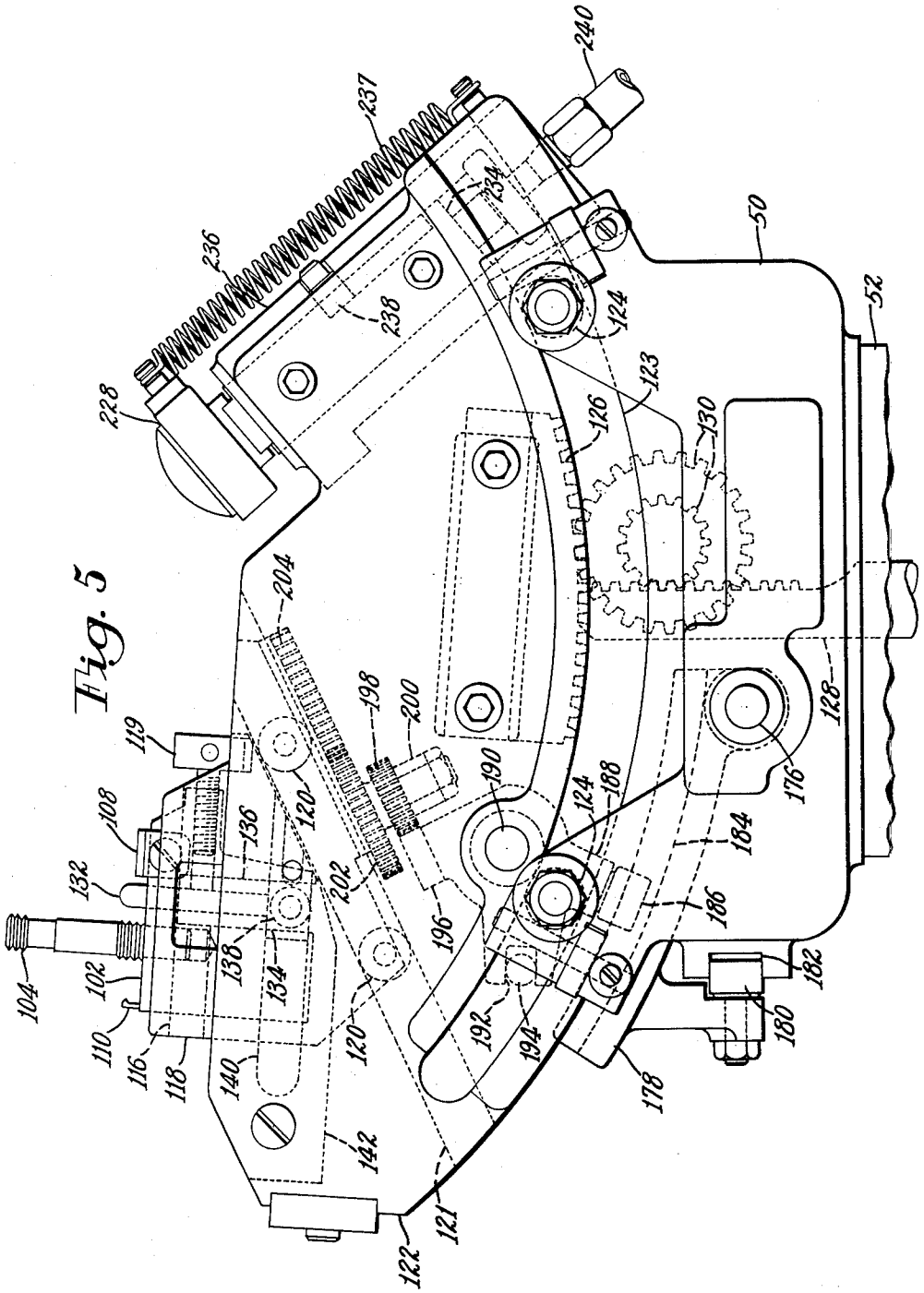

Fig. 5

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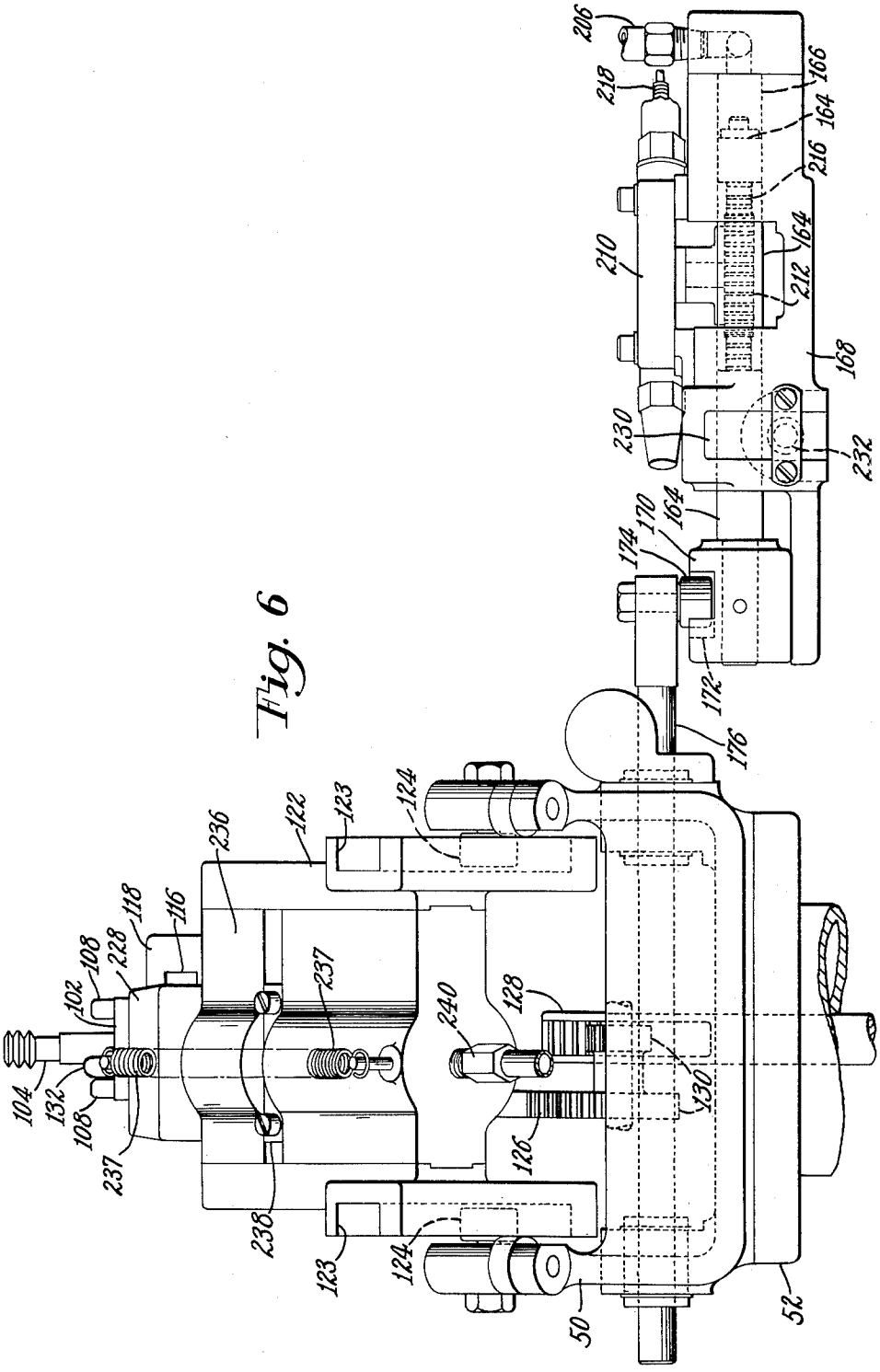

