Jan. 11, 1938. P. SCHULTZE 2,105,130

POUNCING MACHINE

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Fig. 1.

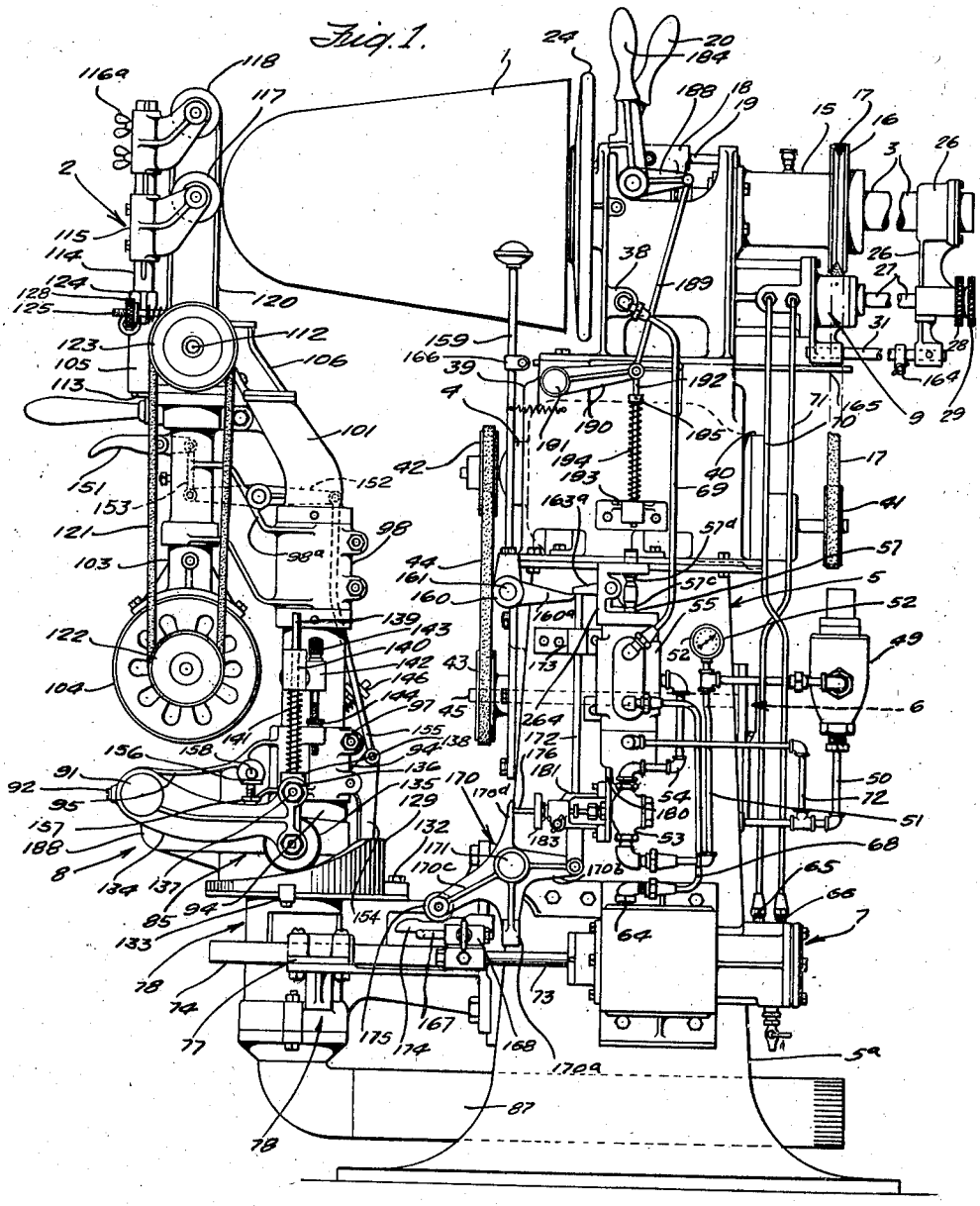

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Fig. 2.

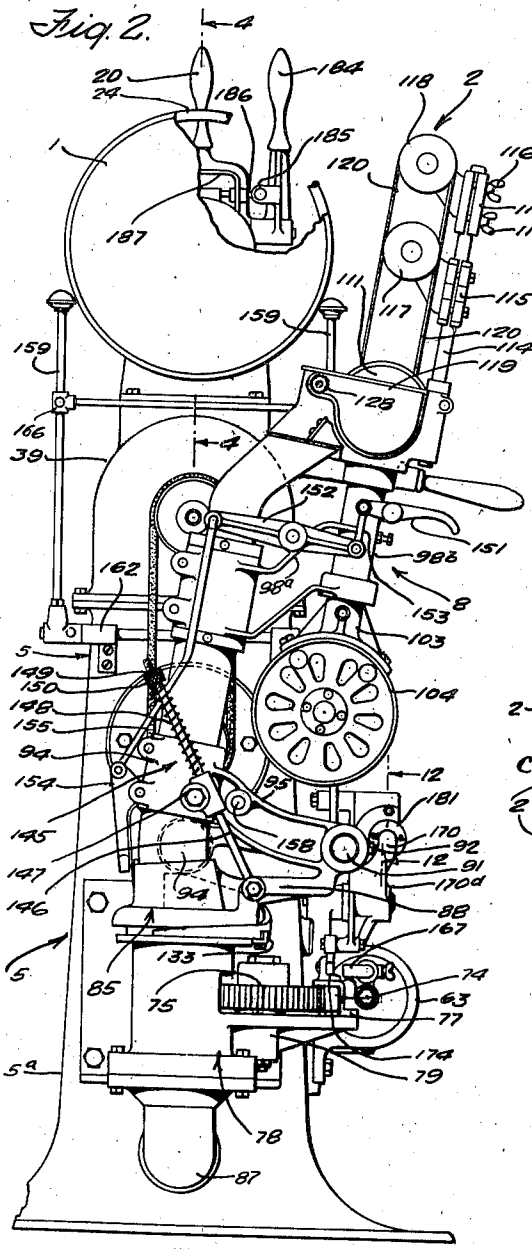

Fig. 3.

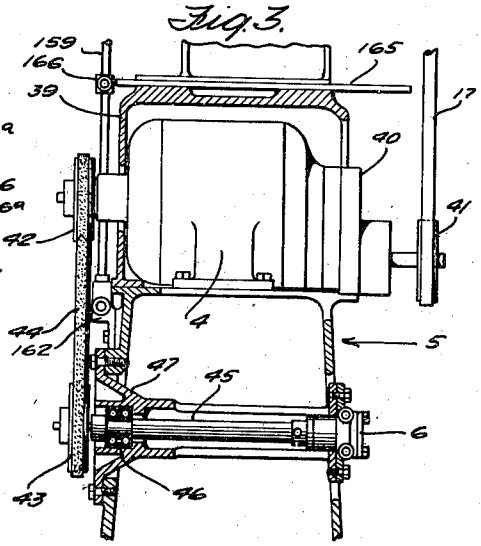

Fig. 14.

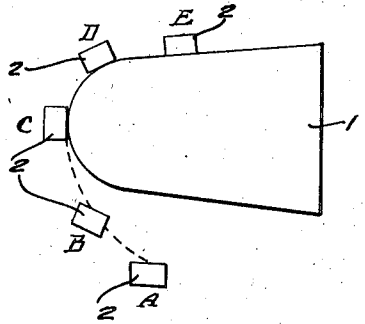

Fig. 15.

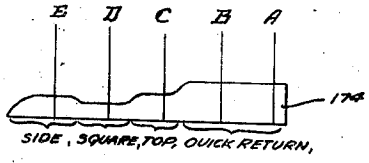

Fig. 16.

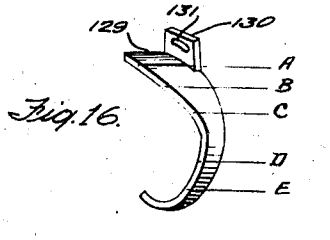

Fig. 17.

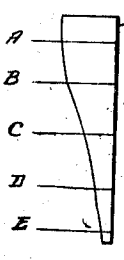

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Fig. 5.

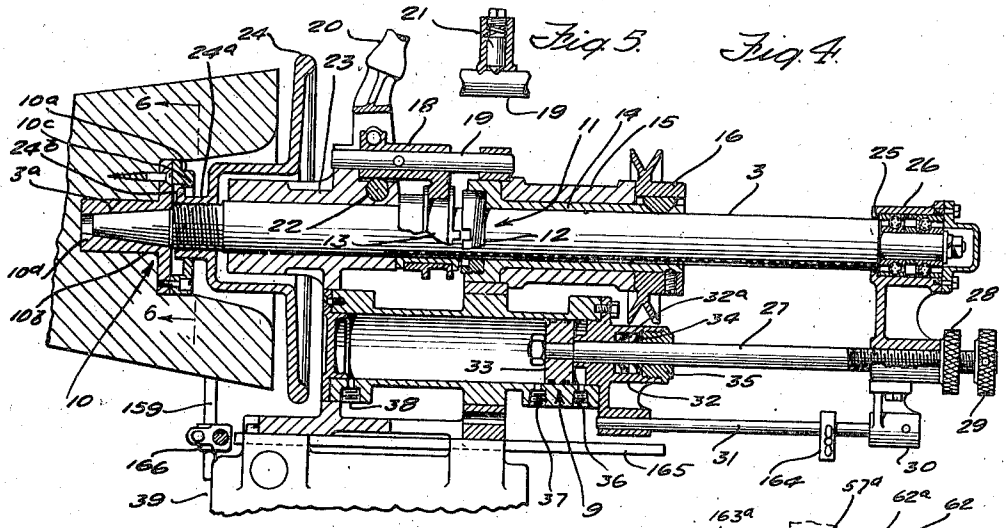

Fig. 4.

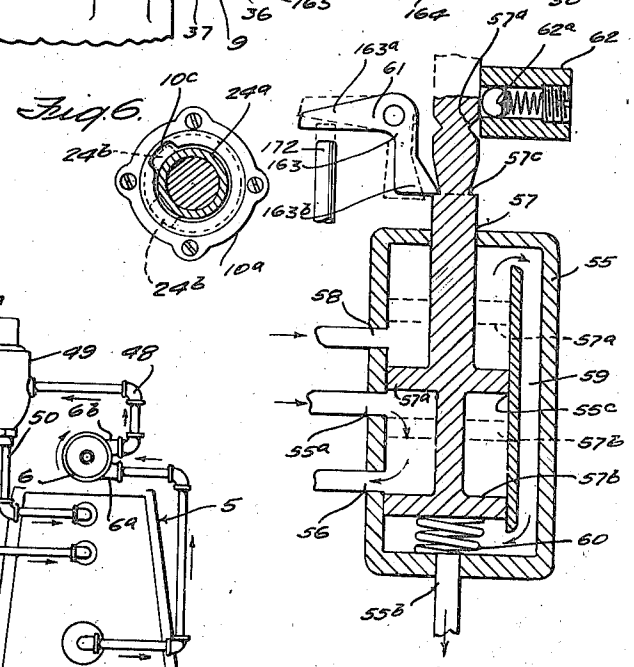

Fig. 6.

Fig. 10.

Fig. 11.

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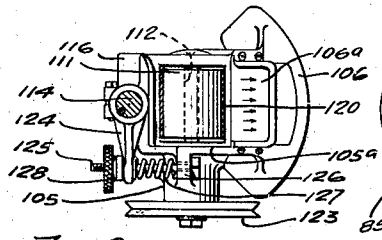

Fig. 8.

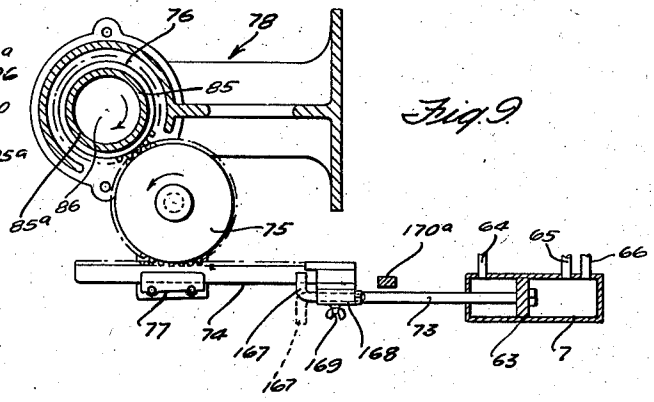

Fig. 9.

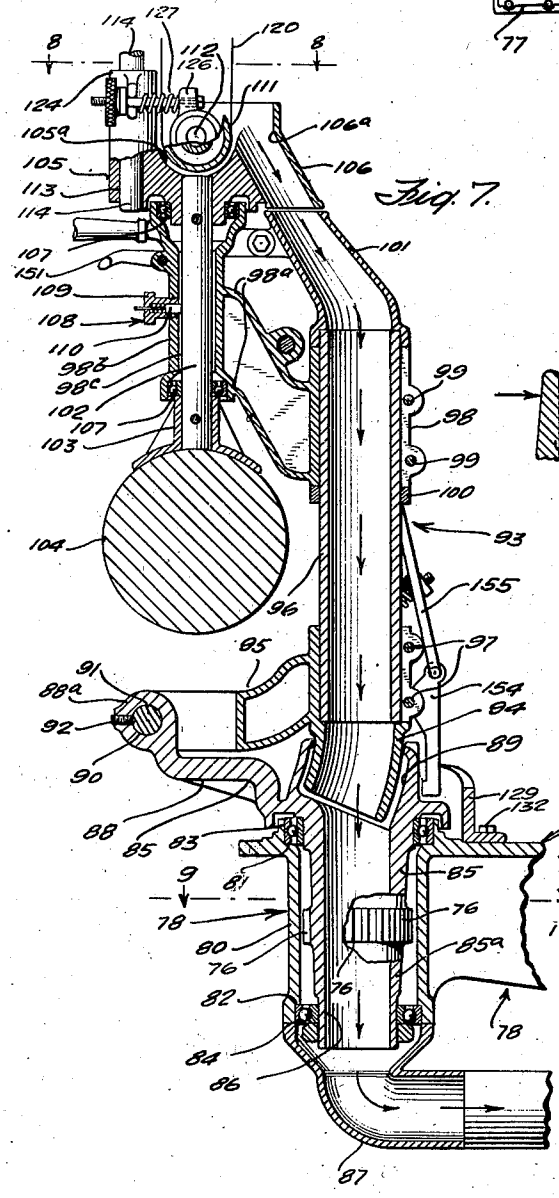

Fig. 7.

