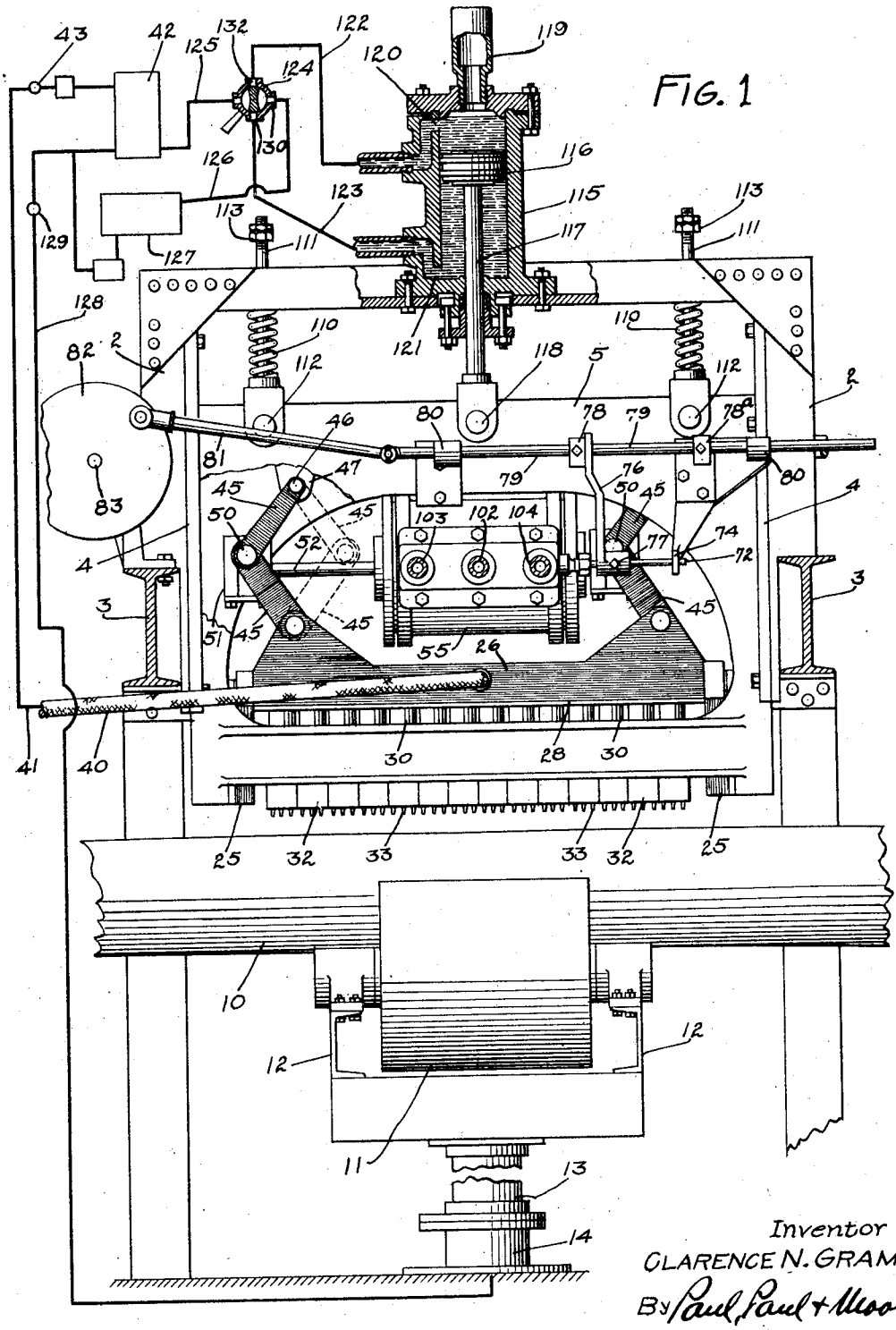
Feb. 5, 1929. 1,701,324

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APPARATUS FOR PERFORATING WOOD PREPARATORY TO RECEIVING PRESERVATIVE MATERIAL