Fig. 6

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Fig. 7

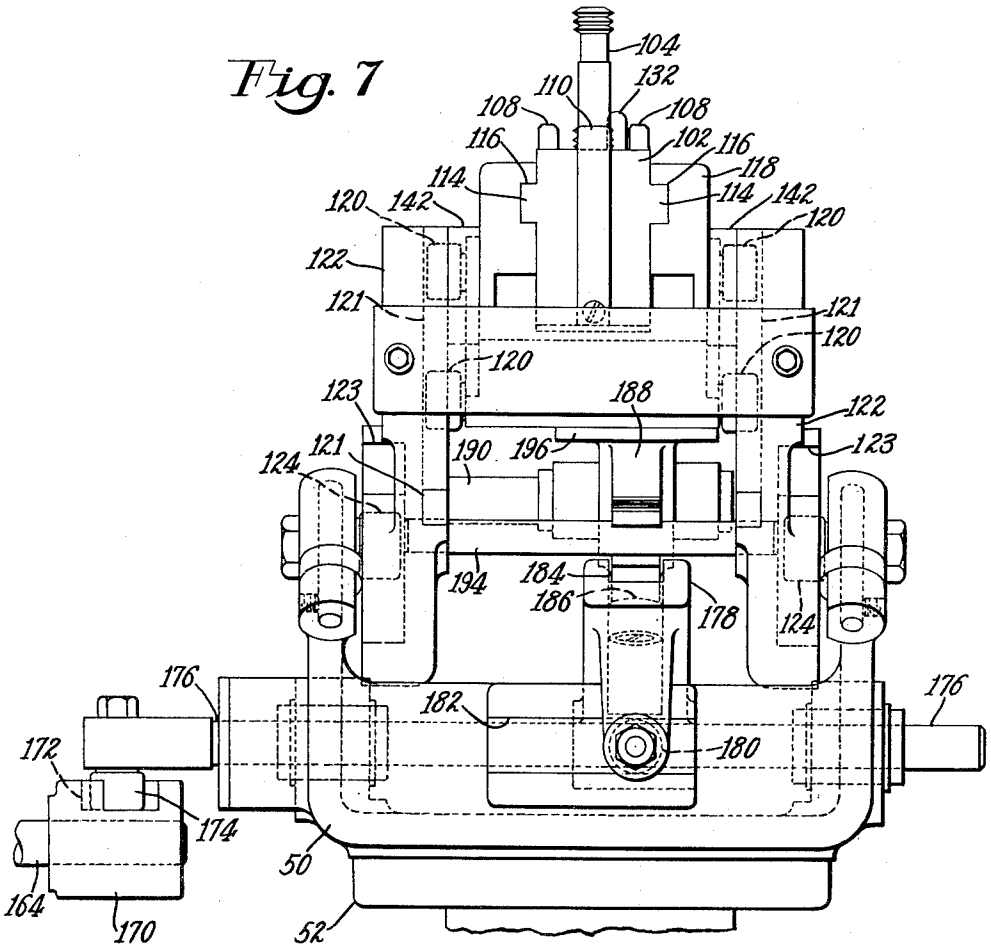

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Fig. 8

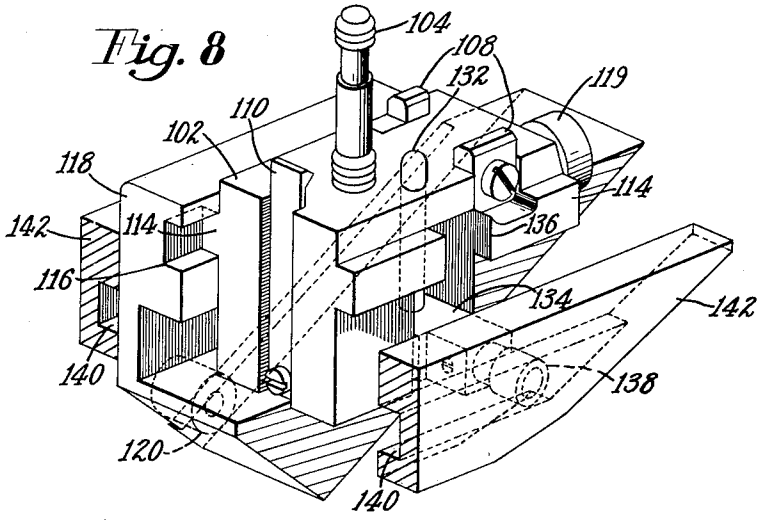


Fig. 9

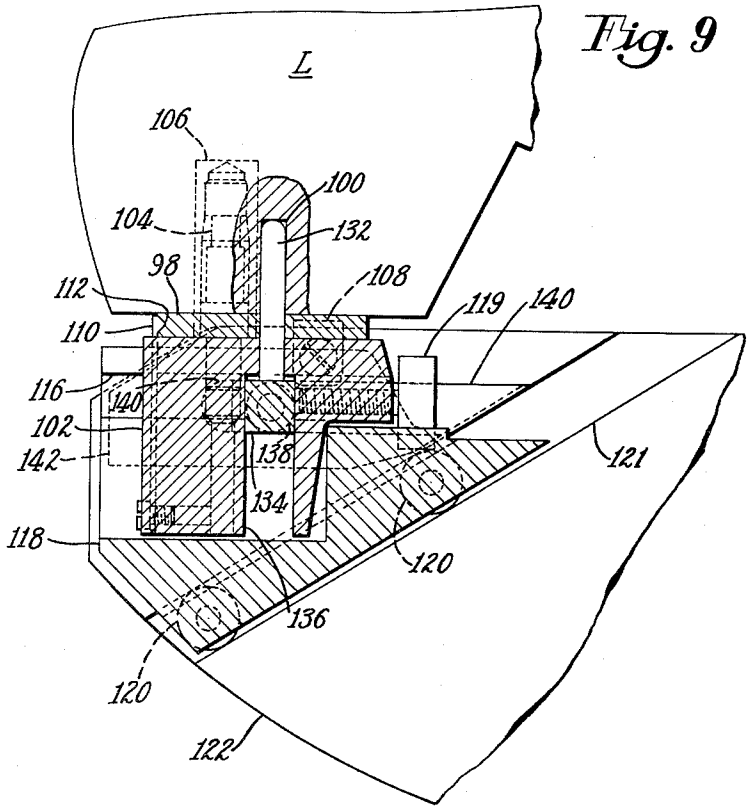
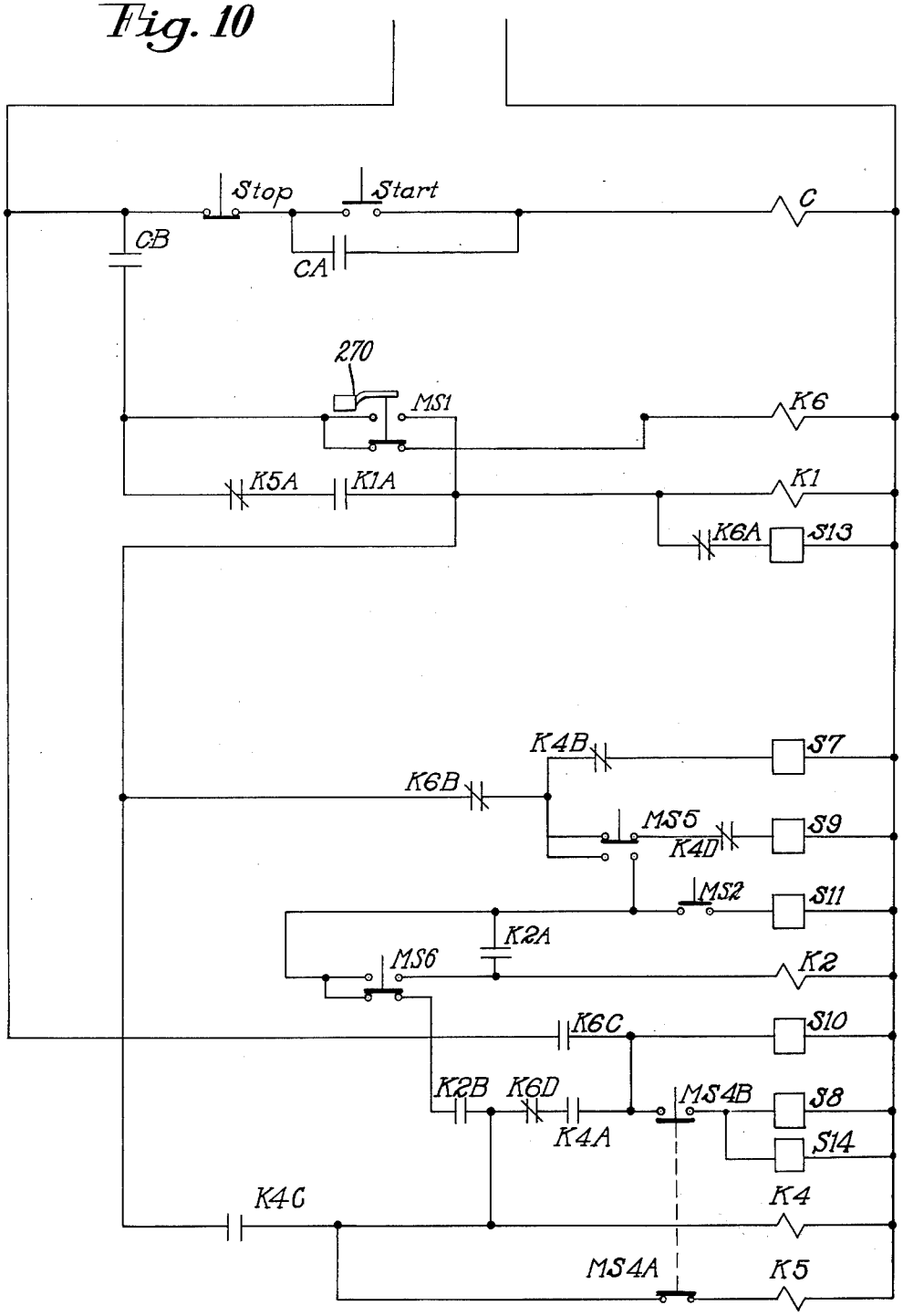


Fig. 10


Stop
Start
C
CB
CA
270
MS1
K6
K5A
K1A
K1
K6A
S13
K4B
S7
K6B
MS5
S9
K4D
MS2
S11
K2A
MS6
K2
K6C
S10
K2B
K6D
MS4B
S8
K4A
S14
K4C
K4
MS4A
K5

United States Patent Office 3,019,461 Patented Feb. 6, 1962

3,019,461
SOLE ROUNDING MACHINES

Paul W. Senfleben, Beverly, Mass., assignor to United Shoe Machinery Corporation, Flemington, N.J., a corporation of New Jersey

Filed May 12, 1960, Ser. No. 28,800
14 Claims. (Cl. 12—17.2)

This invention relates to shoemaking machines of the type employed in performing an operation upon the periphery of a shoe and is illustrated herein as embodied in a machine, for rounding the soles of shoes, such as that disclosed in either of United States Letters Patent No. 2,825,076, granted on March 4, 1958, upon an application of G. W. Cleversey, or United States Letters Patent No. 2,869,156, granted on January 20, 1959, upon an application of E. W. Stacey.

In the use of the patented machine referred to above, a shoe to be operated upon is presented to a cutter head upon a jack which is oscillated with a variable stroke according to the size of the shoe, the shoe also being constantly rotated upon the jack. The cutter head is mounted for movement toward and away from the jack, is constantly biased into engagement with the shoe and, under the guidance of the shoe, has such shoe following movements directed toward and away from the jack as are necessary to cause continuous contact between the shoe and the cutter head to be maintained.

In order to obtain the optimum relation between the shoe and the cutter head at all times, the oscillatory and rotative movements of the jacks are so combined that the direction of movement of the shoe, at the point where it is operated upon by the cutter head, always conforms as nearly as possible to the direction of the sole edge at this point. Moreover, the shoe at the point being operated upon also is moved as nearly normal as possible to the shoe following movement of the cutter head for the purpose of minimizing movement of the cutter head as well as variations in its bearing pressure against the shoe. The foregoing motions are obtained by a jack design predicated on the fact that the shoe is centered upon the jack, i.e., mounted with the mid point of the shoe bottom at the axis of rotation of the jack. Hence, it is evident that the efficacy of the design will not be realized unless the shoe is centered in this manner upon the jack.