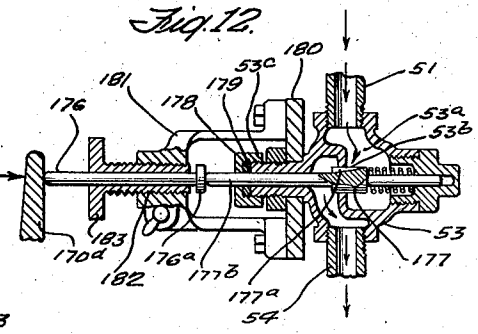

Fig. 12.

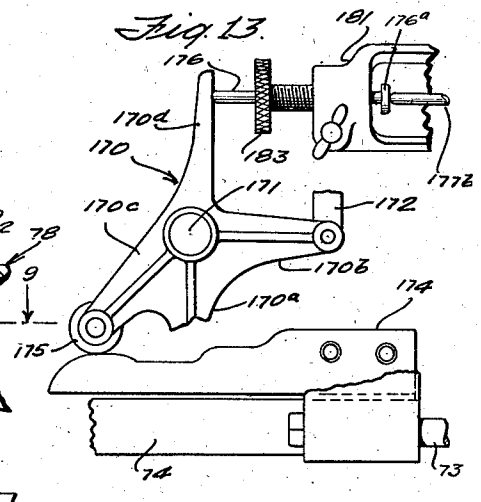

Fig. 13.

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Fig. 18.

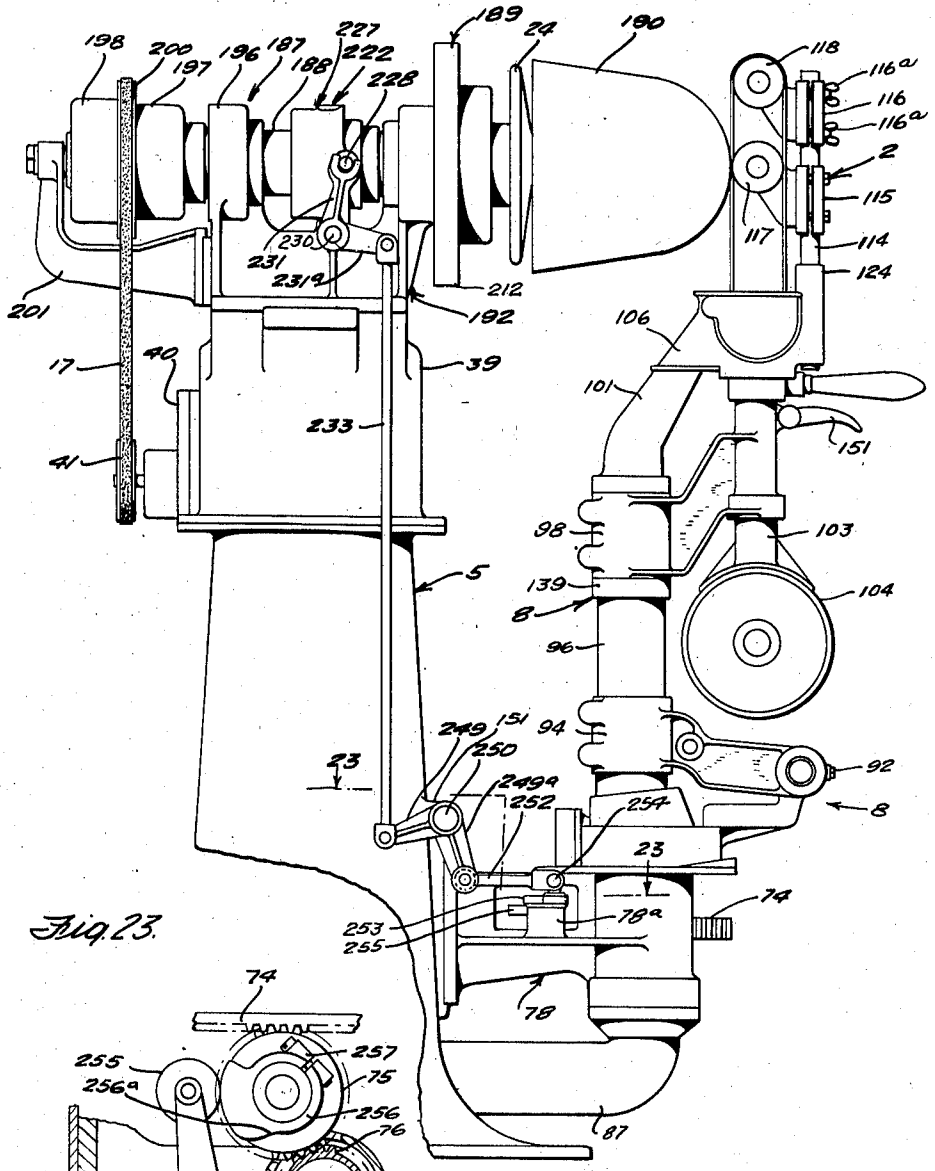
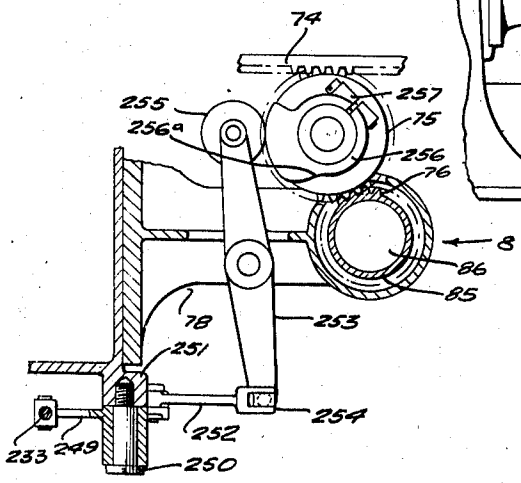


Fig. 23.



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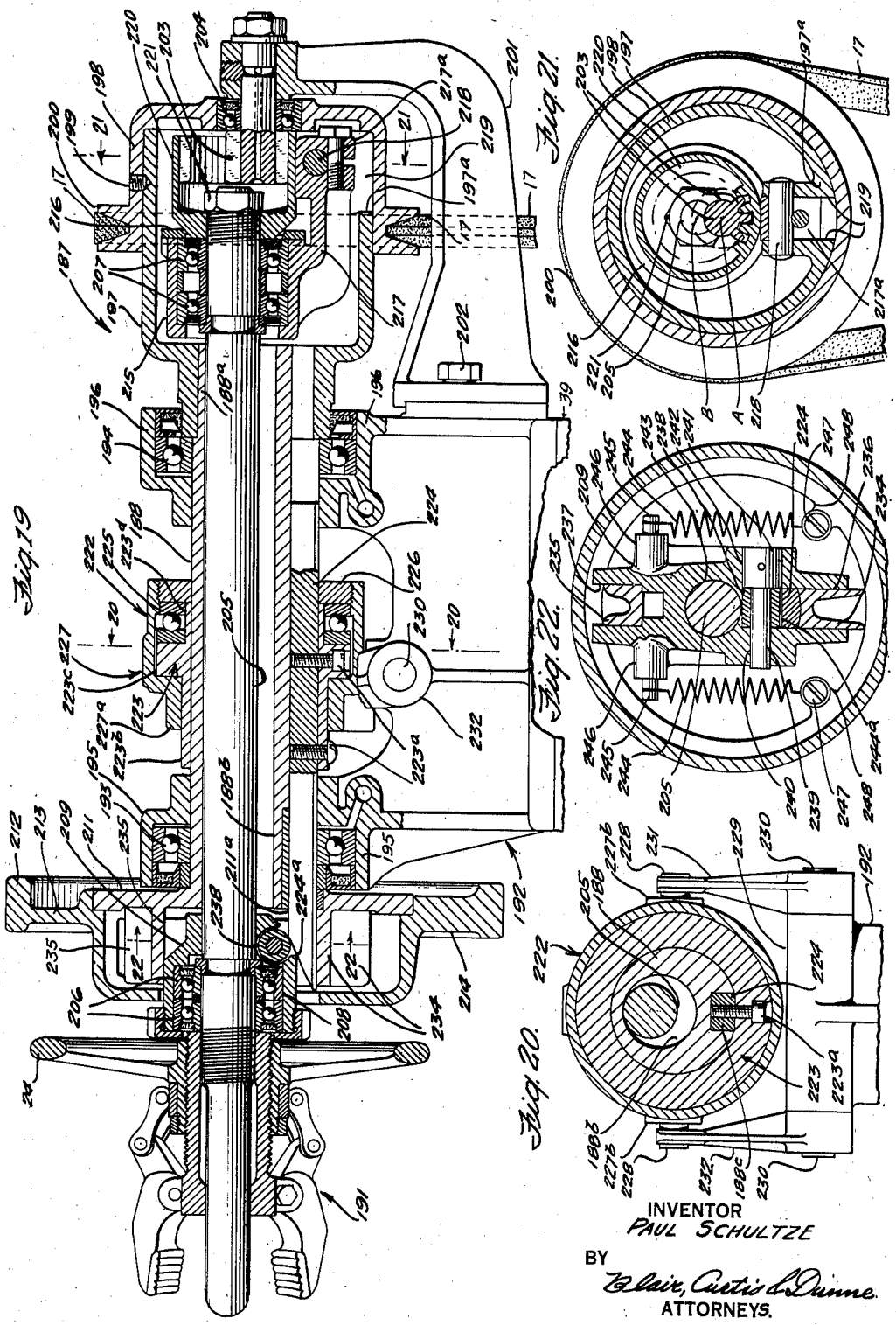

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Patented Jan. 11, 1938 2,105,130

UNITED STATES PATENT OFFICE

2,105,130

POUNCING MACHINE

Paul Schultze, Danbury, Conn., assignor to John C. Doran, doing business as Doran Brothers, Danbury, Conn.

Application February 9, 1935, Serial No. 5,757

63 Claims. (Cl. 223—20)

This invention relates to machines for finishing or sandpapering hat bodies.

One of the objects of this invention is to produce a machine for finishing hat bodies which is characterized by simplicity of construction, efficient operation, sturdiness and durability under extended use. Another object is to provide a machine of the above nature which is inexpensive to manufacture, inexpensive to operate and which may be readily operated by unskilled labor.

Another object is to provide a machine of the above nature wherein gearing is reduced to a minimum and wherein several of the operating parts are actuated hydraulically.

Another object is to provide a machine of the above nature whereby hat bodies of unusual depth may be finished.

Another object is to provide a machine of the above nature whereby the finishing or pouncing of oval hat bodies is rapidly and efficiently consummated.

Other objects will be in part apparent and in part pointed out hereinafter.

Accordingly, the invention consists in the features of construction, combination of elements, and arrangement of parts, all as will be illustratively set forth in the following description, and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings,

Figure 1 is a side elevation of the machine;

Figure 2 is a front elevation of the machine having a portion of the hat body support broken away;

Figure 3 is a side elevation partly in section showing a portion of the column of the machine which houses the main driving motor and oil pump;

Figure 4 is an enlarged sectional elevation of the hydraulic head taken along the line 4—4 of Figure 2;

Figure 5 is an enlarged sectional elevation of a detent associated with the clutch shaft shown in Figure 4;

Figure 6 is an enlarged sectional elevation of a portion of the chuck which supports the hat body support or hat block, taken along the line 6—6 of Figure 4;

Figure 7 is an enlarged sectional elevation of the tool assembly;

Figure 8 is an enlarged horizontal sectional view taken along the line 8—8 of Figure 7;

Figure 9 is an enlarged sectional plan view of the tool assembly drive taken along the line 9—9 of Figure 7;

Figure 10 is a diagrammatic elevation showing the several valves, cylinders and pipe connections therebetween which constitute the hydraulic drive of the machine;

Figure 11 is an enlarged diagrammatic sectional elevation of the direction control valve;

Figure 12 is an enlarged sectional elevation of the metering valve taken along the line 12—12 of Figure 2;

Figure 13 is an enlarged fragmentary elevation showing the cam and lever which operate the metering valve;

Figure 14 is a diagrammatic view indicating successive positions of the tool with respect to the hat block;

Figure 15 is an enlarged elevation of the cam which controls the metering valve, successive positions being indicated thereon in coincidence with the tool positions shown in Figure 14;

Figure 16 is a perspective view of the cam which controls the positions of the tool with respect to the axis of the hat block, successive portions of the cam being indicated to coincide with the tool positions in Figure 14;

Figure 17 is a development of the cam shown in Figure 16;

Figure 18 is a side elevation of the machine having a modified head construction preferably for the accommodation of oval hat shapes, some of the parts shown in Figure 2 being omitted;

Figure 19 is an enlarged vertical sectional elevation of the head of the machine in Figure 18;

Figure 20 is a sectional elevation taken along the line 20—20 in Figure 19;

Figure 21 is a sectional elevation taken along the line 21—21 in Figure 19;

Figure 22 is a sectional elevation taken along the line 22—22 in Figure 19; and

Figure 23 is a sectional plan view of the modified head control taken along the line 23—23 in Figure 18.