Filed Dec. 19, 1927 4 Sheets-Sheet 1

FIG. 1



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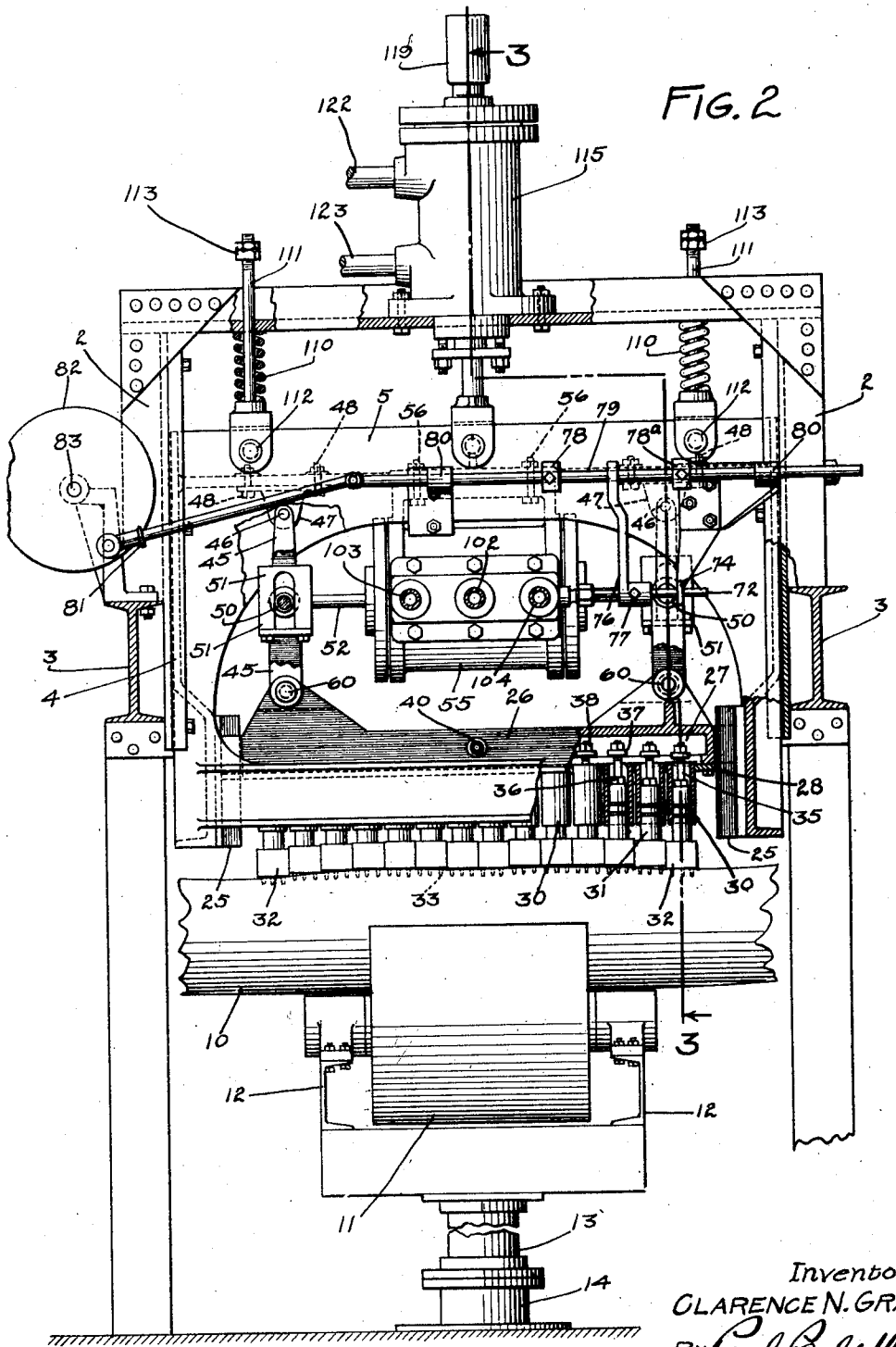
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FIG. 2