To this end, provision has already been made, as in the above-mentioned patented machine, for positioning a shoe lengthwise thereof accurately upon a jack by means of operator-controlled gaging means. However, if this gaging means is not adjusted properly for the size of shoe being operated upon, or if the operator neglects making any such adjustment, it is evident that the most advantageous relationship between the work and the cutter head will not be obtained.

In view of the foregoing, it is an object of the invention to center a shoe, regardless of its size, upon the jack of a machine of the type under discussion automatically and, hence, without requiring any attention on the part of the operator.

In the pursuance of this object, there is contemplated the use of lasts, characterized by the fact that they have size indicating surfaces disposed in different positions designating the sizes of the lasts, with a novel jack construction which utilizes the size indicating surface of the last thereon to position each last, regardless of its size, with the midpoint of the bottom of the shoe on the last at the axis of rotation of the jack.

In the illustrated construction, a last of the above type carrying a shoe to be operated upon is mounted upon a jack which, in accordance with one feature of the invention, comprises a holder for the last which is mounted for last positioning movement lengthwise of the last and

further comprises a last size sensing element for limiting the last positioning movement of the holder, by engagement with the size indicating surface of the last, when the midpoint of the bottom of the last will have been brought to the axis of rotation of the jack.

In order to support the forepart of the last, as well as to fix it securely upon the jack in the position referred to above, the invention also provides, in accordance with a further feature thereof, means for engaging the forepart of the last and exerting a clamping pressure upon it so as to cause it to be held at the extremity of its positioning movement, against the sensing element, and also cramped upon the holder to insure against accidental displacement of the last on or its removal from the holder.