Similar reference characters refer to similar parts throughout the several views of the drawings.

In general, the hat body is mounted on a block 1 (Figure 1) which is revolved during the operations of a pouncing tool, generally indicated at 2, this tool having various motions in relation to hat block 1, as will be more fully described hereinafter. Hat block 1 is mounted on a shaft or spindle 3 driven through suitable belts and pulleys by a motor 4 which is housed in the machine column, generally indicated at 5.

As is more clearly shown in Figure 3, motor 4 also drives a gear pump 6 conveniently mounted in the casing 5, gear pump 6 being suitably connected to various control valves whereby fluid under pressure is directed to one or the other of two hydraulically actuated pistons. Thus, in Figure 1, a lower piston, generally indicated at 7 and mounted on column 5, is actuated to rotate an assembly, generally indicated at 8, whereby pouncing tool 2 mounted thereupon travels about hat block 1 in an axis substantially perpendicular to the axis of rotation of the hat block. An upper piston, generally indicated at 9 (Figures 1 and 4) and mounted on the head of the machine, is actuated by the fluid under pressure from the oil pump to impart axial movement to spindle 3, this movement, however, preferably not being imparted to spindle 3 until the movement of tool 2 about hat block 1 has ceased, all as will be more fully described hereinafter.

Referring now to Figures 1 and 4, hat block 1 is secured to spindle 3 by means of a suitable chuck, generally indicated at 10, and is rotatable with spindle 3 upon the engagement of a clutch, generally indicated at 11. Clutch 11 is comprised of a driving member 12 and a driven member 13, member 13 being slidably related to spindle 3 and having a driving relation therewith by means of suitable keys or splines. Driving member 12 is secured to a clutch sleeve 14, journaled in a housing 15, a part of the head bracket, and is driven by a pulley 16 which is suitably secured to clutch sleeve 14, pulley 16 being driven by motor 4 by means of a suitable belt 17 (Figure 1).

Clutch 11 (Figure 4) is thrown into and out of engagement by means of a clutch fork 18 mounted on a clutch shift rod 19 slidably received in the head bracket and shiftable by means of a clutch lever 20. As is more clearly shown in Figure 5, shift rod 19 has associated therewith a detent 21 adapted to maintain the clutch in either its engaged or disengaged position. Clutch lever 20 is suitably secured to a pin 22 rotatably mounted in a housing 23 which journals one end of spindle 3 and is a part of the head bracket.

A hand wheel 24 (Figure 4) is threadably mounted on one end of spindle 3 and has a cylindrical portion 24*a* from which extends a projection 24*b* (Figure 6). As is more clearly shown in Figure 6, chuck 10 includes an annulus or chuck ring 10*a* which is secured to the body 10*b* (Figure 4) of the chuck. Chuck ring 10*a* is provided with an opening 10*c* into which projection 24*b* may be inserted (Figure 6). Thus, when hat block 1 is placed upon the tapered end of spindle 3 and projection 24*b* engages behind the wall of chuck ring 10*a* upon the rotation of hand wheel 24, the conical bore 10*d* in the body of chuck 10 is drawn tightly on to the tapered end 3*a* and thus held securely in driving relation with spindle 3.

The other end of spindle 3 (Figure 4) is reduced and is preferably mounted in a suitable ball bearing 25 held in an end bearing or bracket 26. Bracket 26 also threadably receives the threaded end of a piston rod or shaft 27 connected to piston 9. Piston rod 27 is held against rotation in bracket 26 by means of a knurled lock nut 28. However, when lock nut 28 is released, piston rod 27 may be rotated by manually turning knurled knob 29. Upon the rotation of knob 29 in one direction or another, bracket 26 moves to the right or left with respect to piston 9 and accordingly imparts axial movement to spindle 3 and hat block 1, the purpose of which movement will be pointed out hereinafter.

Still referring to Figure 4, there is secured to the bottom of bracket 26, a bracket 30 in which is received a stroke-adjusting rod 31, the operation and purpose of which will be pointed out hereinafter. A housing 32 comprises the front end cover for cylinder 9 which is suitably mounted in the head bracket. End cover 32 is provided with suitable bores which slidably receive piston rod 27 and stroke-adjusting rod 31, and also has a chamber or bore 32*a* in which is disposed suitable packing 34 and a plug bearing 35 for piston rod 27. A piston is slidably received in cylinder 9 and is secured to piston rod 27 in any suitable manner.

As viewed in Figure 4, piston 33 is at its extreme right hand position and accordingly a port 36 communicates with the interior of cylinder 9 behind piston 33 while a port 37 and a port 38 communicate with the interior of cylinder 9 in front of piston 33. The operation and purposes of these ports in relation to piston 9 will be more fully described hereinafter.

From the above it may now be seen that as piston 33 reciprocates within cylinder 9 axial movement is imparted to spindle 3 and accordingly hat block 1 by means of the connection therebetween provided by bracket 26 and piston rod 27. One of the several advantages of providing an axially movable hat block lies in the fact that considerable versatility accrues to the machine in that hat bodies of varied dimensions and shapes may be accommodated. Furthermore, by providing the threaded connection between piston rod 27 and bracket 26, whereby axial adjustment of spindle 3 may be attained by the manual rotation of knob 29, it is possible to position hat block 1 (Figure 1) in relation to pouncing tool 2 in such a manner that a hat body of exceptional depth may be operated upon, thus obviating the necessity of providing additional machines for hat bodies of varying depths.

Referring now to Figures 1 and 3, motor 4 is preferably mounted in a housing portion 39 (Figure 3) of column 5. Preferably motor 4 is equipped with suitable reduction gears 40 which drive a shaft and pulley 41 by which belt 17 is driven. Reduction gears 40 are driven from one end of the armature shaft of motor 4, while the other end of the armature shaft drives a pulley 42 which in turn drives a pulley 43 by means of belt 44. Pulley 43 is mounted on the end of a shaft 45 which is journaled in ball bearings 46 mounted in a pump shaft housing 47, which comprises another section of column 5. Shaft 45 extends through housing 47 and is connected to gear pump 6. Thus it will be seen that motor 4 not only drives spindle 3 but also furnishes the power for driving the gear pump.

As is more clearly shown in Figure 10, gear pump 6 has an inlet port 6*a* communicating with a suitable oil reservoir in column 5 and an outlet port 6*b*. A pipe 48 leads from outlet port 6*b* into a pressure regulating valve 49 which may be of any desirable type. Valve 49 is adjustable so that if a maximum predetermined pressure is exceeded, fluid under pressure from the oil pump is exhausted through a pipe 50 into the oil reservoir and is not admitted into the system. Oil at correct pressures flows from pressure valve 49 through a pipe 51 past a pressure gauge 52 into a metering valve 53, and from metering valve 53 by means of a pipe 54 the oil flows into a direction-control valve 55.

As is more clearly shown in Figure 11, the direction-control valve 55 is provided with an

inlet port 55a and an exhaust port 55b. Thus, oil under pressure admitted into valve 55 through inlet port 55a flows out of valve 55 through a port 56 when a direction-control plunger 57 is in the full line position shown in Figure 11. When the plunger 57 is in this position, exhaust oil returns to the valve 55 through a port 58, passes through a channel 59 within the valve and thence out of the valve through an exhaust port 55b into the reservoir in column 5 (Figure 10) by way of a pipe 72. Plunger 57 is constantly biased upwardly by a spring 60 so that gates 57a and 57b of plunger 57 will lie in the dotted line position shown in Figure 11. However, plunger 57 is held in its lowermost position by means of a bell crank lever or detent 61, the end of which opposes or engages a shoulder 57c formed on the shaft of plunger 57.

The shaft of plunger 57 is also preferably provided with a notch 57d into which a spring biased ball 62a of a detent 62 drops to hold valve plunger 57 in a neutral position. In this position the plunger 57 is in neutral; that is, the ports 56 and 58 are both shut off from the flow of fluid which enters through the intake port 55a. The gates 57a and 57b, however, do not cover the ports 56 and 58 entirely, so that oil can flow freely between these ports by way of the channel 59 when the swinging arm 8 is manually pivoted. When the valve is in this position, fluid bypasses through pressure valve 49 and pipe 50 (Figure 10).

When plunger 57 is in its dotted line position, as shown in Figure 11, the fluid under pressure which flows into valve 55 through inlet port 55a is directed through port 58 and thence into the system and returns to valve 55 by way of port 56, thence to leave valve 55 through exhaust port 55b. These different lines of communication are made possible by a partition 55c along which gates 57a and 57b slide. The means and purposes of positioning plunger 57 as described above will be more fully pointed out hereinafter.

Referring to Figures 1 and 10, a lower piston 63 reciprocates within cylinder 7 provided with ports 64, 65 and 66, this piston and cylinder being substantially similar to piston 9 and cylinder 33 except preferably on a larger scale. When piston 63 is at the extremity of its stroke to the right, as viewed in Figure 10, it lies between ports 65 and 66; that is, its relationship to those ports is similar to the relationship of upper piston 33 to ports 36 and 37 as pointed out hereinabove.

A pipe 68 leads from port 56 in valve 55 to port 64 in cylinder 7, and a pipe 69 permits communication between port 58 of valve 55 (Figures 10 and 11) and port 38 of cylinder 9. Cylinders 9 and 7 are in communication by means of a pipe 70 between ports 37 and 66 and by a pipe 71 between ports 36 and 65. Thus, when valve plunger 57 is in the full line position shown in Figure 11, fluid under pressure is free to flow from port 56 through pipe 68 and into cylinder 7 by way of port 64. Piston 63 is accordingly forced to the right (see Figure 10) and as the exhaust oil in front of the piston seeks the line of least resistance it flows through port 66, through pipe 70 into cylinder 9 by way of port 37 and out of cylinder 9 through port 38; thence through pipe 69 into valve 55 by way of port 58, out of valve 55 by way of exhaust port 55b, and through exhaust pipe 72 into the oil reservoir in column 5.

As piston 63 (Figure 10) travels to the right its covers port 65 and shortly thereafter reaches the end of its travel so that port 65 is completely open to receive the full oil pressure. As piston 63 has ceased its travel, exhaust oil ceases to flow through pipe 70 and oil under pressure flowing through port 64 now flows through port 65, thence through pipe 71 through port 36 of the cylinder 9 and behind piston 33, thus forcing piston 33 to the left as viewed in Figure 10. The exhaust oil pursues substantially the same route from cylinder 9 as pointed out above with reference to the exhaust from cylinder 7, this route being indicated by the arrows in Figure 10.

When plunger 57 is in the dotted line position shown in Figure 11, the oil flow, and consequently the action of pistons 33 and 63, is reversed and the fluid, instead of flowing in the direction indicated by the arrows in Figure 10, flows in the opposite direction. Thus oil flowing into valve 55 by way of inlet port 55a flows out of the valve through port 58 and into cylinder 9 by way of pipe 69 and port 38 thus forcing piston 33 toward its position as indicated in Figure 10. Oil exhausted from cylinder 9 flows through port 37 into cylinder 7 by way of pipe 70 thus to force piston 63 into its position as indicated in Figure 10. Oil is exhausted from cylinder 7 by way of port 65 and pipe 68 and flows into valve 55 (Figure 11) by way of port 56 and thence out of the valve and into the oil reservoir in column 5, Figure 10, by way of exhaust 55b. Thus it will be seen that pistons 33 and 63 are returned to their respective positions as shown in Figure 10.

From the above it may now be seen that the two pistons preferably operate successively and not concurrently and the reason for this will be pointed out hereinafter.

With reference now to Figures 1, 2 and 9, piston 63 has connected thereto a piston rod 73 which in turn is suitably secured to a rack 74 (Figures 1 and 9). Rack 74 meshes with an idler gear 75, which in turn meshes with a driving gear 76 (Figure 9). Rack 74 is held in operative relationship with idler gear 75 by means of a guide 77 which is mounted upon a bracket, generally indicated at 78, extending from the base 5a of column 5 (Figure 1). Preferably bracket 78 also includes a suitable bearing 79 (Figure 2) in which the shaft, on which idler gear 75 is mounted, is journaled.

As is more clearly shown in Figure 7, bracket 78 also includes a housing portion 80, the top of which has formed therein a shoulder 81 and in the bottom of which a shoulder 82 is provided. Rotatably mounted, preferably by ball bearings 83 and 84 or the like, on shoulders 81 and 82 respectively, I provide a casting or the like, generally indicated at 85, and it is on a downwardly extending portion 85a of this casting that the teeth of drive gear 76 are cut. Portion 85a of casting 85 has a bore 86 which communicates with an exhaust conduit 87 secured to the bottom of housing portion 80 for purposes to be hereinafter pointed out.

Casting 85 conveniently taking the form shown in Figures 1, 2 and 7, accordingly includes a support 88 (Figure 7) and an upper chamber 89 communicating with bore 86. Support 88 of casting 85 has a projection 88a in which a bore 90 is formed and this bore receives a pin 91 preferably secured against rotation as by a set screw 92.

As is more clearly shown in Figure 7, support 88 supports a swinging arm, generally indicated at 93, arm 93 being pivotable about pin 91 by way of a bracket 95. Bracket 95 also includes a lower

exhaust elbow 94 extending into chamber 89. Lower elbow 94 is conveniently arcuate in shape, in order that, as swinging arm 93 pivots about pin 91, the lower portion of elbow 94 is free to leave and enter chamber 89 without jamming against any portions of the walls thereof. Preferably I provide a relatively small clearance between the walls of elbow 94 and the walls of chamber 89, in order that the influx of air between the walls of these two parts is kept at a minimum.