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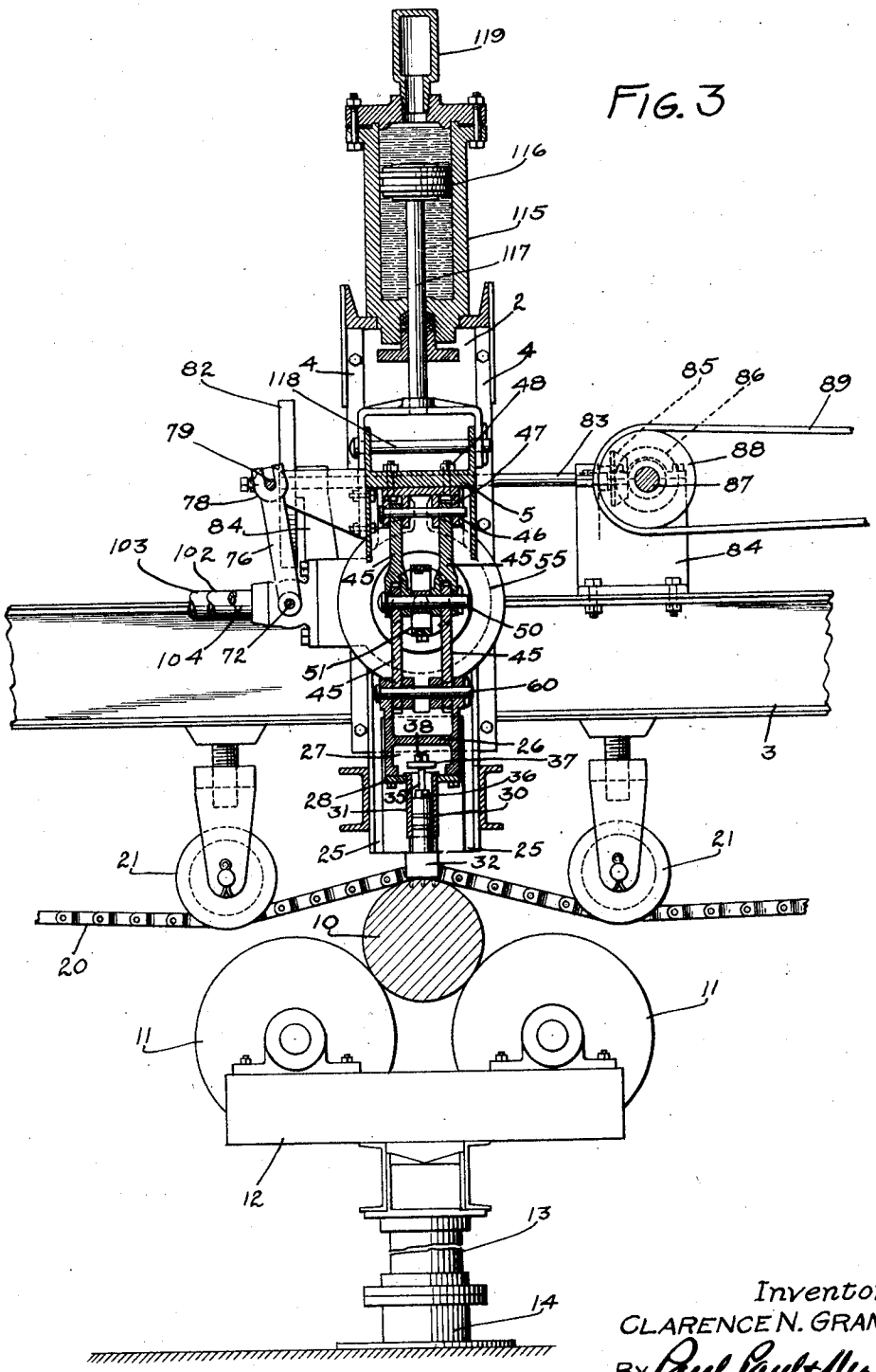
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Filed Dec. 19, 1927 4 Sheets-Sheet 3

FIG. 3



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APPARATUS FOR PERFORATING WOOD PREPARATORY TO RECEIVING PRESERVATIVE MATERIAL