In the above-mentioned patented machine, the jack is rotatably mounted upon an oscillating swing arm, and provision is made for varying the amplitude of oscillation of the swing arm, in accordance with the size of the shoe to be operated upon, by manually adjusting a fulcrum for a lever in the operating mechanism for the swing arm. As this adjustment is made by the operator, if he fails to make it properly or neglects to make it altogether, the amplitude of oscillation of the jack may not correspond to the size of the work, to the detriment of the above-mentioned relationship between the shoe and the cutter head, particularly when the end portions of the work are operated upon.

It is, therefore, a further object of the invention to control the amplitude of oscillation of the jack in accordance with the size of the last and shoe on the jack, without requiring any attention on the part of the operator.

To this end, the illustrated machine, which includes the above-mentioned swing arm operating mechanism of the patented machine, is also provided, in accordance with a further feature of the invention, which means for automatically adjusting the amplitude of oscillation of the swing arm appropriately for the size of the shoe on the jack. More specifically, this means is associated with the above-mentioned fulcrum for the swing arm and imparts a setting movement to the fulcrum, at the beginning of each operating cycle of the machine, of an extent corresponding to the length of the above-mentioned centering movement of the work upon the jack.

The above and other objects and features of the invention will now be disclosed in greater detail in the following specification and will be set forth in the appended claims.

In the drawings,

FIG. 1 is a side elevation of an illustrative machine embodying the invention, as viewed from the right;

FIG. 2 is a sectional plan view of the jack driving mechanism;

FIG. 3 is a plan view of a part of the jack driving mechanism and control mechanism therefor;

FIG. 4 is a diagrammatical view of the fluid system of the machine;

FIG. 5 is a front elevation of the jack;

FIG. 6 is a side elevation of the jack and a portion of the control mechanism for the jack driving mechanism, as viewed from the right;

FIG. 7 is a side elevation of the jack as viewed from the left;

FIG. 8 is a perspective view of the holder for a last mounted upon the jack;

FIG. 9 is a sectional front elevation of the structure of FIG. 8, the section being taken parallel to and forwardly of the longitudinal center line of the jack; and

FIG. 10 is a diagrammatical showing of the electrical features of the control mechanism for the fluid system and jack driving mechanism.

The illustrated machine comprises a cutter head 10

which normally is in an inoperative position, as illustrated in FIG. 1, retracted from a jack 12 for holding a lasted shoe upon which a sole rounding operation is to be performed. The illustrated cutter head 10 is substantially the same as that disclosed in the patented machine and has a chopping knife 14 which cooperates, in shearing relation, with an anvil 16 which is fixed upon the cutter head. The rounding cut is made under the control of a gage 18, the forward end of which bears against the side of the shoe upper contiguous to the welt crease when the cutter head is in operative relation to the work and, at this time, the upper surface of the welt is seated upon the upper sides of the gage and anvil. A yieldingly mounted bottom rest 20 rolls upon the bottom of the sole adjacent to the knife and urges the upper surface of the welt against the gage 18 and anvil 16.

The illustrated jack 12, in which certain features of the present invention are embodied, is rotatably mounted, like the jack in the patented machine, upon the forward portion of a swing arm 22 having at the rear thereof a sleeve 24 (FIG. 2) which is mounted to oscillate about a vertical axis in the base 26 of the machine. One complete transfer of the point of operation of the cutter head upon the shoe about the periphery thereof is effected by simultaneously rotating the jack counterclockwise through one revolution upon the arm 22 and oscillating the arm back and forth, first to the left through a portion of its stroke, next to the right through a full stroke, then to the left through a full stroke, and finally, to the right to the original starting point.

To permit engagement of the cutter head with the shoe to be maintained throughout a cycle of operation of the jack, the cutter head 10 is mounted to swing about a pivot at 28 (FIG. 1) upon a carriage 30, as the level of the sole at the point being operated upon rises and falls, the carriage being biased toward the jack along a horizontal slideway 32 which is adjustable heightwise on a pedestal 34 fixed upon the base 26. A spring 36 abutting an arm 38 on the carriage 30 biases rearwardly a rod 40, which is pivoted upon the cutter head 10, so as to counterbalance the cutter head. The carriage is operated by mechanism comprising a fluid operated piston 42 in a cylinder 44 fixed upon the pedestal 34, a bell crank 46 driven by the piston and a link 48 which connects the bell crank and the carriage. The cutter head 10 is brought into and out of engagement with the shoe and is held against the shoe throughout the rounding operation by the application of a variable fluid pressure to the piston 42, as disclosed in the above-mentioned Cleversey patent.

The jack 12 has a base 50 which is fixed upon a support 52 rotatably mounted in the arm 22, the support being driven by a train of gears (not shown) housed in the arm, one of these gears being fixed upon the upper end of a shaft 54 (FIG. 2) which is mounted for rotation within the above-mentioned sleeve 24. A gear 56, fixed upon the lower portion of the shaft 54, is rotated with a variable velocity by a gear 58 under the control of mechanism comprising a fixed cam 60. This mechanism is driven by other gears comprising an idler gear on the shaft 54, like and directly below the gear 56, and meshing with another gear 62 which is driven by a pinion 64. The latter pinion is driven, through a clutch to be referred to later, from a motor driven reduction gear unit 66 (FIG. 1). The gear 62 is fixed upon a vertical shaft 68 which is rotatably mounted in the base 26.

In a cycle of operation of the machine, the gear 62 makes one complete revolution during which the arm 22 is swung in the manner stated above by the following connections.

A cam 70 (FIG. 2), fixed upon the shaft 68, is engaged by a roll 72 on a bell crank 74 which is pivoted at 76 upon a bracket 78, the latter being fixed upon the base 26. The bell crank is connected by a link 80 to one end of a lever 82, to the other end of which is pivoted a link 84 connecting the lever 82 with an arm 86 which is fixed upon the sleeve 24. The link 84 is urged to the left, causing the roll 72 to be held against the cam 70, by a spring 88 which biases a rod 90 to the right and tensions a chain 92 which connects the rod with the above-mentioned link 84. The right-hand end of the link 84 moves in a path controlled by a link 94 which is pivoted to the link 84 and also to the bracket 78. In the mid portion of the lever 82 there is an elongated slot 95 which receives a fulcrum block 96 (FIG. 3), the latter being adjustable within the slot so as to vary the lengths of the arms of the lever 82 and, hence, the amplitude of oscillation of the arm 22.

The structure referred to thus far, except for the bracket 78 and mounting for the fulcrum block 96, is the same as the corresponding structure shown in the above-mentioned patents, to which reference may be made for a more detailed description of these parts. The present invention is concerned, more particularly, with a novel jack, having provision for locating lasts, regardless of their size, in a predetermined centered position on the jack and, associated therewith, means responsive to the centering movement of the last and work upon the jack for automatically setting the fulcrum block so as to cause the amplitude of oscillation of the jack to be appropriate for the size of the work.

Although a jack embodying the invention may be designed to accommodate any type of last, the illustrated jack is particularly suited for use with geometrically graded lasts of the type disclosed in United States Letters Patent No. 2,806,233, granted on September 17, 1957, upon an application of A. R. Hubbard et al. Such lasts are characterized by the fact that the dimensions of lasts of different sizes vary according to a constant ratio or gradient and that each last has a positioning plate 98 fixed upon the top of its heel part. The last L shown herein (FIG. 9) is a modification of the patented last above referred to because of the provision therein of a size indicating hole 100 which extends vertically into the last through the positioning plate to a depth corresponding to the size of the last. In a family of lasts, the depths of the holes 100 represents the sizes of the lasts; and in a series of geometrically graded lasts, the depths of the holes are graded according to the gradient or grading ratio of the lasts. Thus, regardless of the type of last, its surface at the bottom of the hole 100 is a size indicating surface which designates the size of the last.