Still referring to Figure 7, arm 93 also includes a bored shaft 96 or the like, this shaft being received into the upper portion of lower elbow 94 and preferably being clamped securely therein as by a bolt 97. Securely clamped to the upper portion of hollow shaft 96, I provide a sleeve 98 which has upwardly extending ribs 98a on which is preferably integrally formed an upper support housing 98b which will be more fully described hereinafter. Upper sleeve 98 is securely held on shaft 96 by clamping bolts 99 and a collar 100 suitably secured to shaft 96. Preferably the top of shaft 96 extends a suitable distance beyond the top of sleeve 98 in order to accommodate an exhaust guide 101 which is suitably clamped or secured to the top of shaft 96.

From the above it may now be seen that swinging arm 93 is preferably comprised of three main elements, 94, 96 and 101, which have communicating bores forming an exhaust conduit constantly in communication with bore 86 and accordingly exhaust conduit 87. The purpose of this exhaust conduit or channel will be more fully pointed out hereinafter.

As is most clearly shown in Figure 7, upper housing 98b is provided with a bore 98c which rotatably receives a shaft 102. Secured to the bottom of shaft 102, I provide a motor bracket 103 to which is secured a motor 104. On the upper end of shaft 102 is secured a tool support bracket 105 which has mounted thereon an upper exhaust elbow 106 having a bore 106a which registers with the bore of upper exhaust elbow 101 to complete the exhaust conduit.

The assembly in Figure 7 consisting of shaft 102, motor support 103 and tool support 105 is pivotally borne by upper housing 98b by suitable antifriction bearings as, for example, ball bearings 107 mounted in suitable shoulders formed in housing 98b. This assembly is preferably so related to housing 98b that its natural tendency is to assume a central position in order that the bore of exhaust elbow 106 constantly registers with the bore of upper exhaust elbow 101. To prevent the pivoting of the assembly about the axis of the shaft 102 at the slightest touch, I preferably provide a brake, generally indicated at 108, this brake including a bored plug 109 in which is disposed a spring-urged plunger 110, which bears against shaft 102. Plug 109 is threaded into bracket 98b and accordingly by screwing plug 109 toward or away from shaft 102 the pressure of spring-urged plunger 110 is increased or decreased at will.

Referring now to Figures 7 and 8, tool support 105 is provided with a chamber 105a in which is disposed a pulley 111 mounted on a shaft 112 journaled in suitable bearings formed in tool support 105. A bore 113 formed in tool support 105 conveniently receives a shaft 114 which, as is more clearly shown in Figures 1 and 2, has mounted thereon pulley brackets 115 and 116. Brackets 115 and 116 suitably mount rotatable pulleys 117 and 118, respectively, pulley 117 preferably being of a compressible material, such as sponge rubber, for example.

Preferably tool support 105 is provided with a gate 119 (Figure 2) which may be raised to permit the installation of a sandpaper belt 120 in operative position with relation to the three pulleys. In order to facilitate the installation of sandpaper belt 120, pulley bracket 116 is provided with suitable wing nuts 116a or the like, the loosening of which permits the lowering of the bracket in order that the sandpaper belt may be readily slipped over the upper and lower pulleys 111 and 118 whereafter bracket 116 may be raised as necessary to provide suitable tension in the sandpaper belt. Pulley bracket 115 is likewise adjustable in order that compressible pulley 117, which is the pressure pulley, may be adjusted according to the level at which it is desired that the pressure be applied against the hat body.

With reference to Figure 1, sandpaper belt 120 is driven by motor 104 by means of a belt 121 in driving relation between pulleys 122 and 123 secured respectively to the motor shaft and lower pulley shaft 112.

It might be pointed out here that sandpaper belts such as sandpaper belt 120 are usually made from a length of sandpaper, the ends of which are cut on the bias and then pasted together to form a continuous belt. Occasionally, due to faulty materials or careless workmanship, the centers of rotation of such a belt are not always aligned and thus the belt will not run true. If this deflection were not rectified such a faulty belt would readily run itself off of the pulleys or wear so rapidly that its usefulness would soon depreciate. In order to provide for defective belts of this nature, I preferably mount on shaft 114 (Figures 1, 7 and 8) a pulley-adjusting lever 124 (Figure 8) this lever being suitably keyed to shaft 114. Thus, swinging of the lever imparts rotation to the shaft 114. Extending through the free end of lever 124, I provide a rod 125 which is secured to a lug 126 preferably integrally formed on tool support 105. Between lever 124 and lug 126 there is disposed a spring 127 the pressure of which tends to force lever 124 away from lug 126. A knurled nut 128 is suitably threaded on the end of rod 125 and accordingly by the rotation of nut 128, lever 124 may be swung toward or away from lug 126 at will. It will now be seen that as lever 124 swings, shaft 114 pivots and accordingly brackets 115 and 116 (Figure 1) likewise swing as they are keyed to shaft 114. This swinging movement is continued until such an angular deflection between pulley 118 and lower pulley 111 is attained as will compensate for the deflection in the belt.

From the above it will now be seen that as piston 63 (Figure 9) travels toward the right in cylinder 7 (Figure 10) rack 74 rotates idler gear 75 in a counterclockwise direction, and accordingly driving gear 76 is rotated in a clockwise direction to impart a pivotal motion to swinging arm 8 (Figures 1 and 2) and accordingly pouncing tool 2. As the center of gravity of swinging arm 8 is displaced to the right of shaft 91 (as viewed in Figure 1) about which the arm pivots, pouncing tool 2, or more specifically soft pulley 117, forces the sandpaper belt 120 against hat block 1, and as the tool 2 pivots, as pointed out above, the sandpaper belt travels in an arc starting at the apex of a hat body mounted on hat block 1 and continuing in a direction toward the brim of the hat body. As both sandpaper belt 120 and hat block 1 are rotating in opposite directions, the

sandpaper abrades material from the hat body, this material being sucked down through the exhaust conduit and disposed of in any suitable manner as by a suitable exhaust mechanism (not shown) secured to exhaust conduit 87 in a suitable manner.

Inasmuch as most hat bodies are of a more or less frusto-conical shape, and as the pressure of the tool against the hat body is preferably kept at a constant figure in order not to abrade the hat body too severely, I have found it preferable to provide suitable mechanism for varying the tool pressure during its movement about its axis of rotation. To this end, as is more clearly shown in Figure 1, I preferably secure a suitably designed cam 129 to the top of bracket 78. Cam 129 is preferably provided with a projection 130 (Figure 16) through which extends an arcuate slot 131. A bolt 132 (Figure 1) extending through slot 131 is threaded into the top of bracket 78 to clamp cam 129 in operative position. It will be noted that cam 129 is adjustable throughout the extent of slot 131. A suitable clamp 133 (Figures 1 and 2) bolted to bracket 78 retains cam 129 from displacement. Pivotally mounted on shaft 91 (Figure 1) I provide a cam roller arm 134 on the free end of which is rotatably mounted a suitable cam roller 135 which rolls upon the upper surface and accordingly follows the configuration of cam 129.

Projecting from cam roller arm 134 a lug 136 is provided with a suitable bore for the reception of a stud 137, on which is mounted a block 138 which suitably receives in a threaded bore provided therefor a rod 139, rod 139 being slidably received in a guide 140. Guide 140 is pivotally secured to the spring adjusting bracket 142. Bracket 142 has a downwardly extending shaft (not shown) which is slidably guided in a suitable bore formed in lower exhaust elbow 94. As viewed in Figure 1, this shaft and bore lie directly behind rod 139. A pressure relief spring 141 is disposed about rod 139 between block 138 and guide 140. Spring adjusting bracket 142 has a bore extending therethrough which accommodates an adjusting screw 143 in parallel alignment with the above-mentioned shaft (not shown). Adjusting screw 143 is threaded into a suitably threaded bore provided in that portion of lower exhaust elbow 94 immediately adjacent the shaft (not shown) which guides bracket 142. A knurled nut 144 is threaded on screw 143 to maintain adjustments provided thereby. Thus, upon nut 144 being loosened, adjusting screw 143 may be rotated to force bracket 142 and guide 140 downwardly or permit it to rise under the influence of spring 141, thus to adjust the tension of the spring. Spring 141 is a pressure release spring and its influence on the pressure exerted by pouncing tool 2 against a hat body 1 will be more fully pointed out hereinafter.

It will now be seen that as cam roller 135 rolls upwardly on the surface of cam 129, the tension of spring 141 is increased so as to urge swinging arm 8 and accordingly pouncing tool 2 away from hat block 1, and conversely, as cam roller 135 rolls downwardly on the surface of cam 129, tension of spring 141 is relaxed to permit swinging arm 8 and accordingly pouncing tool 2 to swing toward hat block 1.

The center of gravity of swinging arm 8 and the parts associated therewith is, however, not displaced so far from the arm's pivotal axis as to induce any great amount of pressure at the level of soft pressure roller 117. In order to attain suitable operating pressure of roller 117 against hat block 1, I have provided, as shown in Figure 2, a pressure device generally indicated at 145. This device is comprised of a rod 146 pivotally secured to support 88 and extending upwardly therefrom to be slidably received in a spring rod guide 147 which is pivotally mounted on lower exhaust elbow 94.

A spring 148 is positioned about rod 146 and is disposed between guide 147 and a knurled nut 149 threadably related to the free end of rod 146. The tension of spring 148 is adjustable by the manipulation of nut 149 which, when the desired adjustment is obtained, may be locked in position by a lock nut 150. As the tension of the spring is exerted downwardly on guide 147, swinging arm 8, and accordingly pouncing tool 2, is biased toward hat block 1.

As stated hereinbefore, it is desirable that the pressure exerted on a hat body by the pouncing tool be kept constant throughout the operation. Accordingly, pressure spring 148 (Figure 2) and pressure relief spring 141 (Figure 1) are so adjusted that as the pouncing tool progresses from the apex of the hat toward the brim thereof and thence back to the apex, the pressure of the tool against the hat body is substantially constant at all times during the contact therebetween. Furthermore, I have found it desirable that as the tool operates on that portion of the hat between the top and the side of the crown, hereinafter termed the "square" of the hat, the pressure should be slightly increased. It will be apparent that as the sandpaper abrades material from the square of the hat the whole surface of the belt will not contact the hat body or, in other words, the contact will approach a line. When this point is reached cam roller 135 is descending, cam 129 thus relieving the tension of pressure relief spring 141 which causes a slight increase in the pressure of the tool against the hat body by way of spring 148 (Figure 2). It also may be noted at this point that it is desirable that the feed rate of the tool be decreased slightly in order that the line contact pointed out above does not result in the formation of unsightly rings on the "square" of the hat. This variation in feed rate is accomplished by mechanisms which will be more fully described hereinafter.

Thus it will be seen that by providing an automatic pressure release in addition to an automatic feed control it is possible to impart a perfect finish to the hat body which could not otherwise be so readily obtained.

When piston 63 (Figure 10) has reached the end of its stroke in cylinder 7 (Figure 1) pouncing tool 2 has reached the end of its feed stroke in one direction and, as pointed out above, piston 33 in cylinder 9 is immediately actuated to effect axial movement of hat block 1. In other words, the hat body is now progressing at a feed rate rather than the pouncing tool. When the hat body has progressed to the predetermined limit of its feed stroke, reversing mechanism is automatically actuated to reverse the feed of the hat block and upon completion of the reverse feed of the hat block to initiate a reverse feed of the pouncing tool. The reverse feed of the pouncing tool terminates when the tool arrives at the apex of the hat block, and from this point a quick return motion is effectuated to rapidly swing the pouncing tool through an arc of substantially 90° into the position illustratively shown in Figure 2.

During this quick return action it is desirable

that the tool does not operate on the hat body. This disassociation is automatically accomplished by the abutment of the adjustable screw 156 in cam roller stud 134 against arm 158 extending from bracket 95 as cam roller 135 (Figure 1) proceeds from that portion of the cam designated by the letter C in Figure 16 to that portion of the cam designated by the letter A, in which position the tool has been backed off a substantial distance from the hat block. By referring to Figure 14 and Figure 16, the relationship of tool 2 to hat block 1 is illustratively shown, the letters A, B, C, D and E, which indicate the several positions of tool 2 (see (Figure 14) being coincident with the letters A, B, C, D and E, which indicate the positions of roller 135 on cam 129 (Figure 16) which has effected the related positions of the tool.

Under certain circumstances it is desirable that tool 2 be operated manually and backed off a further distance from hat block 1 than results from the ultimate progression of cam roller 135 to the top-most point of cam 129. As pointed out above, direction-control valve 55 (Figure 11) has a neutral position, and when the valve is in this position, swinging arm 8 can be manually pivoted as the fluid in the system is free to flow in either direction. To maintain swinging arm 8 a distance further spaced from hat block 1 than results from the normal operation of the arm, I have provided a release trigger 151 (Figure 2) pivotally mounted on support bracket 98b. A lever 152 pivotally mounted on arm 98a is connected at one end to trigger 151 by a link 153. The other end of lever 152 is connected to a latch 154 by a rod 155, the lower end of latch 154 (Figure 7) projecting normally below the top edge of casting 85. Thus, when trigger 151 is pivoted in a clockwise direction (Figure 2) lever 152 is pivoted in a counterclockwise direction, causing a counterclockwise pivoting of latch 154 to place the latch into a position where it may engage the top of casting 85 and thus hold the swinging arm in an extended pivoted position in a direction away from the hat block.