Filed Dec. 19, 1927 4 Sheets-Sheet 4

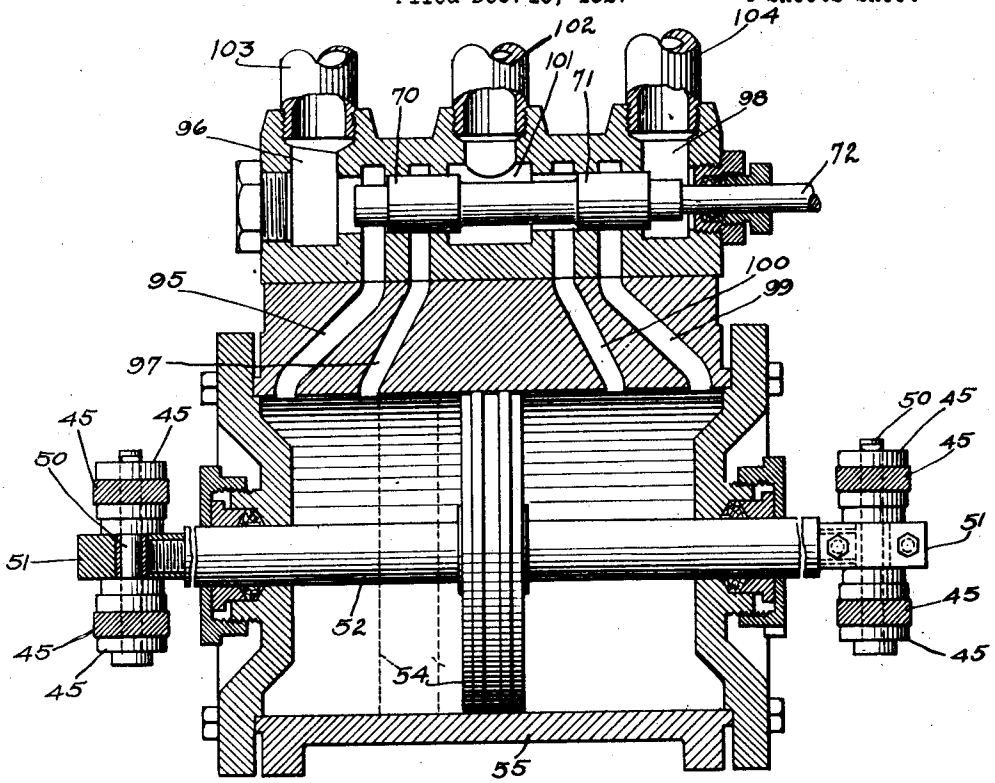


FIG. 4

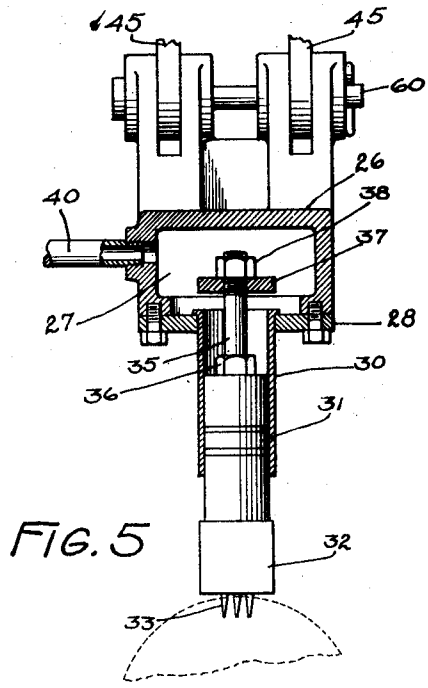


FIG. 5

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR PERFORATING WOOD PREPARATORY TO RECEIVING PRESERVATIVE MATERIAL.

Application filed December 19, 1927. Serial No. 241,065.

This invention relates to improvements in pole punching machines, that is machines which are used for perforating or indenting wood preparatory to impregnating it with a preservative.