A last L carrying a shoe to be operated upon is supported upon the illustrated jack by a holder 102 (FIGS. 8, 9 and 5) from which there projects upwardly a pin 104 adapted to be received in the usual thimble 106 in the heel part of the last. The holder is provided with a pair of lugs 108 which are spaced so as to receive closely the forward end of the positioning plate 98 on the last, whereby the last is accurately oriented upon the holder. A spring clip 110 mounted upon the holder becomes engaged within a notch 112 in the rear end of the positioning plate when the last is fully seated upon the holder and releasably holds the last in this position. The holder at opposite sides thereof has tongues 114 which slide freely in horizontal grooves 116 formed in a carrier 118 to permit adjustment of the holder upon the carrier lengthwise of the last. This adjustment is effected by a screw 119 threaded in the holder, the head of the screw being received in a recess in the carrier. The carrier has a pair of rolls 120 at each side thereof which are received in inclined grooves 121 formed in the inner sides of a cradle 122, the slope of the grooves 121 conforming to the ratio of the changes in length and height of lasts of different sizes. Provision is thus made for simultaneously moving the holder heightwise and lengthwise of the last according to its grading ratio or gradient and, for this reason, all lasts of a series, regardless of their size, may be centered upon the jack with their bottoms at the same level.

The cradle has an arcuate groove 123 (FIGS. 5, 6 and 7) formed in each side thereof and each groove receives

a pair of rolls 124 rotatably mounted upon the base 50, permitting the jack to have such pitching movement as is necessary to keep the shoe bottom level at the point where it is operated upon by the cutter head 10. This pitching movement is imparted to the cradle by mechanism, like that in the above-mentioned Cleversey machine, comprising a segmental gear 126 on the cradle, a vertical rack 128, and a double pinion 130 rotatably mounted upon the base in mesh with the gear and rack. As this mechanism is fully described in the above-mentioned Cleversey patent and forms no part of the present invention, it will not be further described herein.

The carrier 118 is normally disposed at the righthand extremity of its travel, in a loading position slightly to the right of that which it occupies when a last of the smallest size to be used is centered upon the jack. With a last on the holder 102 in the loading position, a pin 132, for sensing the size of the last, and mounted for movement vertically through the top of the holder 102 into engagement with the size indicating surface of the last at the bottom of the hole 100, projects slightly into the hole. This pin is fixed at its lower end to a bar 134 (FIGS. 8 and 9) which is arranged to slide vertically within a slot 136 in the holder 102. Upon each end of the bar there is rotatably mounted a roll 138, these rolls being received in horizontal grooves 140 in the inner sides of guide plates 142, one of which is fixed upon each side of the cradle 122. It will now be evident that as the holder 102 is lowered with movement thereof toward the left, the pin 132 will rise relatively to the holder until it engages the last at the bottom of the hole 100, whereupon further movement of the holder to the left is prevented. Thus, each last, regardless of size, is centered upon the jack with the midpoint of its bottom at the axis of rotation of the jack and with the last bottom at a predetermined level which is the same for all lasts.

Different styles of lasts may require different settings of the holder 102 lengthwise of the carrier 118, and such adjustment of the holder is effected by the above-mentioned screw 119.

Upon the initiation of a cycle of operation of the machine, the above-mentioned fulcrum block 96 (FIG. 3) is set, lengthwise of the slot 93 in the lever 82, in a position determined by the position of the last holder 102 when the last will have been centered upon the jack in the manner described above; and, with the fulcrum block in this position, the lengths of the arms of the lever 82 at each side of the block are such as to cause the amplitude of oscillation of the arm 22 and jack to correspond to the size of the work.

The fulcrum block 96 is pivoted by means of a stud 143 upon a slide 144 which is mounted to slide upon the bracket 78 and has an adjustable stop screw 146 which, by engagement with the rearward portion of the bracket opposite thereto, limits rearward movement of the slide and determines its initial position. The stud 143 is fixed upon a piston rod 147 the end portions of which are received in cylinders 148, 150 formed in the bracket 78. Fluid under pressure is supplied to these cylinders through pipes 152, 154, respectively, to move the piston rod 147 to and fro in a manner to be described below. When the machine is at rest, fluid pressure is supplied to the cylinder 150, whereby the slide 144 and block 96 are held in their initial positions. At the beginning of each cycle of operation of the machine, the block 96 is moved into its operative position under the control of an adjustable microswitch MS5 and a solenoid operated valve 156 (FIG. 4) which is first set to direct fluid pressure through the pipe 152 to the cylinder 148 and to vent the cylinder 150 through the pipe 154. When a shoulder 157 on the slide 144 strikes and operates the microswitch MS5, the valve 156 resumes a centered position and prevents any flow of fluid into or out of the cylinders 148, 150, whereby the block 96 is hydraulically locked in its operative position. The microswitch MS5 is fixed upon a plate 160 (FIGS. 3 and 2) which at its left-hand side slides in a guideway formed in the bracket 78 and at its other side is fixed upon a rod 162, the latter being mounted to slide in the bracket 78 parallel to the piston rod 147 and set in response to the centering movement of the last holder 102 through connections to be described later.

A piston 164 (FIG. 3) is mounted to slide forward and away from the jack in a cylinder 166 formed in a member 168 which is fixed upon the top of the arm 22. Upon the forward end of the piston 164 there is fixed a yoke 170 having an arcuate slot 172 which is concentric with the axis of rotation of the jack upon the arm 22 and receives a roll 174 mounted upon the rearward end of a rod 176. This rod is mounted to slide in the base 50 of the jack and carries an arcuate bar 178 (FIGS. 5 and 7) which is concentric with the above-mentioned grooves 123 in the cradle 122 and has rotatably mounted thereon a roll 180 which runs in a horizontal groove 182 formed in the base 50, whereby rotation of the bar 178 and rod 176 about the axis of the rod is prevented. The upper side of the bar 178 is provided with a groove 184 which receives a roll 186 carried by a member 188, the latter being mounted to slide freely between the sides of the cradle 122 upon a rod 190 which spans the sides of the cradle. The member 188 is slotted at 192 to receive a rod 194 fixed in the sides of the cradle, whereby rotation of the member 188 upon the rod 190 is prevented. A rack 196, fixed upon the member 188, meshes with a pinion 198 (FIG. 5) which is rotatably mounted in a strut 200 fixed upon the inner sides of the cradle. Another pinion 202, integral with the pinion 198, meshes with a rack 204 which is fixed upon the bottom of the carrier 118.

Fluid pressure is supplied to the cylinder 164, at the end of a cycle of operation of the jack, through a pipe 206 (FIGS. 3 and 4) under the control of a valve 208 (FIG. 4), to return the holder 102 to its loading position. In response to each centering movement of the holder and through connections driven from the piston 164, the above-mentioned microswitch MS5 is set in a position corresponding to the size of the last on the holder, as will now be described.