In order to effect the reverse feeds of the hat block and tool as mentioned above, I have preferably provided both manually and automatically actuated mechanisms. With reference to Figure 1, a reversing lever 159 is connected to a bell crank lever 160 pivotally mounted on a shaft 161 carried by suitable lugs 162 (Figure 2) secured to column 5. When lever 159 is pivoted away from column 5, end 160a of bell crank lever 160 raises an end 163a (see Figure 11) of a bell crank lever 163 pivotally mounted on a bracket 264 (Figure 1) secured to the top of direction-control valve 55. As end 163a (Figure 11) is raised the other end 163b of bell crank lever 163 is withdrawn from its engagement with shoulder 57c of valve plunger 57 thus permitting spring 60 to force plunger 57 upwardly so that gates 57a and 57b of the plunger assume the dotted line positions shown in Figure 11. When in this position a reversal of the operations takes place, that is, piston 33 (Figure 10) first is actuated to travel from the left to the right of cylinder 9 (Figure 1) and, after that action is terminated, piston 63 immediately travels from the right to the left of cylinder 7 to feed tool 2 in a reverse direction as pointed out above.

It will now be clear that the feeds of either the tool or the hat block may be reversed at will by manual operation of reversing lever 159. The above reverse feeds may, however, be effected automatically. As hat block 1 approaches the end of its forward feed stroke, the length of which may be determined by the positioning of an adjustable stroke-adjusting trip 164 which is slidably mounted on stroke-adjusting rod 31 (see Figure 4), trip 164 abuts a push rod 165 slidably mounted in the top of housing portion 39. As push rod 165 is forced to the left, as viewed in Figure 4, it eventually abuts a lug 166 secured to reversing lever 159, thus forcing lever 159 away from housing portion 39 and bringing about the release of plunger 57 in valve 55 to effect a reversal of operations as pointed out above with respect to the manual operation of reversing lever 159.

It is to be noted that inasmuch as trip 164 can be positioned at any point on stroke-adjusting rod 31, the length of the feed stroke of hat block 1 may be positively determined or varied according to the depth of the hat body being operated upon. Thus, a short stroke is obtained by positioning trip 164 to the left in Figure 4 and a long stroke by positioning the trip to the right.

Under certain conditions, as for example where very shallow hat bodies are being finished, it is desirable in the interests of economy of time that the automatic reversal just described be supplemented by a quicker acting mechanism which effects a reversal of the feed of tool 2 only and suspends the hat block feed. To this end, I preferably provide a valve trip hook 167 (Figure 1) pivotally mounted in a bracket 168 secured to piston rod 73. As is more clearly shown in Figure 9, hook 167 may be swung from its operative position shown in full line in Figure 9 to an inoperative dotted line position and maintained in either by means of a wing nut 169 or the like. When hook 167 is in its operative position it contacts a projection 170a (Figures 1 and 9) of a bell crank lever generally indicated at 170 (Figure 1). When piston 63 has reached the end of its stroke toward the right of cylinder 7 (it being noted that this stroke imparts initial feed to tool 2), the abutment of hook 167 against projection 170a causes bell crank lever 170 to pivot about a stud 171 (Figure 1) mounted in a suitable boss formed on column 5. This pivoting effects the elevation of another projection 170b of bell crank lever 170 and thus forces upwardly a valve release rod 172 which is pivotally secured to projection 170b and slidably extends through a guide 173 secured to column 5.

As valve release rod 172 (Figure 11) is thus raised it pivots bell crank lever 163, with the result that plunger 57 is released to assume its dotted line position as shown in Figure 11, thus effectuating a reverse feed of the tool as pointed out above. When valve release hook 167 is thus used to effect a reversal of tool 2, piston 33 (Figure 10) in upper cylinder 9 is inoperative because the direction of fluid pressure is the reverse of that indicated by the arrows in Fig. 10. That is, immediately after piston 63 opens port 65, plunger 57 (Figure 11) of valve 55 is released to change the direction of fluid flow from port 56 to port 58 (Figure 10). Accordingly, piston 63 immediately starts back in the opposite direction as no fluid can enter cylinder 9 through port 36 to actuate piston 33 (Figure 10).

As has been previously mentioned hereinabove, I find it preferable to provide mechanism for automatically varying the feed rate. This is particularly true of the feed rate of tool 2 in both directions of its stroke in order that the

appearance of the "square" of the hat is not marred, as pointed out above, and also to attain a quick return of the tool from the point at which it leaves the surface of the hat body (also mentioned hereinabove).

To effect automatically this variation in feed rate I have provided a speed control cam 174 (Figures 1, 2, 13 and 15) mounted upon rack 74. Bell crank lever 170 is provided with a projection 170c (Figure 13) on the end of which is revolubly mounted a cam roller 175 which is positioned to follow the surface of cam 174 throughout the extent of the cam's movement as imparted by the travel of rack 74. Another projection 170d on bell crank lever 170 projects upwardly and engages the end of push rod 176 which regulates the fluid output of the metering or speed control valve 53 (Figures 1, 10 and 12).

As pointed out above, speed control valve 53 is interposed between the oil pump and the direction control valve 55 (see Figure 10). Accordingly, fluid under pressure is always flowing through speed control valve 53 in the direction indicated by the arrows in Figure 12.

With reference to Figure 12, fluid under pressure flows through pipe 51 into a chamber 53a of valve 53. Chamber 53a is provided with an outlet port 53b in which a spring actuated piston 177 (partly shown in section) is slidably received. Piston 177 is provided with a longitudinal tapered groove 177a on its circumference and an outwardly extending stem 177b which abuts push rod 176. Stem 177b is sealed in a portion 53c of valve 53 by a cap 178 and a suitable oil seal 179.

Valve 53 is suitably mounted on a bracket 180 secured to column 5 (Figure 1). Secured to bracket 180 and extending therefrom I provide a U-shaped member or bracket 181 (Figure 12) which has a threaded bore 182 extending therethrough. Suitably threaded into bore 182 is an adjusting screw 183 suitably bored to receive push rod 176. Push rod 176 preferably has a collar 176a thereon adapted to abut against the adjacent end of screw 183. It may now be seen that screw 183 may be so positioned that the closing of port 53b can be positively limited, in that, push rod 176 and accordingly collar 176a thereon can slide through screw 183 until collar 176a abuts thereagainst, thus limiting the closing movement of valve piston 177 and stem 177b.

The operation of the above-described speed control for the feed rate is as follows, reference being made to Figures 1, 12, 13 and 15: As cam roller 175 (Figures 1 and 13) is forced along that portion of cam 174 indicated by the letter E in Figure 15, projection 170d of bell crank lever 170 is swung to the right to effect a freer passage of fluid under pressure through port 53b. This greater volume of fluid effects a faster feed to the tool but, as will readily be seen, at a constant oil pressure. As rack 74 progresses, cam roller 175 travels over that portion of cam 174 indicated by the letter D in Figure 15. As the cam roller attains this position, projection 170d is swung to the left causing a closing movement of port 53b and accordingly a lessening of feed rate but not of pressure. It will be noted that at this point tool 2 (as diagrammatically indicated in Figure 14) is in a position indicated by the numeral 4. Thus the tool is fed slowly over the "square" of the hat, the pressure of the tool being slightly decreased, and accordingly a perfect finishing job being obtained.

As the tool approaches the flatter surface of the top of the hat body, cam roller 175 rides up over that portion of cam 174 indicated by the letter C in Figure 15, thus effecting a more rapid feed rate in a manner similar to that pointed out above. Immediately after tool 2 passes the apex of the hat body, that is, as it leaves position C as viewed in Figure 14, cam roller 175 rides over those portions of the cam indicated by the letters B and A, at which time port 53 is open to its fullest extent. It is during this phase that the quick return is effected.

When the forward feed of tool 2 is effected, rack 74 moves from the left to the right, as viewed in Figure 1. Accordingly a rapid advance of tool 2 to the apex of the hat body results because meter valve 53 is fully opened, cam roller 175 being raised by cam 174 at portions A and B thereon (Figure 15). The different feed rates then follow in an order reverse to that described above with respect to the return feeds.

To instigate the operation of the machine, I have provided a valve operating lever 184 (Figure 1) pivotally mounted on the support bracket of the hydraulic head. As is more clearly shown in Figure 2, valve operating lever 184 has a lug 185 extending therefrom, and this lug abuts a pin 186 secured to a yoke 187 on which is mounted clutch operating lever 20. Thus, when valve operating lever 184 is pushed to the right, as viewed in Figure 1, clutch lever 20 is also moved by the abutment of lug 185 against pin 186 to engage clutch 11 (Figure 4) and thus cause rotation of the hat block.

As valve operating lever 184 (Figure 1) is moved, it forces downwardly a lever 188 to which is pivotally connected a valve push rod 189, in turn pivotally connected to an intermediate lever 190 suitably mounted to pivot about a stud 191 secured to column 5. As intermediate lever 190 pivots clockwise, it depresses a push rod 192 which is slidably received in the bore of a guide bracket 193 secured to column 5. Preferably I provide a spring 194 interposed between the top of guide 193 and a collar 195 secured to push rod 192, spring 194 being so disposed for the purpose of constantly biasing the valve operating element 192 to inoperative position.

With continued reference to Figure 1, when push rod 192 is sufficiently depressed, it abuts the top of plunger 57 (Figures 1 and 11) of valve 55, and on continued depression, plunger 57 is forced down until arm 163b of bell crank lever 163 engages shoulder 57c on valve plunger 57, in which position the forward operation of the tool is effected, all as best shown in Figure 11.

After the machine has been put into operation by the manipulation of lever 184, as pointed out above, the operation continues as follows: Fluid under pressure flows through the hydraulic system in the direction indicated by the arrows in Figures 10 and 11. Under this influence, piston 63 is forced to the right in cylinder 7 (Figures 1 and 10) and accordingly rack 74 moves from the left to the right as viewed in Figure 1. As rack 74 moves, idler gear 75 is driven, and it in turn drives gear 76 (Figure 9) to rotate pouncing tool 2 about a hat body mounted on hat block 1.

As the pouncing tool approaches the apex of the hat body or substantially position C as shown in Figure 14, cam roller 135 (Figures 1 and 16) descends from the highest portion of cam 129, thus permitting swinging arm 8 to pivot toward the hat body to bring the pouncing tool into contact therewith as it reaches this position. Thence the pouncing tool continues to travel

about the hat, and cam roller 135 progresses further down cam 129, thus automatically adjusting the pressure of the pouncing tool against the hat body, as pointed out above, until piston 63 and accordingly rack 74 completes its stroke.

Immediately upon the halting of piston 63 the fluid pressure is shifted into upper cylinder 9 in back of piston 33 therein to effect motion of piston 33 from the right to the left, as viewed in Figure 1. This movement of piston 33 is imparted to hat block spindle 3 and accordingly the rotating hat body is fed past the now stationary pouncing tool.

When the hat body has reached the end of its predetermined feed stroke, an automatic reversal takes place by the abutting of trip 164 (Figure 1) against reverse lever push rod 165 which slides to the left causing reversing lever 159 to be thrown. As reversing lever 159 is thrown, bell crank lever 160 pivots and one end thereof trips bell crank lever 163 (Figure 11) to release the engagement of arm 163*b* from shoulder 57*c*. As this engagement is released, plunger 57 in direction control valve 55 automatically shifts into a reverse position under the bias of spring 60, and in this position the direction of flow of the fluid under pressure immediately shifts so that the fluid now flows in a direction opposite to that indicated by the arrows in Figure 10.

Now follows a sequence of operations exactly the reverse of those pointed out above until the pouncing tool returns to its original position or position A shown in Figure 14.

During the forward and reverse feed strokes of both the pouncing tool and the hat body, the speed rate is varied for purposes hereinbefore set forth. Thus, as rack 74 moves from the left to the right in Figure 1, cam roller 175 rides over the surface of cam 174 which is carried by rack 74. As pointed out above, the different positions indicated on cam 174 in Figure 15 effect different feed rates of the pouncing tool. Thus, upon the forward stroke, the portions of cam 174 indicated by the letters A and B effect a rapid advance of the tool toward the apex of the hat until the position indicated by letter C is reached. At this position the feed rate is reduced somewhat as the sandpaper belt is now removing material from the hat body. When the "square" of the hat is reached, position D on cam 174 effects a slower feed rate in order not to deface this portion of the hat as would otherwise occur, as has been already pointed out. After the tool has progressed beyond the "square" of the hat, position E on cam 174 is reached and a faster feed rate is effected, as it is along this portion of the hat body that full contact is maintained between the sandpaper belt and the hat body, and the feed rate is accordingly preferably higher in order not to remove too much material from the hat body. This same feed rate is preferably maintained during the forward and reverse feed strokes of the hat body and also a portion of the return feed of the tool, after which time the different feed rates follow in an order reverse to that just described.

By referring to Figure 10, it may be seen that upon the completion of the forward and reverse feed strokes of pistons 63 and 33, these pistons have returned to the positions shown. The direction of flow of the fluid under pressure, however, is the reverse of that indicated by the arrows because plunger 57 of direction control valve 55 is in the dotted line position shown in Figure 11. Accordingly, an automatic repetition of the operating cycle will not ensue because the fluid, instead of flowing in the directions indicated by the arrows in Figures 10 and 11, will be flowing in an opposite direction, and as the pistons cannot travel any further in reverse direction, the oil will by-pass through pressure regulating valve 49 and thus return to the oil reservoir in column 5 by way of pipe 50.