General objects of the invention are to provide a comparatively simple construction by which the punching elements can be advanced to be maintained in, and withdrawn from operative position, and by which they are capable of conforming to the configuration of the surface of the element being punched or perforated. In preparing poles for impregnation in the manner above mentioned, it has been difficult to obtain a uniform depth of punching or impressing. The present invention provides an arrangement of a plurality of punching elements which are capable of automatic adjustment relatively to the surfaces of the stock.

Features of the invention include all the details of construction.

Advantages of the invention will be set forth in the description of the drawings forming a part of this application, and in said drawings

Figure 1 is an elevation partly in section illustrating the general construction of the device and showing the punching instrumentalities in raised inoperative position;

Figure 2 is a view similar to Figure 1 but showing the punching instrumentalities in lowered, operative position;

Figure 3 is a vertical transverse section substantially on line 3—3 of Figure 2, illustrating the connections for the pressure applying links as well as showing the internal construction of the cylinder for operating the links and punching mechanism;

Figure 4 is a detail section through the link operating cylinder; and

Figure 5 is a detail transverse section through the punching head showing the construction and arrangement of one of the punching units.

A structural iron supporting frame for the mechanism is generally indicated, and comprises, among other elements, a bridging structure 2 supported at opposite sides on I-beams 3 in turn supported on suitable foundations. Slidably arranged in guides 4 is a frame 5 which may be referred to as the punching frame. This frame is reciprocable in a vertical direction and supports those elements which control and perform the punching operation, and which operate to advance and withdraw the punching mechanism respectively toward and away from the work.

The work, such as a pole 10, is supported, directly beneath the punching mechanism, as best shown in Figure 3, by a pair of rollers 11 mounted on a suitable frame 12, in turn secured to the upper end of a piston 13 operated hydraulically through the cylinder 14. The machine can be used for punching stock of any character, but is illustrated as particularly designed for operating on cylindrical stock. The work is mounted substantially as shown in Figure 3 to be rotated to successively present different surface portions to the punching elements. The means herein employed for rotating the pole 10 comprises a chain 20 engaging over the top of the pole and base, beneath rollers 21 carried by the beams 3 of the frame. The chain is suitably driven by means not shown.

Vertically slidable upon guides 25 is an element 26 as a head which provides a chamber 27 sealed at the bottom by plate 28, the plate being suitably removably secured as by bolts. Carried by this plate are a series of tubes 30 as cylinders arranged in parallel relation, secured against axial movement, and extended downwardly toward the work support. Reciprocable within each cylinder is a piston 31 having a punching head 32, the said head having punching pins 33. To the upper end of each piston is attached, as by threading, a rod 35 secured against rotation by a jamb nut 36. In threaded engagement with the upper end of this rod is a plate 37 as a stop engageable with the top of the cylinder 30 for limiting downward motion of the piston 31. A jamb nut 38 engages the plate from the upper side. The jamb nut and plate may be adjusted by rotation upon the rod 35 to vary the length of the piston stroke. A constant pressure is maintained in the chamber 27 by the introduction of some fluid through a pipe 40, Figure 1, connecting with a supply pipe 41, in turn connecting with a supply tank 42. This pressure line is controlled by a valve 43.

When the head 26 is forced downwardly, and after the punching heads engage the work, and with pressure continuously applied in a downward direction, the pistons are free to yield upwardly against the pressure in the chamber 27. When the head 26 is raised as shown in Figure 1, the pistons are forced outwardly and the heads are aligned as shown. By this means, the heads or tools automatically adjust themselves to compensate for any unevenness of the pole as well as any inequalities in the surface of the pole, but at the same time equal and proper pressure is maintained against each head or piston. This compensating cushion effect is an important feature of the invention.