A casing 210 fixed upon the member 168 houses a pinion 212 which meshes with one rack 214 mounted to slide in the casing and also with another rack 216 formed upon the piston 164. A Bowden cable 218 connects the rack 214 and a rod 220 which is mounted to slide in the bracket 78 and is pivotally connected to a lever 222 fulcrumed at 224 upon the top of the cylinder 150. The lever 222 is connected to the rod 162 by a link 226. By this means, for any movement or position of the holder 102 a corresponding movement or position is imparted to the microswitch MS5. Upon forward movement of the piston rod 146 and the operation of the microswitch MS5 by the shoulder 157 on the slide 144, the valve 156 resumes its centered position, causing the fulcrum block 96 to be set and hydraulically locked in its adjusted position. Thus, the amplitude of oscillation of the jack is adjusted appropriately for the size of the work thereon.

Before the jack is operated to present the periphery of the shoe to the cutter head, a support 228 (FIG. 5) is brought forcibly, in a sloping direction, into engagement with the top of the instep portion of the last to cause the last to be cramped, in its centered position, firmly upon the holder 102 and pin 104. At the same time, a locking ring 230 (FIG. 3), housed in the member 168 and encircling the piston 164, is closed against the piston by a fluid operated plunger 232 to lock the piston in its position determined by the roll 174. The yoke 170 is thus held, during the rotation of the jack, so that the roll 174 will freely enter the slot 172 in the yoke at the end of the movement of the jack. The support 228 (FIG. 5) is at the upper end of a piston 234 which slides within a cylinder 236, the latter being fixed between the

sides of the cradle 120. A spring 237 stretched between the lower end of the cylinder 236 and the support urges the piston 234 downwardly toward a retracted position and a bar 238 fixed upon the cylinder cooperates with a land on the piston 234 to prevent it from turning. Fluid pressure is supplied to the cylinder 236 and the lock for the piston 164 through pipes 240, 242 (FIG. 4), respectively, under the control of a solenoid operated valve 246.

Upon the completion of a cycle of operation of the jack, the valve 156 is set so as to supply fluid pressure to the cylinder 150 and cause the fulcrum block 96 to be returned in its initial position; the valve 246 is set so as to vent the pipes 240, 242, permitting the retraction of the support 228 and causing the release of the locking ring 230 from the piston 164; and the valve 208 is set to supply fluid pressure to the cylinder 166, whereby the piston 164 drives the work and the holder 102 to the right and back to its original loading position, this action also being accompanied by the return of the microswitch MS5 to its original position.

Fluid pressure for the system is provided by a motor driven pump 248 (FIG. 4) which draws fluid from a tank 250 and delivers it through a pipe 252 to another pipe 254 which supplies fluid pressure to the valve 156. Pipes 256 and 258, connected to the pipe 254, supply fluid pressure to the valve 208 and valve 246, respectively. A pressure relief valve 260 maintains the desired fluid pressure in the system.

Other parts of the fluid system and features of the illustrated machine which are duplicated in the prior patented machine but are related to the present invention, only because of their involvement in the operation of the jack, will now be referred to. The above-mentioned pipe 254 supplies fluid pressure to a valve 260 which, in one setting, directs fluid pressure through a pipe 262 to the lower end of the cylinder 44 for causing the retraction of the cutter head 10 from the jack. In the other setting of the valve 260, it directs fluid pressure through a pipe 264 into the upper end of the cylinder 44 so as to advance the cutter head toward the jack and hold the cutter head against the shoe throughout the rounding operation with a variable pressure, the latter pressure being under the control of a valve 266 which is operated by a cam 268 (FIG. 1) at the lower end of the shaft 68. This cam is the same as the cam 120 in the Stacey machine.

Among the principal elements of the electrical control system for the machine is a microswitch MS1 which is mounted upon the cutter head and is normally depressed by a finger 270 fixed upon the upper end of a rod 272 carrying the above-mentioned bottom rest 20. The rod 272 is mounted to slide axially thereof in the cutter head and is biased downwardly by a spring 274 which seats upon a block 276 on the rod. When in its lowermost position, the bottom rest 20 is at, or just above, the level of the anvil 16 and gage 18, this position being determined by the engagement of the finger 270 with the frame of the cutter head. To facilitate the presentation of the cutter head to the work, the bottom rest is raised by pressing rearwardly upon a lever 278 which is pivoted upon the cutter head and is connected by a link 280 to the block 276 in such a manner that the link and lever constitute a toggle. Such lifting of the bottom rest 20 releases microswitch MS1 and causes the advance of the cutter head toward the jack. A microswitch MS2 is provided on the cutter head for initiating each cycle of operation of the jack driving mechanism. A microswitch MS6, which is fixed upon the base 26 of the machine, is normally depressed by a small lobe 282 on a cam 284 which is fixed upon the upper end of the above-mentioned shaft 68. This microswitch, when depressed at the end of a cycle of operation of the jack, causes the retraction of the cutter head from the jack. Microswitches MS4A and MS4B are associated with the pedestal 34 and are simultaneously depressed by the carriage 30 upon the return of the cutter head into its retracted position to cause the unclamping of the work and the unlocking of the piston 164.

Interposed between the output shaft of the unit 66 and the above-mentioned pinion 64 is a clutch mechanism like that disclosed in the above-mentioned Stacey patent (FIG. 16). The clutch in the patented machine is engaged by depressing its treadle 42 to which a treadle 290 (FIG. 1) of the illustrated machine corresponds. The treadle 290 is pivoted at 292 upon the base of the machine and is connected by a link 294 to a bell crank 296 also pivoted upon the base of the machine. A link 298 connects the bell crank 296 with another bell crank 300 pivoted upon the base 26 and having an arm disposed behind a spring biased bar 302 which operates the clutch. A notch in the bar 302 receives an arm 304 fixed upon the lower end of a shaft which is rotatably mounted in the base 26 and carries at its upper end another arm 306. The latter arm has on its rearward end a roll which runs upon a cam 308 (like cam 155 in the Stacey machine) which has a single notch in its periphery and is mounted upon the lower portion of the shaft 68.

It is sufficient to state for purposes of disclosure of the present invention that when the bell crank 300 is rotated clockwise (as by depressing the treadle 290), the bar 302 is released from the arm 304 and the clutch is engaged, whereupon a revolution of the shaft 68 is initiated. At the end of a revolution of this shaft, the notch in the cam 308 is presented to the roll on the arm 306 which allows the arm 304 to become seated in the notch in the bar 302 and, with slight further rotation of the cam 308, the arm 304 acts upon the bar 302 to disengage the clutch, whereby a cycle of operation of the jack driving mechanism is terminated.

While the tripping of the clutch in the illustrated machine may be effected by depressing the treadle 290, it is normally done by a solenoid S11 which is connected to an arm 310, integral with the bell crank 300, in such a manner that when the solenoid is energized the bell crank is swung clockwise. The solenoid S11 is energized when a microswitch MS2 on the cutter head 10 is depressed by the operator, as will be explained below.

A cycle of operation of the machine will now be described with reference to FIG. 10. The pump 248, the knife 14, and the driving unit 66 are assumed to be in operation.