It will now be seen that I have provided a hat finishing machine which will accommodate a hat body of unusual depth. By providing cams which automatically vary the pressure of pouncing tool 2 on the hat body and which vary the feed rate of the tool at those portions of the hat body where lesser or greater feed rates are needed, I have made it possible to put a uniform finish on the exterior surface of the hat body by removing the same amount of felt therefrom at substantially all portions thereof. Furthermore, I achieve extensive versatility through numerous adjustments such as the pressure adjustments provided by the pressure spring 148 (Figure 2) and pressure relief spring 141 (Figure 1), by the adjustable reversing trip 164 (Figure 1), by the feed stroke adjustment 29 (Figure 4) of the hat block spindle, and by the adjustment 128 (Figure 8) for compensating out-of-line sandpaper belts.

It will also be seen that by providing hydraulic drives, I have reduced to a minimum the number of moving parts. I have accomplished a simplicity of construction which denotes inexpensive manufacture, reliable operation and durability in the course of extended use.

As has been stated hereinabove, it is desirable that the pressure of the pouncing tool upon the hat body be constant and uniform throughout the pouncing or finishing operation. It may readily be seen that to obtain this constant and uniform tool pressure during the finishing operation on a hat body of oval shape entails difficulties not encountered in finishing a hat body of regular frusto-conical shape. As an oval hat body has a multitude of different diameters the surface of the hat body travels through an extremely irregular path when the hat body is rotated; that is, if a tool were to be held stationary it would either contact the hat body with constantly varying pressures due to the eccentricity of the oval shape, or it would contact portions of the hat body and fail to come into contact with other portions. Accordingly, I have found it desirable to provide a hat block and hat block spindle which may be eccentrically revolved in order to neutralize the effect of the varying hat body diameters. In effect, this eccentric action reduces the greater diameters and increases the lesser ones so that substantially an average diameter is imparted to the oval shape. To this end, I have provided an oval head assembly which is readily interchangeable with the hydraulic hat block head assembly which has been described in detail hereinbefore.

Accordingly, with regard to Figure 18, I provide an oval head generally indicated at 187, comprising a main shaft 188, a fly wheel 189 and a hat block 190 mounted on a chuck generally indicated at 191 in Figure 19. The several operating parts of head 187 are journaled in or secured to a head bracket generally indicated at 192 (Figure 18) which is suitably bolted or otherwise secured to the top of motor housing 39, which forms the upper part of column 5. Motor housing 39 and column 5 support and house parts similar to those hereinbefore described with the

exception of the upper cylinder 33, which is preferably not used in this embodiment of my invention. If desired, however, hydraulic means may be incorporated with the oval head for the same purposes as disclosed with respect to the other embodiment.

Still referring to Figure 18, it will be seen that I provide pouncing tool 2 on the swinging arm 8 mounted on bracket 78, these several assemblies being substantially as already described. Thus the main difference is in the head assembly and the drive therefor, which will be more fully described hereinafter.

Referring now to Figure 19, wherein there is shown on an enlarged scale, a sectional elevation of my oval head assembly, main shaft 188 is preferably journaled in ball bearings 193 and 194 mounted in housings 195 and 196 which are preferably integral parts of head bracket 192. Preferably, an end 188*a* of shaft 188 is reduced and on this end is secured a rear support 197 which conveniently takes the form of a drum. Upon rear support or drum 197 there is mounted an upper pulley cap 198 which is held in related assembly with drum 197 by a set screw 199 or the like. A pulley 200 is preferably integral with pulley cap 198 and, as is more clearly shown in Figure 18, driving belt 17 affords a driving relation between motor pulley 41 and head pulley 200, whereby the oval head is driven.

Referring again to Figure 19, I provide a supporting arm or bracket 201 secured to head bracket 192 as by bolts 202 or the like and, for purposes to be hereinafter described, there is mounted in arm 201 a stationary pinion 203, the shaft of which conveniently provides a mounting for a suitable anti-friction member 204 which supports pulley cap 198.

As is more clearly shown in Figure 20, main shaft 188 has an off-center bore 188*b* extending therethrough in which is received a spindle 205, spindle 205 having a diameter substantially smaller than that of bore 188*b*. Spindle 205 (Figure 19) is rotatably supported substantially at its opposite ends by anti-friction members 206 and 207 which conveniently take the form of ball bearings. Bearing 206 is mounted in a bore 208 provided in a journal member 209 reciprocably mounted with respect to flange 211, a part of shaft 188, all as will be more clearly described hereinafter. Mounted on and secured to flange 211 is a fly wheel 212, this fly wheel having webs 213 and 214 of differing thicknesses for a purpose to be set forth hereinafter.

Bearing 207 at the opposite end of spindle 205 is mounted in a bearing support 215 and is held in place therein by means of a suitable cover plate 216 or the like secured to support 215. Support 215 has integrally formed therein and extending therefrom an arm 217, the end of which conveniently takes the form of a clamp 217*a* which secures a supporting pin 218.

As is more clearly shown in Figure 21, the ends of pin 218 are journaled in a pair of support plates 219 which extend through a cut-out portion 197*a* in rear support 197 and are suitably secured to pulley cap 198. It will now be seen that arm 217, clamp 217*a*, pin 218 and support plates 219 comprise a hinge whereby spindle 205 (Figure 19) which is journaled in bearing 207 secured in support 215 may be given an angular deflection about pin 218 as an axis. The means for accomplishing and the purpose of this deflection will be more fully described hereinafter.

Still referring to Figure 19, an internal gear 220 is threaded onto the end of spindle 205 and is held in related assembly therewith by means of a clamping nut 221 threaded upon a reduced threaded end portion of spindle 205. Internal gear 220 meshes with stationary pinion 203, as may be more clearly seen in Figure 21.

Accordingly, it will now be seen that there are two axes of rotation, namely: one axis indicated by the letter A (Figure 21) which is the axis of rotation of main shaft 188 in addition to being the axis of stationary pinion 203, and the axis indicated by the letter B which is the axis of rotation of internal gear 220 and accordingly spindle 205. Thus, when rear support 197 and pulley cap 198 and the parts contained therein are rotated by belt 17, a double rotation is imparted to spindle 205 because of the connection thereof with pulley cap 198 by means of arm 217 and because of the meshing of internal gear 220 with stationary pinion 203. In other words, spindle 205 revolves about the axis A, the radius of revolution being A—B, and also spindle 205 revolves about its own axis B through the meshing of the gears. Accordingly a gear reduction is accomplished and spindle 205 is driven at a speed proportionate to the speed of rotation of main shaft 188, the speed of rotation of spindle 205 about its axis B being determined by the gears. By providing the hinged relation between spindle 205 and pulley cap 198 as described above, it is possible to deflect spindle 205 through an arc in the order of 2°–3° while both shaft 188 and spindle 205 are revolving.

As long as axis B is spaced from axis A, the surface of a hat block 190 mounted on chuck 191 (Figure 19) has an eccentric rotation with respect to pouncing tool 2, but hat block 190 being of an oval shape, the eccentricity of its rotation will substantially neutralize the differing diameters of the oval and thus effect a substantial circular rotation of the surface of the oval.

As spindle 205 is deflected so that its axis B at the end thereof remote from internal gear 220 merges with axis A of the main shaft 188, the eccentricity of rotation of chuck 191 is destroyed and accordingly the axis of the oval coincides with axis A and the surface of the oval now moves in an irregular path determined by the differing diameters of the oval. However, it is during this latter phase of rotation that the top of the oval is being operated on by the pouncing tool and accordingly a correction for the eccentric shape of the oval is not needed.

Preferably the deflection of shaft 205 is accomplished automatically by means of a shift device generally indicated at 222 in Figures 19 and 20. Shift device 222 (Figure 19) is preferably comprised of a shift collar generally indicated at 223 slidably mounted on shaft 188 and secured to an oval control wedge 224 by means of screws 223*a* or the like, wedge 224 being reciprocably disposed within a groove 188*c* formed in shaft 188 (see Figure 20) and in effect keys shift collar 223 to shaft 188. It will now be clear that shift collar 223 is rotatable with shaft 188.

Shift collar 223 (Figure 19) preferably includes a reduced portion 223*b*, a flange 223*c* and a shoulder 223*d*, thus conveniently taking the form illustratively shown in Figure 19. Mounted on shoulder 223*d* I preferably provide a thrust bearing 225 which is held in engagement with flange 223c by means of a lock nut 226 threaded into a housing member generally indicated at 227 suitably disposed about shift collar 223. Hous-

ing 227 includes a portion 227a which, upon tightening of lock nut 226, takes up behind flange 223, thus holding the housing and the shift collar in secured assembled relation and maintaining thrust bearing 225 in operative position. As housing 227 is also in effect a journal for shift collar 223 it will now be clear that shift collar 223 is free to rotate within this housing.

As is more clearly shown in Figure 20, housing 227 has projecting therefrom a pair of bosses 227b suitably bored to receive a pair of studs 228. Still referring to Figure 20, head bracket 192 has integrally formed therewith a boss 229 which is suitably bored to rotatably support a pin 230, the ends of which project beyond the ends of the boss. Mounted on the ends of pin 230 and secured to pivot therewith, I provide a pair of shifting arms 231 and 232, the free ends of these arms preferably being forked to engage studs 228.

As is more clearly shown in Figure 18, shift arm 231 conveniently takes the form of a bell crank lever, the other arm being an offset lever 231a pivotally connected to a push rod 233. Thus upon operation of push rod 233 either upwardly or downwardly, shift device 222 will be moved to the left or right respectively, thus imparting a corresponding reciprocation to oval control wedge 224 (Figure 19) by means of its connection with shift collar 223.

As mentioned hereinbefore, journal 209 (Figure 19) is reciprocably mounted with respect to flange 211. Thus flange 211 has integrally projecting therefrom a pair of guides 234 and 235 which, as is more clearly shown in Figure 22, are received in suitable guideways 236 and 237 formed in journal 209. The top of guide 234 is preferably slightly concave and slidably supports oval control wedge 224 which extends through a suitable bore 211a (Figure 19) formed in flange 211. In the top of guideway 236 a wedge roller 238 is rotatably mounted on a pin 239 suitably received in a bore 240 formed in journal 209. Pin 239 is secured to a plug 241 which is received in a bore 242 formed in journal 209, plug 241 being secured against rotation in any suitable manner. Journal 209 is further provided with a bore 243 in which spindle 205 is rotatably received.

It will now be seen that as wedge 224 is reciprocated by the mechanism heretofore described its inclined surface 224a (see also Figure 19) bears against roller 238 to force journal 209 upwardly or permit the journal to be displaced downwardly, as the case may be. The downward travel of journal 209, as viewed in Figure 22, is effected by means of a pair of springs 244 which are attached to journal 209 by suitable pins 245 conveniently received in bosses 246, which are preferably integral parts of journal 209. Springs 244 are secured at their other ends to a pair of pins 247 mounted in a pair of bosses 248 which are preferably integral parts of flange 211.

Referring now to Figures 18 and 23, push rod 233 (Figure 18) is pivotally connected at its lower extremity to an offset lever 249 pivotally mounted on a pin 250 (Figure 23) which is threadably received in a boss 251 which projects from column 5. Offset lever 249 has a complemental arm 249a (Figure 18) to the end of which is pivotally secured a link 252. Link 252 is secured to a lever 253 (Figure 23) the joint 254 therebetween being in the nature of a universal joint to permit pivoting of link 252 in planes both vertical and horizontal with respect to the plane of lever 253. Lever 253 is pivotally mounted on a suitable boss or projection 78a which is preferably integrally formed with bracket or support 78, lever 253 having rotatably mounted on the free end thereof a cam roller 255. Cam roller 255 operatively follows the surface of a cam 256 which is mounted on the supporting shaft of idler gear 75, thus rotating through a limited arc when idler gear 75 is driven by rack 74. Cam 256 is preferably adjustable on the idler gear shaft by means of a suitable clamp 257.

In operation, as rack 74 (Figure 23) drives idler gear 75, cam 256 rotates through an arc the limits of which are determined by the stroke of rack 74. As cam 256 rotates, its surface is followed by cam roller 255, and accordingly lever 253 is pivoted, thus actuating push rod 233 which in turn changes the angularity of spindle 205 (Figure 19) through the medium of shifting mechanism 222 (Figures 18 and 19) as previously described. Cam 256 (Figure 23) is so positioned on the shaft of idler gear 75 that the correct or desired degree of angularity is automatically imparted to spindle 205 according to the position of pouncing tool 2 (Figure 18) on hat block 190. Thus, when the pouncing tool is operating on top of the hat, it is not so important to compensate for the different diameters of the oval shape inasmuch as the eccentricity of rotation during this period of the finishing operation will not result in varying pressures, as the plane of the surface of the top of the oval hat does not change.

With further reference to Figures 18 and 23, as rack 74 moves to the left, pouncing tool 2 is driven in forward feed direction, idler gear 75 accordingly rotating in counterclockwise direction. Cam 256 rotates with idler gear 75 and as cam roller 255 follows the portion indicated at 256a (Figure 23) the shifting mechanism 222 is actuated. As cam roller 255 is rolling over surface 256a, pouncing tool 2 is progressing toward the brim of the hat, and, as the tool is now operating upon the sides of the hat, the angularity of spindle 205 with respect to main shaft 188 is so varied that the different diameters of the oval shape are compensated for, thus enabling a substantially constant pressure to be maintained between the pouncing tool and the hat body.