In order to maintain the pressure on the head 26, and respectively advance and retract it relative to the work, the opposite ends of the head are connected, and suspended by means of pairs of toggles 45 arranged substantially as shown, adjacent opposite longitudinal terminals of the head. The upper toggles are pivoted as at 46, see Figure 3, to the frame 5, the pivots 46 being supported by a bracket 47 in turn secured by bolts 48. Pairs of pairs of toggles are arranged at each end and the pivotal point of each pair is connected with the opposing pair by bolts or shafts 50. This shaft 50 also traverses and connects with an element 51 connected with a piston rod 52 as by threads as best shown at the left in Figure 4. Arranged on this piston rod is a piston 54 which operates within cylinder 55 suitably connected with the frame 5 as by bolts 56, see Figure 2. The lower pivot 60 of the toggles connects the toggles with lugs integral with the element 26. Fluid to the piston 54 is controlled by valves 70—71 on stem 72, guided as best shown in Figures 1 and 2 in a bracket 74 carried by the frame 5. Adjustably connected to this stem 72 is an arm 76 which is secured on the stem by means of a set screw 77. The upper end of this arm 76 is slidable upon a rod 79 which rod is reciprocable in suitable brackets 80 also carried by the frame 5. This rod carries a pair of adjustable stops 78—78a, which alternately engage the arm 76 to move the valves 70—71 alternately in opposite directions. This rod 79 is reciprocated by means of a pivoted crank 81 secured to crank disk 82 said disk being mounted on a suitably journaled shaft 83. The journaling of this shaft is best shown in Figure 3 in which brackets 84 are employed secured to beam 3. The opposite end of the shaft 83 carries a gear 85 meshing with a companion gear 86 carried by shaft 87. Attached to the shaft 87 is a pulley 88 operated by a belt 89. Certain mechanism, not shown, obtains synchronizing movement between the elements 89 and 20 so that after the pole is rotated the punching instrumentalities are forced to punching position, raised. While the punches are being raised the work is given a slight rotation and stopped, and then the tool is again forced forwardly to punch and again raised. This cycle is properly carried out by a synchronizing mechanism which will readily occur to anyone skilled in the art.

A shown in Figure 1, the head is in raised position with the links 45 having their pivotal points disaligned vertically. This is one limit position for the links. Referring to Figure 4, the punching head is raised and lowered at the end of each stroke of the piston, in other words, the piston travels from a position corresponding to Figure 1 to the right, and during a full stroke the pivotal points of the links are aligned and then disaligned to assume the position shown in dotted lines at the left of Figure 1. On the return stroke, the links are brought from the dotted line position to the full line position of Figure 1 and the result is that the punching instrumentalities, for each stroke, are raised, lowered, and raised.

As the result of driving of the pulley 88 the disk 82 is driven and reciprocative motion transmitted to the valves 70—71. The valve 70 controls ports 95—96 as well as exhaust port 97 while valve 71 controls inlet ports 98—99 and exhaust port 100. The exhaust ports 97 and 100 pass through a common chamber 101 to the common exhaust pipe 102. The intake pipes for the ports 96 and 98 are respectively indicated at 103—104. For purposes of illustrating the operation, it will be assumed that the element 54 lies in the position shown in Figure 4 when the toggles occupy the position shown in Figure 2, or in other words, when the toggles are holding the punching elements forwardly in punching position. It will further be assumed that the dotted line position of element 54 shown in Figure 4 corresponds to the position of the toggles shown in Figure 1 in which the working elements are raised. The valve is operated in the following manner: In Figure 4, it will be seen that the element 71 is positioned to close exhaust port 97, and open inlet port 95. At the same time valve 70 is positioned to open outlet port 100 and close inlet port 99. It will be understood that when the valve is moved in the opposite direction to its limit, the exhaust port 97 will be opened, intake 95 closed, exhaust port 100 closed, and intake port 99 open.

The punchers are thus driven into the wood, withdrawn, the pole turned, the punchers again lowered and driven then again raised and so on in repeated similar cycles. It will be understood, of course, that after that portion of the pole which lies within the punching zone has given a complete rotation, the work will be slid longitudinally to bring an unpunched portion in opposition to the punches.