Upon depressing the "start" switch, coil C is energized and the associated contactors CA and CB are closed. The contactor CA completes a holding circuit for the coil C and, through the contactor CB and the lower contacts of MS1, a circuit including coil K6 is completed whereby this coil also is energized. With coil K6 energized, the normally closed contactors K6A, K6B and K6D are opened but the normally open contactor K6C is closed, causing solenoid S10 to be energized and the valve 156 to be set (to the left) whereby fluid pressure is directed to the cylinder 150 and the slide 144 is held in its initial position. The solenoid S13 not being energized at this time, the valve 246 is set so as to vent the pipes 240, 242. Thus, the support 228 is in its retracted position and no locking effect is exerted upon the piston 164 by the locking ring 230. As the solenoid S14 is now deenergized, the valve 208 is set so as to vent the pipe 206, permitting a work piece on the holder 102 to be moved freely by the operator into its centered position upon the jack; and in response to such movement, the microswitch MS5 is moved forwardly into a position corresponding to the size of the work.

With the cutter head 10 still in its retracted position, microswitches MS4A and MS4B are held in the position shown in FIG. 10. Accordingly, solenoid S8 is deenergized as is solenoid S7 also because its circuit cannot be energized when the microswitch MS1 is depressed. Thus, the valve 260 is centered, causing the cutter head to be hydraulically locked in its retracted position.

The work now being in its centered position upon the jack and the adjustment of the microswitch MS5 having been automatically made, the operator presses the lever 278 rearwardly to raise the bottom rest 20, in preparation for presenting the cutter head to the work. The finger 270 is thus lifted off microswitch MS1, permitting it to close its upper contacts and complete a circuit including coil K1 and solenoid S13. As soon as the lower contacts of the microswitch MS1 are disconnected, coil K6 is deenergized and the associated contactors K6A, K6B and K6D are closed; but contactor K6C is opened, causing the solenoid S10 to be deenergized and the valve 156 to become centered. When the solenoid S13 is energized, the valve 246 is set to direct fluid into the pipes 240, 242. Accordingly, the work is cramped upon the holder 102 by the support 228 and the locking ring 230 is operated to lock the piston 164. Contactor K6B now being closed, a circuit including solenoid S7 is completed, whereby the solenoid is energized and the valve 260 is set (to the right) to direct fluid pressure through the pipe 264 into the upper end of the cylinder 44. The cutter head is now advanced toward the jack. Upon the departure of the cutter head from its retracted position, microswitches MS4B and MS4A are closed and opened, respectively, without any immediate effect except for the preparation of circuits for later use. When the cutter head 10 will have been properly located against the work, the lever 278 is released, permitting the bottom rest 20 to urge the shoe downwardly against the anvil 16 and gage 18. However, the work prevents the finger 270 from being lowered sufficiently to operate microswitch MS1 which remains released as long as the cutter head is in operative relation to the work.

With the above-mentioned closure of contactor K6B, there is also completed, through microswitch MS5, a circuit including solenoid S9 which, upon being energized, sets the valve 156 (to the right) so as to direct fluid pressure through the pipe 152 into the cylinder 148, causing the slide 144 to be moved forwardly until its shoulder 157 depresses the microswitch MS5, opening its upper contacts and closing its lower contacts. This operation of microswitch MS5 interrupts the circuit including solenoid S9 which immediately resumes its centered position and, therefore, causes the piston 147 to be hydraulically locked where it was stopped upon the actuation of the microswitch MS5. Thus, the fulcrum block 96 is set with respect to the lever 82, according to the size of the work, so as to provide the proper amplitude of oscillation of the jack. The full depression of the microswitch MS5 closes, up to the microswitch MS2, a circuit including the solenoid S11 which when energized, causes a cycle of operation of the jack driving mechanism to be initiated. The machine is thus put into a state of readiness for performing a rounding operation.

The operator now momentarily closes microswitch MS2, whereupon the solenoid S11 is energized and movement of the jack begins. The cam 284 immediately releases the microswitch MS6 causing the closure of a circuit including coil K2 which, upon being energized, results in the closure of the associated contactors K2A and K2B. Contactor K2A now completes a holding circuit for the coil K2 and closure of the contactor K2B results in the preparatory and partial closure of a circuit including coil K4 with no other effect.

At the end of the rounding operation and a cycle of operation of the jack, the cam 284 will have completed a revolution with its lobe 282 engaging and depressing microswitch MS6; and such operation of this microswitch again closes its lower contacts whereby, through a circuit including closed contactor K2B, the coil K4 is energized. This results in the opening of the contactors K4B and K4D causing solenoids S7 and S9 to be deenergized and the valves 260, 156, respectively, to become centered. Simultaneously, contactors K4A and K4C are closed, the latter being arranged to complete a holding circuit for the coil K4. Upon the closure of contactor K4A, circuits including solenoids S8 and S14 are closed, causing the valve 260 to be set (to the left), whereby fluid pressure is directed to the lower end of the cylinder 44 and retractive movement of the cutter head is begun. With the energizing of solenoid S14, the valve 208 is set to direct fluid pressure to the cylinder 166, whereby the piston 164 is advanced and the holder 102, with the work thereon, is returned to its original loading position.

Immediately upon the departure of the cutter head from the work, the bottom rest 20 falls to its lowermost position and the finger 270 depresses the microswitch MS1, causing its upper contacts to be opened and its lower contacts to be closed. Thus, coil K6 is energized again with the result that contactors K6A and K6B are reopened and the solenoids S13, S7 and S9 are deenergized. Accordingly, the valve 246 is set to vent the pipes 240, 242 whereby the support 228 is retracted and the piston 164 is unlocked. With the closure of contactor K6C, solenoid S10 is reenergized causing the valve 156 to be set (to the left) and the slide 144, together with the block 96, to be returned to their starting positions. Such movement of the slide immediately releases microswitch MS5, the upper contacts of which become closed again.

Upon the arrival of the cutter head in its retracted position, microswitches MS4B and MS4A are opened and closed, respectively, causing solenoids S8 and S14 to be deenergized and the coil K5 to be energized. By deenergizing solenoid S8, the valve 260 is restored to its centered position whereby the cutter head 10 is hydraulically locked in its retracted position. By deenergizing solenoid S14, the valve 208 is set to vent the pipe 206 so as to permit free centering movement of the holder 102 in the next operating cycle of the machine. Closure of microswitch MS4A completes a circuit including coil K5 which causes the opening of contactor K5A and the opening of the circuit including coil K1, whereupon the contactors K1A and K5A resume, in succession, their normally open and closed states, respectively, and the apparatus is restored to its original state in readiness to begin another cycle of operation.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a shoe machine, an operating head, a jack for a last, said jack being mounted for rotation and oscillation to present a shoe on the last to said head, adjustable driving means for rotating said jack and simultaneously oscillating it with a variable amplitude, said jack comprising means for centering the shoe thereon with the mid point of the last bottom at the axis of rotation of said jack, and means controlled by said centering means for setting said driving means in accordance with the size of the last.

2. In a shoe machine, an operating head, a jack for a last, an oscillating arm upon which said jack is mounted to rotate, adjustable driving means for oscillating said arm as said jack rotates thereon to cause a shoe on the last to be presented to said head, said jack comprising centering means which is movable to position the last with the mid point of its bottom at the axis of rotation of said jack, and means operated in response to the movement of said centering means for setting said driving means so as to impart an amplitude of oscillation to said arm corresponding to the size of the last on the jack.