When cam roller 255 reaches the lowermost portion of cam 256, shifting mechanism 222 has been so operated as to withdraw wedge 224 (Figure 19) as far from wedge roller 238 as possible, thus merging the movable end of the axis of spindle 205 with the axis of shaft 188. When these axes are in this position, the differing diameters of the oval hat body are not being compensated for. Accordingly, when cam roller 255 is riding over the higher portions of cam 256, shifting mechanism 222 (Figure 19) and wedge 224 are shifted toward the hat body to culminate in the position shown in Figure 19, wedge 224 thus being forced under roller 238 to separate the axes of spindle 205 and shaft 188 and accordingly compensate for the eccentricity of rotation of the hat block.

From the description set forth hereinabove of the hydraulic head shown in Figure 1 and the oval head shown in Figure 18, it is to be noted that these heads are interchangeable on column 5 of the pouncing machine. Thus the hydraulic head which is secured to column 5 by means of a suitable number of bolts may be readily removed therefrom and the several pipe connections plugged up all without effecting the hydraulic operation of the pouncing tool upon a hat body mounted on the oval head which readily

replaces the hydraulic head. This feature of interchangeability is of great benefit in that only one machine with interchangeable heads might be purchased rather than two separate machines for finishing different types of hats.

It will thus be seen that by automatically varying the angularity of the shaft, which rotatably supports an oval hat block, with respect to the main drive shaft, the eccentricity of rotation of the oval block may be compensated for, thus permitting the maintenance of a constant pressure on the surface thereof by a pouncing tool or the like. It is important that the variations of this angularity be effected automatically as the pouncing tool progresses from the "square" of the hat to the brim thereof, as there are an infinite number of differing diameters each of which would effect a different degree of eccentricity were there no way of compensating for the different diameters of an oval shape. By thus compensating for these differing diameters the surface of the oval hat is maintained in a substantially constant plane at the point of contact with the pouncing tool, no matter what position the pouncing tool attains along the axis of the hat. Hence, the operating pressure of the tool on the hat is maintained at a substantially constant figure, thus preventing over-abrasion at some portions and under-abrasion at others. This results in the imparting of a finish of high quality to the hat which would not be otherwise obtainable. It also follows that reliance upon the skill of a workman is obviated, as is also the risk of low quality work by a lack of such skill.

It will thus be seen that there has been provided by this invention an apparatus in which the various objects hereinabove set forth, together with many thoroughly practical advantages, are successfully achieved.

As various possible embodiments might be made of the mechanical features of the above invention, all without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a finishing machine, in combination, a hat support, hydraulic means adapted to impart axial movement to said support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to cause relative movement between said support and said tool in a path extending from the apex to the brim of the hat, and valve means adapted to control the direction of operation of said hydraulic means.

2. In a finishing machine, in combination, a support, a head mounted on said support, said head including a spindle, hydraulic means adapted to impart axial movement to said spindle, a chuck mounted on said spindle, a tool rotatably mounted on said support and adapted to rotate about said chuck, hinge means whereby said tool may be pivoted toward and away from said chuck, hydraulic means adapted to rotate said tool, valve means, said valve means and both of said hydraulic means being interconnected whereby said valve means determines the direction of operation of both of said hydraulic means, and means adapted to force oil under pressure into said valve means.

3. In a machine of the character described, in combination, a rotatable hat support, means for driving said support, hydraulic means adapted to impart axial translation to said hat support, means for varying at will the direction of translation of said hat support, an oil pump connected to said second-mentioned means, and a valve automatically actuated to determine the direction of translation of said support, said valve being interposed between said pump and said second-mentioned means.

4. In a machine of the character described, in combination, a rotatable hat support, a drive shaft mounting said support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said support axially, hydraulic means adapted to move said tool about said hat, and means associated with both of said hydraulic means whereby said first-mentioned hydraulic means operates upon the cessation of operation of said second-mentioned hydraulic means.

5. In a machine of the character described, in combination, a rotatable hat support, a drive shaft mounting said support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said support axially, hydraulic means adapted to move said tool about said hat, means associated with both of said hydraulic means whereby said first-mentioned hydraulic means operates upon the cessation of operation of said second-mentioned hydraulic means, and valve means for automatically varying the feed rate of said second-mentioned means.

6. In a machine of the character described, in combination, a rotatable hat support, a drive shaft mounting said support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said support axially, hydraulic means adapted to move said tool about said hat, means associated with both of said hydraulic means whereby said first-mentioned hydraulic means operates upon the cessation of operation of said second-mentioned hydraulic means, valve means for automatically varying the feed rate of said second-mentioned means, and valve means connected to both of said hydraulic means and said first-mentioned valve means, said last-mentioned valve means being adapted to control the direction of operation of both of said hydraulic means.

7. In a machine of the character described, in combination, a rotatable hat support, a drive shaft mounting said support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said support axially, hydraulic means adapted to move said tool about said hat, means associated with both of said hydraulic means whereby said first-mentioned hydraulic means operates upon the cessation of operation of said second-mentioned hydraulic means, valve means for varying the speed of operation of said second-mentioned means, valve means connected to both of said hydraulic means and said first-mentioned valve means, said last-mentioned valve means being adapted to automatically control the direction of operation of both of said hydraulic means, and means associated with said last-mentioned valve means whereby said last-mentioned valve means is retained in a neutral position to permit manual operation of said tool.

8. In a machine of the character described, in combination, a rotatable hat support, a traversing tool having means for actuating it to operate on the surface of a hat mounted on said support, means including a spring for effecting a

continuous pressure of the tool against the hat, spring means biasing said tool away from said hat to partially relieve said pressure, and means adapted to positively control said pressure.

9. In a machine of the character described, in combination, a rotatable support for an oval hat, a tool rotatable about said support, eccentric mechanism adapted to shift the axis of said support, automatic means for varying the eccentricity of said mechanism as said tool operates on the hat, hydraulic means adapted to rotate said tool, and valve means connected to said hydraulic means whereby the speed of operation thereof is automatically varied.

10. In a machine of the character described, in combination, a rotatable spindle, a chuck mounted on said spindle, hydraulic means adapted to impart axial movement to said spindle, a tool movable about said chuck, hydraulic means for moving said tool, valve means connected to both of said hydraulic means and adapted to control the direction of operation thereof, and a valve member connected to said valve means and adapted to vary the rate of flow of fluid into said valve means whereby the speed of operation of said second-mentioned hydraulic means may be varied, and means adapted to automatically control said valve member.

11. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to travel about said support, hydraulic means for imparting axial movement to said support, and means for automatically reversing the direction of travel of said hydraulic means and said tool.

12. In a machine of the character described, in combination, a rotatable support for an oval hat, a tool for operating on the surface of said hat, hydraulic means for moving said tool about said hat support, means for changing the axis of rotation of said hat support as said tool moves thereabout, and means connected to said hydraulic means for varying the rate of flow of fluid into said hydraulic means for varying the feed rate of said tool during its motion about said hat support.

13. In a machine of the character described, in combination, means for rotatably supporting an oval hat, said means including a hollow shaft having a fixed axis and a spindle disposed within said hollow shaft having a variable axis, a tool for operating on the surface of said hat, and means for changing the axis of said spindle as said tool operates on said hat.

14. In a machine of the character described, in combination, means for rotatably supporting an oval hat, said means including a hollow shaft having a fixed axis and a spindle disposed within said hollow shaft having a variable axis, a tool for operating on the surface of said hat, and means for changing the axis of said spindle as said tool operates on said hat, said means including a cam and connecting elements therefrom to said spindle to change the axis of said spindle.

15. In a machine of the character described, in combination, a support comprised of a base, a pump housing and a motor housing, a bracket mounted on said support, a hat support rotatably mounted in said bracket, a motor in said motor housing, an oil pump in said pump housing, said motor being adapted to drive said hat support and said pump, a tool rotatably mounted on said first-mentioned support, hydraulic means secured to said base and adapted to rotate said tool, valve means for controlling the direction of flow of oil from said pump to said hydraulic means, means for reversing the direction of flow of oil from said valve to effect a reversal of movement of said tool, valve means interpositioned between said pump and said first-mentioned valve means for varying the rate of flow of oil into said first-mentioned valve means whereby the feed rate of said tool may be varied, and means operably associated with said hydraulic means and said last-mentioned valve means for varying the rate of flow of oil from said last-mentioned valve means.

16. In a machine of the character described, in combination, a base, a hat support rotatably mounted on said base, a tool support rotatably mounted on said base and pivoted to swing toward and away from said hat support during its rotation, means including a cam for effecting the swinging movement of said tool support, the position of said cam being variable at will to vary said swinging movement and a tool mounted on said tool support for operating upon a hat mounted on said hat support.

17. In a machine of the character described, in combination, a base, a hat support rotatably mounted on said base, a bracket member extending from said base, a tool support rotatably mounted in said bracket and pivoted to swing toward and away from said hat support, means including a rack and pinion for rotating said tool support about a hat mounted on said hat support, means including a cam mounted on said bracket for effecting the swinging movement of said tool support, and a tool mounted on said tool support for operating upon the surface of said hat.

18. In a machine of the character described, in combination, a base, a hat support rotatably mounted on said base, means disposed in said base for rotating said hat support, a tool support rotatably mounted on said base, said tool support being adapted to rotate about a hat mounted on said hat support, means associated with said tool support and including a cam and roller pivoted to swing said tool support toward and away from said hat during the rotation of said tool support, means for rotating said tool support, a tool mounted on said tool support for operating upon the surface of said hat in a path extending from the apex to the brim thereof, and a motor mounted on said tool support for driving said tool.

19. In a machine of the character described, in combination, a base, a hat support rotatably mounted on said base, means for rotating said hat support, a tool support pivoted to swing toward and away from a hat mounted on said hat support, said tool support being rotatably mounted on said base, a tool mounted on said tool support for operating upon the surface of said hat, means for forcing said tool support and said tool toward said hat, and spring means for partially relieving the pressure of said last-mentioned means as said tool traverses predetermined portions of the hat.

20. In a machine of the character described, in combination, a base, a hat support rotatably mounted on said base, means for rotating said hat support, a tool support pivoted to swing toward and away from a hat mounted on said hat support, said tool support being rotatably mounted on said base, a tool mounted on said tool support for operating upon the surface of said hat, means for forcing said tool support and said tool toward said hat, spring means for partially relieving the pressure of said second-mentioned means as said tool traverses predetermined portions of the hat, and means for varying at will

the effective pressure of both of said second and third-mentioned means.

21. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said support axially, hydraulic means adapted to move said tool about said hat, and means associated with both of said hydraulic means whereby said first-mentioned hydraulic means operates upon the cessation of operation of said second-mentioned hydraulic means.

22. In a machine of the character described, in combination, a rotatable hat support, means including a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said tool about said hat, and valve means associated with said hydraulic means and actuated by said first-mentioned means for automatically reversing the direction of movement of said tool upon said tool attaining the limit of its feed in one direction.

23. In a machine of the character described, in combination, a rotatable hat support, means including a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said tool about said hat, valve means associated with said hydraulic means and actuated by said first-mentioned means for automatically reversing the direction of movement of said tool upon said tool attaining the limit of its feed in one direction, and means for varying the rate of movement of said tool.

24. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said tool about said hat, valve means associated with said hydraulic means for automatically reversing the direction of movement of said tool upon said tool attaining the limit of its feed in one direction, and means including a cam and follower operatively associated with said hydraulic means and responsive to the movement thereof for varying the rate of movement of said tool in both directions of its travel.

25. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means adapted to move said tool about said hat, valve means associated with said hydraulic means for automatically reversing the direction of movement of said tool upon said tool attaining the limit of its feed in one direction, and means for varying the rate of movement of said tool, said means including a metering valve associated with said hydraulic means and said direction-control valve.

26. In a machine of the character described, in combination, a rotatable hat support, a tool for operating upon the surface of a hat mounted on said support, said tool being movable thereabout, hydraulic means for moving said tool about said hat, hydraulic means for moving said hat support axially, and means including a direction-control valve and a system of piping interconnected with both of said hydraulic means whereby a forward feed is imparted to said tool, thence a forward feed is imparted to said hat support, thence a return feed is imparted to said hat support, and thence a return feed is imparted to said tool.

27. In a machine of the character described, in combination, a rotatable hat support, a tool for operating upon the surface of a hat mounted on said support, said tool being movable thereabout, hydraulic means for moving said tool about said hat, hydraulic means for moving said hat support axially, means including a direction-control valve and a system of piping interconnected with both of said hydraulic means whereby a forward feed is imparted to said tool, thence a forward feed is imparted to said hat support, thence a return feed is imparted to said hat support, and thence a return feed is imparted to said tool, and means for preventing a repetition of the movements of said tool and said hat support.

28. In a machine of the character described, in combination, a rotatable hat support, a tool for operating upon the surface of a hat mounted upon said support, hydraulic means adapted to move said tool about said hat, and valve means associated with said hydraulic means for automatically reversing the movement of said tool, said valve means including a part positionable to remove said tool from the driving effect of said hydraulic means whereby said tool may be operated by hand.

29. In a machine of the character described, in combination, a rotatable hat support, a tool for operating upon the surface of a hat mounted on said hat support, hydraulic means for moving said hat support axially past said tool, and means associated with said hydraulic means and actuated by said hat support for automatically reversing the direction of movement of said hat support.

30. In a machine of the character described, in combination, a rotatable hat support, a tool for operating upon the surface of a hat mounted on said hat support, hydraulic means for moving said hat support axially past said tool, means associated with said hydraulic means for automatically reversing the direction of movement of said hat support, and means for varying at will the extent of travel of said hat support whereby hat bodies of various depths may be operated upon.

31. In a machine of the character described, in combination, a rotatable hat support, a tool for operating upon the surface of a hat mounted on said support, hydraulic means for moving said tool about said support, hydraulic means for moving said hat support axially, and means for varying at will the extent of axial movement of said hat support whereby hat bodies of various depths may be operated upon, and means associated with said hydraulic means and actuated by said hat support for automatically reversing the direction of movement of said hat support.