In addition to the vertical reciprocatory

motions given the element 26 and frame 5, which carries this element 26 and its operating mechanism is also made adjustable as before mentioned. This for the purpose of raising the frame to permit free introduction as well as removal of the work. Cushion springs 110 limit upward movement and rods 111 are pivoted as at 112 to the frame 5. Nuts 113 limit downward movement of the frame. For raising and lowering the frame, cylinder 115 is mounted in a vertical position upon the top of the frame 1, centrally of the frame. A piston is indicated at 116 and a piston rod at 117, this rod being pivotally connected centrally as at 118 to the top of the frame 5. To the upper end of the cylinder is connected an element 119 forming an air chamber. The piston operates between ports 120—121 respectively connected by pipes 122—123 with a four way valve 124. Other ports of the four way valve are connected by pipes 125—126 respectively with the supply tank 42 and a storage tank 127. A pipe 128 controlled by valve 129 in turn controls pressure to the hydraulic cylinder 14. By inspection of Figure 1, it will be seen that when the valve is in one position to deliver, for example, to port 120, the port 125 is in communication with the tank 127 through valve ports 130. On the other hand when fluid is being delivered through port 121, connecting pipe 122 is in communication with the ports 132—130 to tank 127.

The main feature of the invention relates to the construction of the punching head including the element 26, chamber 27 and elements 31—32 and their relation to pistons 30. However, all details of construction of the entire machine are claimed.

The advantages obtained from a punching head of the kind herein disclosed, are that the butt circumference of the pole is not reduced, and that the sap-wood is not macerated, loosened or softened at its line of contact with the heart-wood. When it is remembered that substantially seventy-five per cent of the strength and elasticity of certain woods, such for example as the western red cedar, is in the sap-wood, the advantage of preserving this sap-wood in its original state will be evident. By means of the device herein a machine is provided which does not compress the sap-wood in an injurious degree or lacerate it to decrease its protective action. It is therefore an object of this invention to apply the punching force in such a manner as not to reduce the circumference of the pole by pressure and fracture of the sap-wood, and thereby weaken the pole. The cushioning effect furnished by applicant's device is, therefore, a very important feature of the invention.

I claim as my invention:

1. A device of the class described comprising a work support, a head arranged to be advanced towards and withdrawn from the support, said head providing a chamber, a series of cylinders communicating with the chamber, pistons in the cylinders having terminal punching instrumentalities, means for maintaining air pressure in the chamber against the pistons.

2. A device of the class described comprising a work support, a head arranged to be advanced towards and withdrawn from the support, said head providing a chamber, a series of cylinders communicating with the chamber, pistons in the cylinders having terminal punching instrumentalities, means for maintaining air pressure in the chamber against the pistons, and means for advancing and retracting the head.

3. A device of the class described providing a support upon which the work may be turned, a head adapted to reciprocate toward and away from the work, said head having a chamber, a series of cylinders communicating with the chamber, a piston in each chamber having a punching portion, means for limiting the outward movement of the pistons in the cylinders, and means for maintaining a pressure in the chamber.

4. A device of the class described providing a support upon which the work may be turned, a head adapted to reciprocate toward and away from the work, said head having a chamber, a series of cylinders communicating with the chamber, a piston in each chamber having a punching portion, means for limiting the outward movement of the pistons in the cylinders, means for maintaining a pressure in the chamber, and means for forcibly advancing the head in a predetermined degree towards the work and retracting the head, the arrangement being such that the pistons are free for limiting movement towards the chamber as they engage the work.

5. A punching head having a chamber, passages communicating with the chamber, and punches having portions fitting the passages as pistons, and arranged to move in substantially the same direction.

6. A punching head having a chamber, passages communicating with the chamber, and punches having portions fitting the passages as pistons, and means limiting their outward movement.

7. A punching head having a chamber, passages communicating with the chamber, and punches having portions fitting the passages as pistons, and arranged to move in substantially the same direction, means limiting their outward movement.

8. In combination a punching head slidably arranged, toggles arranged to move the head respectively in opposite directions, means for operating the toggles, said head having a chamber and passages communicating with the chamber, and punches having extensions fitting the passages as pistons.

9. A punching head reciprocably mounted

and having punching instrumentalities also reciprocably mounted therein, and means yieldably pressing each punching head outwardly.

10. A punching head for the purpose described having punching elements independently translatably arranged and cushioned, so that after engagement of their punching instrumentalities with the element to be punched, the head is capable of being moved toward said element to be punched.

In witness whereof, I have hereunto set my hand this 30th day of August, 1927.

CLARENCE N. GRAM.