3. In a shoe machine, an operating head, a jack upon which a last carrying a shoe is mounted for centering movement lengthwise of the last, said jack being mounted for rotation and also for movement back and forth through a stroke of variable length to present shoes of different sizes to said head, jack driving means comprising an adjustment for controlling the stroke of said jack, means for centering the last upon the jack with the mid point of the last bottom at the axis of rotation of the

jack, and means connecting said centering means and said adjustment for setting the latter according to the position of said centering means whereby the stroke of the jack conforms to the size of the shoe thereon.

4. In a shoe machine, an operating head, a rotatable jack for a last carrying a shoe, said jack being mounted to oscillate as it rotates progressively to present the periphery of the shoe to said head, adjustable driving means for imparting a variable amplitude of oscillation to said jack, said jack comprising a last holder mounted for movement lengthwise of the shoe and centering means for positioning the shoe with the mid point of its bottom at the axis of rotation of the jack, means for setting said driving means, and means operated by said centering means for controlling said setting means to cause the amplitude of oscillation of said jack to correspond to the size of the shoe on the jack.

5. In a shoe machine, an operating head, a jack for a last, an oscillating arm upon which said jack is mounted to rotate, driving means for oscillating said arm as said jack rotates thereon to cause a shoe on the last to be presented to said head, said driving means comprising a lever having an adjustable fulcrum which is movable from an initial position into a variable operative position to control the amplitude of oscillation of said arm, said jack comprising a last holder mounted thereon for last positioning movement lengthwise of the last, last centering means for limiting the positioning movement of said holder when the mid point of the last bottom is brought to the axis of rotation of said jack, and means for imparting a setting movement to said fulcrum corresponding to the last positioning movement of said holder.

6. In a shoe machine having an operating head and a jack for a last which is movable through a path of variable extent to present a shoe on the last to said head, adjustable driving means for operating said jack with a scope of movement corresponding to the size of the shoe, said jack comprising a last holder mounted for last positioning movement thereon lengthwise and heightwise of the last simultaneously to permit the bottoms of lasts of different sizes to be positioned lengthwise thereof with respect to said jack and head at a constant level, said jack also comprising a last size sensing element mounted for movement relatively to said holder heightwise of the last in response to said last positioning movement of said holder whereby said element is brought into engagement with the last and the last positioning movement of said holder is limited when the last is positioned upon the jack, and means operated in response to the last positioning movement of said holder for adjusting said driving means.

7. In a shoe machine having an operating head and a jack for a last carrying a shoe which is movable progressively to present the shoe to said head, said head being operable through advancing and retractive movements into and out of operative relation to the shoe, driving means for imparting a cycle of movement to said jack, said driving means comprising a member which is adjustable to vary the scope of movement of said jack, mechanism actuated in response to advancing movement of said head for imparting a setting movement to said member, said jack comprising a last holder mounted for positioning movement thereon lengthwise and heightwise of the last to position the last with respect to said head and jack, said jack also comprising a last size sensing element mounted for movement with respect to said holder into engagement with the last to limit the movement of said holder whereby the last is located in its operative position upon the jack, and means operated in response to the movement of said holder lengthwise of the last for limiting the operation of said mechanism whereby a setting movement is imparted to said member in accordance with the positioning movement of said holder.

8. In a shoe machine having an operating head and a jack for a last carrying a shoe which is movable progressively to present the shoe to said head, said head being operable through advancing and retractive movements into and out of operative relation to the shoe, driving means for imparting a cycle of movement to said jack, said driving means comprising a member which is adjustable to vary the scope of movement of said jack, mechanism actuated in response to advancing movement of said head for imparting a setting movement to said member, said jack comprising a last holder mounted for positioning movement thereon lengthwise and heightwise of the last to position the last with respect to said head and jack, said jack also comprising a last size sensing element mounted for movement with respect to said holder into engagement with the last to limit the movement of said holder whereby the last is located in its operative position upon the jack, means operated in response to the movement of said holder lengthwise of the last for limiting the operation of said mechanism whereby a setting movement is imparted to said member in accordance with the positioning movement of said holder, control means operable at the end of a cycle of movement of said jack for initiating a retractive movement of said head, and other control means operated in response to the departure of said head from the shoe for actuating said mechanism to return said member to its original position.

9. In a machine for operating upon shoes on lasts having size indicating surfaces located thereon in positions corresponding to their sizes, a jack comprising a holder for a last and a size sensing element disposed opposite to the size indicating surface of a last on said holder, said holder and element being mounted for last positioning movement together upon said jack lengthwise of the last, said holder and said element also being mounted for movement relatively to each other heightwise of the last in response to said positioning movement to bring said element into engagement with said size indicating surface whereby the said last positioning movement of said holder is limited in accordance with the size of the last.

10. In a machine for operating upon shoes on lasts having size indicating surfaces located thereon in positions corresponding to their sizes, a jack comprising a last holder mounted for positioning movement lengthwise of the last and inclined to its bottom to permit the mid point of the shoe bottom to be centered with respect to said jack at a predetermined level, and a size sensing element mounted in said holder for movement heightwise of the last into engagement with the size indicating surface of a last on said holder in response to the positioning movement of said holder whereby the positioning movement of said holder is arrested when the last reaches a centered position upon the jack.

11. In a machine for operating upon shoes on lasts having size indicating surfaces located thereon in positions corresponding to their sizes, a jack comprising a last holder and a size sensing member disposed opposite to the size indicating surface of a last on said holder, said holder and member being mounted for last positioning movements together in different directions lengthwise of the last, and connections for causing said member to move toward the last relatively to said holder in response to its positioning movement whereby the last is located with respect to the jack in a predetermined position upon the engagement of said sensing member with the size indicating surface on the last.

12. In a machine for operating upon shoes on lasts having size indicating surfaces thereon in positions corresponding to their sizes, a jack comprising a last holder and a size sensing member mounted thereon for movement relatively thereto heightwise of a last on the holder into engagement with the size indicating surface of the last, said member and holder being mounted for movement parallel and inclined to the last bottom, respectively, and connections between said holder and member for causing said member to be moved proportionately to the movement of said holder into engagement with the size indicating surface of the last on the holder whereby its

movement is limited in accordance with the size of the last.

13. In a machine for operating upon shoes on lasts having size indicating surfaces located thereon in positions corresponding to their sizes, a jack comprising a last holder which is mounted for movement lengthwise of a last on the holder along a path inclined to the last bottom at a slope which conforms to the ratio of the changes in length and height of lasts of different sizes, a last size sensing member mounted in a recess in said holder extending heightwise of the last for movement relatively to said holder into engagement with the size indicating surface of the last on the holder, said member being mounted for movement upon said jack parallel to the last bottom whereby, in response to last positioning movement of said holder lengthwise of the last, said member is moved proportionately heightwise of said holder into engagement with the size indicating surface on the last.

14. In a machine for operating upon shoes on lasts having size indicating surfaces located thereon in positions corresponding to their sizes, a jack comprising a holder having a jack pin upon which a last is mounted and a size sensing element disposed opposite to the size indicating surface of a last on said holder, said holder and element being mounted for last positioning movement together upon said jack lengthwise of the last, said holder and said element also being mounted for movement relatively to each other heightwise of the last in response to said positioning movement to bring said element into engagement with said size indicating surface whereby the said last positioning movement of said holder is limited in accordance with the size of the last, and a last support mounted upon said jack for movement into engagement with the forepart of the last obliquely toward said jack pin whereby the last is clamped upon said holder and said holder is held at the end of its positioning movement with said sensing element pressed against the last.

No references cited.