32. In a machine of the character described, in combination, a rotatable hat support, a tool for operating upon the surface of a hat mounted on said support, hydraulic means for moving said tool about said hat and upon the surface thereof in a path extending from the apex to the brim of a hat, and feed control means associated with said hydraulic means for varying the feed rate of said tool over different portions of said hat and for effecting a quick return of said tool to a position spaced from the surface of said hat subsequent to the completion of the operation of said tool upon the surface of said hat.

33. In a machine of the character described, in combination, a rotatable hat support, a tool

for operating upon the surface of a hat mounted on said support, hydraulic means for moving said tool about said hat and upon the surface thereof in a path extending from the apex to the brim of a hat, and feed control means associated with said hydraulic means for varying the feed rate of said tool over different portions of said hat and for effecting a quick return of said tool to a position spaced from the surface of said hat subsequent to the completion of the operation of said tool upon the surface of said hat, said means including a cam-operated metering valve.

34. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted on said support, hydraulically operated means including a rack and pinion for moving said tool about said hat, valve means associated with said hydraulic means for varying the feed rate of said tool about said hat, and cam lever means operated by said rack for actuating said feed rate varying means.

35. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted on said support, hydraulic means for moving said tool about the surface of said hat in a path extending from the apex to the brim thereof and back to the apex, and means including a cam for effecting automatically a quick return of said tool from said apex to a position substantially spaced from the surface of said hat after completion of operation of said tool on said hat.

36. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted on said support, hydraulic means for moving said tool along a path extending between the apex and the brim portion of said hat, said means including a direction-control valve and a feed-rate-control valve whereby said tool is automatically reversed at the brim end of said path and whereby said tool is fed at varying feed rates along said path.

37. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted on said support, hydraulic means for moving said tool along a path extending between the apex and the brim portion of said hat, said means including a direction-control valve and a feed-rate control valve whereby said tool is automatically reversed at the brim end of said path and whereby said tool is fed at varying feed rates along said path, and cam means associated with said hydraulic means for controlling the action of said valves.

38. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted on said support, means including a clutch for driving said hat support, hydraulic means for moving said tool about said hat, and means for simultaneously instigating actuation of said hydraulic means and engaging said clutch.

39. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to move about a hat mounted on said support and operate upon the surface thereof, said tool being movable from an inoperative position spaced from the brim portion of said hat to an operative position in engagement with said hat at the apex thereof, thence over the surface of said hat to the brim portion thereof, and thence back through the same path to said inoperative position, hydraulic means for moving said tool, and means associated with said hydraulic means for moving said tool rapidly from said inoperative position to its operative position and also for moving said tool rapidly from its operative position at the apex of the hat to its inoperative position in its return movement.

40. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to move about a hat mounted on said support and operate upon the surface thereof, said tool being movable from an inoperative position spaced from the brim portion of said hat to an operative position in engagement with said hat at the apex thereof, thence over the surface of said hat to the brim portion thereof, and thence back through the same path to said inoperative position, hydraulic means for moving said tool, and means associated with said hydraulic means for moving said tool rapidly from said inoperative position to its operative position and also for moving said tool rapidly from its operative to its inoperative position in its return movement, said last-mentioned means being also adapted to impart varying feed rates to said tool during its operative travel while in engagement with the surface of said hat.

41. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulically actuated means for moving said tool about the surface of said hat, and means associated with said hydraulically actuated means for automatically reversing the direction of movement of said hydraulically actuated means at any predetermined position along its path of movement.

42. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulically actuated means including a rack and pinion for moving said tool about the surface of said hat, and means associated with said rack for automatically reversing the direction of movement of said hydraulically actuaed means, said last-mentioned means including a hand operable lever for reversing the direction of operation of said hydraulically actuated means at any point during its forward travel.

43. In a machine of the character described, in combination, means for rotatably supporting an oval hat, said means including a hollow shaft having a fixed axis and a spindle disposed within said hollow shaft having a variable axis, a tool for operating on the surface of said hat, hydraulic means for moving said tool about said hat, and means for changing the axis of said spindle as said tool operates on said hat.

44. In a machine of the character described, in combination, means for rotatably supporting an oval hat, said means including a hollow shaft having a fixed axis and a spindle disposed within said shaft having a variable axis, said spindle being pivotally supported at one end, a tool for operating on the surface of said hat, a collar slidably mounted on said hollow shaft, means secured to said collar and movable therewith to pivot said spindle whereby its axis of rotation is changed, and means responsive to the movement of said tool for shifting said collar to change the axis of said spindle as said tool operates on said hat.

45. In a machine of the character described,

in combination, means for rotatably supporting an oval hat, a rotatable hollow shaft, a spindle rotatably disposed within said hollow shaft and pivoted thereto at one end thereof whereby the axis of said spindle may be varied with respect to the axis of said hollow shaft, a gear member secured to one end of said spindle, a stationary pinion extending into said hollow shaft and meshing with said gear member, and means for rotating said hollow shaft whereby said spindle is rotated by said gear member and said pinion.

46. In a machine of the character described, in combination, means for rotatably supporting an oval hat, a hollow shaft having a fixed axis, a spindle disposed within said hollow shaft having a variable axis, said spindle being pivotally related to said shaft, means associated with said shaft and said spindle for rotating said spindle when said shaft is rotated, and means slidably mounted on said shaft for shifting the axis of said spindle whereby an eccentric rotation is imparted to one end of said spindle.

47. In a machine of the character described, in combination, means for rotatably supporting an oval hat, a hollow shaft having a fixed axis, a spindle disposed within said hollow shaft and pivotally related at one end to said hollow shaft, means associated with said shaft and said spindle for imparting rotation to said spindle when said shaft is rotated, means forming a bearing in one end of said shaft for journaling said spindle, means for shifting the axis of said spindle with respect to the axis of said shaft, and means at said one end of said shaft forming a guide way to control the shifting movement of said spindle whereby when said spindle is shifted its free end rotates eccentrically.

48. In a machine of the character described, in combination, a hollow shaft having a fixed axis, a spindle disposed in said shaft and having a variable axis, a shiftable member associated with said shaft for varying the axis of said spindle, and means on one end of said spindle responsive to the movement of said shiftable member for varying the axis of said spindle with respect to the axis of said shaft whereby one end of said spindle revolves eccentrically.

49. In a machine of the character described, in combination, a hollow shaft having a fixed axis, a spindle disposed in said shaft and having a variable axis, a shiftable member associated with said shaft for varying the axis of said spindle, means on one end of said spindle responsive to the movement of said shiftable member for varying the axis of said spindle with respect to the axis of said shaft whereby one end of said spindle revolves eccentrically, and means forming a guideway associated with said shaft for controlling the shifting movement of said spindle.

50. In a machine of the character described, in combination, means for rotatably supporting an oval hat, said means including a rotatable part having a variable axis, a thrust receiving member associated with said part, means movable axially with respect to said rotatable part and operatively associated with said thrust receiving member for changing the axis of said part whereby said hat rotates eccentrically, and a tool for operating on the surface of said hat.

51. In a machine of the character described, in combination, means for rotatably supporting an oval hat, said means including a hollow shaft having a fixed axis and a spindle disposed within said hollow shaft having a variable axis, a tool for operating on the surface of said hat, means including a rack and pinion for moving said tool about the surface of said hat, means movable along said shaft for varying the axis of said spindle, and means including a cam and lever associated with said pinion and said movable means for changing the axis of said spindle as said tool operates on said hat.

52. In a machine of the character described, in combination, means for rotatably supporting an oval hat, said means including a hollow shaft having a fixed axis and a spindle disposed within said hollow shaft having a variable axis, a tool for operating on the surface of said hat, a shifting unit for varying the axis of said spindle, said shifting unit being slidably mounted on said shaft and rotatable therewith, a non-rotatable sleeve disposed about said shifting unit, and means for moving said sleeve axially of said shaft as said tool operates on said hat whereby said shifting unit changes the axis of said spindle to impart an eccentric rotation to said hat.

53. In a machine of the character described, in combination, a rotatable hat support, a tool for operating on the surface of a hat mounted on said support, means adapted to translate said support in an axial direction, means for moving said tool about said hat support, and means operatively associated with said translating means and said tool moving means for inter-relating the movement of said hat support and said tool whereby a hat body of abnormal depth may be pounced.

54. In a machine of the character described, in combination, means adapted to rotate a hat, a tool adapted to operate upon the surface of said hat, means adapted to cause relative movement between said hat and said tool in a path extending from the apex to the brim of the hat, means adapted to move said first-mentioned means in axial directions, and means operatively associated with said first-mentioned and second-mentioned means adapted to inter-relate the operations of said first-mentioned and said second-mentioned means whereby a hat body of abnormal depth may be pounced.

55. In a machine of the character described, in combination, a column, a hat support mounted on said column, a tool support operatively associated with said column and adapted to swing toward and away therefrom, said tool support including mounting parts secured to said column whereby said tool support may be rotated relative to said hat support, a cylinder and piston mounted on said column, means adapted to introduce a flowing medium into said cylinder under pressure to reciprocate said piston therein, and means forming an operative connection between said piston and said tool support to effect rotary movement of said tool support.

56. In a machine of the character described, in combination, a hat support adapted to mount a rotatable hat block, a tool support operatively associated with said first-mentioned support and adapted to swing toward and away therefrom, a tool for operating on a hat mounted on said block, said tool being operatively mounted on said tool support, mounting parts associated with both of said supports whereby relative movement therebetween may be effected, a cylinder and piston mounted on one of said supports, means adapted to introduce a flowing medium into said cylinder under pressure to reciprocate said piston therein, and means forming an operative connection between said piston and the other of said supports to effect said relative movement.

57. In a machine of the character described, in combination, a rotatable hat support, a tool for operating on a hat mounted on said support, said tool being movable toward and away from said hat and pivotable thereabout, means for rotating said hat support, means operatively connected with said hat support rotating means for effecting the pivotal movement of said tool about the hat, and means operable for rendering ineffective said second-mentioned means during the operation of said first-mentioned means, whereby said tool may be manually operated.

58. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means for moving said tool about said hat in a path extending from the apex to the brim thereof, a cam and valve means controlled by said cam and connected with said hydraulic means for varying the rate of movement of said tool in said path, the surface of said cam being so configured to control said valve means so that said tool advances from the apex of said hat to the square thereof at a relatively rapid rate, thence advances over the square of said hat at a relatively slow rate, and thence advances along the crown of said hat to the brim thereof at a relatively rapid rate.

59. In a machine of the character described, in combination, a rotatable hat support, a tool adapted to operate upon the surface of a hat mounted upon said support, hydraulic means for moving said tool about said hat in a path extending from the apex to the brim thereof, a cam and valve means controlled by said cam and connected with said hydraulic means for varying the rate of movement of said tool in said path, the surface of said cam being so configured to control said valve means so that said tool advances from the apex of said hat to the square thereof at a relatively rapid rate, thence advances over the square of said hat at a relatively slow rate, and thence advances along the crown of said hat to the brim thereof at a relatively rapid rate, and means associated with said hydraulic means to effect a return movement of said tool over said path in the reverse sequence of said varying feed rates.

60. In a machine of the character described, in combination, a hat support adapted to mount a rotatable hat block, a tool support operatively associated with said first-mentioned support and adapted to swing toward and away therefrom, a tool for operating on a hat mounted on said block, said tool being operatively mounted on said tool support, mounting parts associated with both of said supports whereby relative movement therebetween may be effected, hydraulic means associated with one of said supports, means adapted to introduce a flowing medium into said hydraulic means to effect actuation thereof, and means forming an operative connection between said hydraulic means and the other of said supports to effect relative movement.

61. In a machine of the character described, in combination, a base, a hat support operatively mounted on said base, a tool support, a tool operatively mounted on said tool support, means operatively connecting said tool support and said base for permitting relative movement between said tool and said hat support, hydraulic means for effecting said relative movement, second hydraulic means for effecting further relative movement between said hat support and said tool subsequent to the operation of said first-mentioned hydraulic means, and means adapted to introduce a flowing medium into both of said hydraulic means to effect actuation thereof.

62. In a machine of the character described, in combination, a base, a hat support rotatably mounted on said base, a tool support, a tool operatively mounted on said tool support, means operatively connecting said tool support and said base for permitting relative movement between said tool and said hat support, hydraulic means for effecting said relative movement, second hydraulic means for effecting further relative movement between said hat support and said tool subsequent to the operation of said first-mentioned hydraulic means, said first-mentioned hydraulic means including a part having a cam mounted thereon, movement of which controls the related actuations of both of said hydraulic means, and means adapted to introduce a flowing medium into both of said hydraulic means to effect actuation thereof.

63. In a machine of the character described, in combination, a hat support, a tool support, means for effecting relative movement between said supports, an abrading tool pivotally mounted on said tool support to permit swiveling of said abrading tool during the relative movement between the hat support and the tool support, whereby said abrading tool follows the shape of a hat mounted on said hat support, a motor for driving said abrading tool, said motor being pivotally mounted on said tool support so as to swivel with said abrading tool, and friction means associated with the mounting of said motor and adapted to prevent free swiveling of said abrading tool and said motor.

PAUL SCHULTZE.

CERTIFICATE OF CORRECTION.

Patent No. 2,105,130. January 11, 1938.

PAUL SCHULTZE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, first column, line 4, for "stud 134" read arm 134; same line, for "arm 158, read stud 158; page 14, first column, line 20, claim 34, for the words "and cam lever" read cam lever; and second column, line 47, claim 42, for "actuaed" read actuated; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of May, A. D. 1938.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)