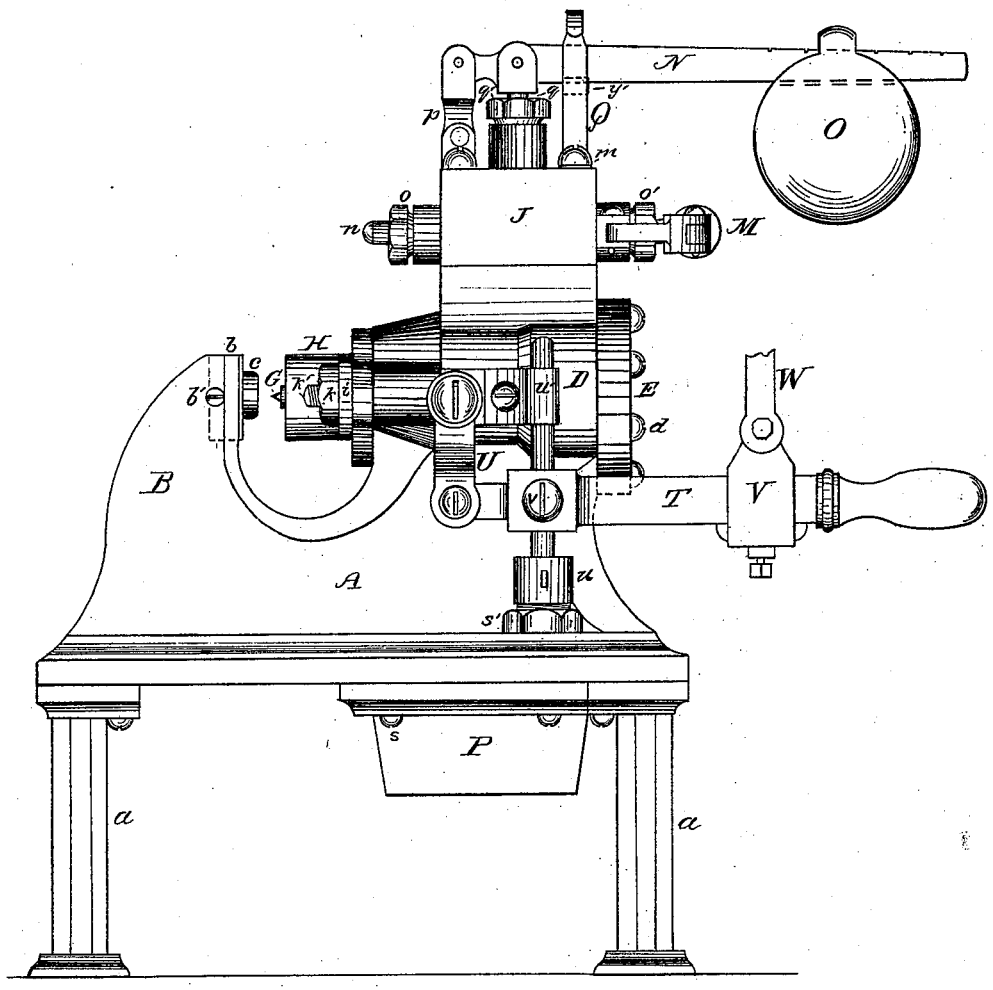
4 Sheets--Sheet 1.

J. B. BARNES.

Hydraulic-Punch.

No. 167,975. Patented Sept. 21, 1875.

Fig. 1.



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4 Sheets--Sheet 2.

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Fig. 2.

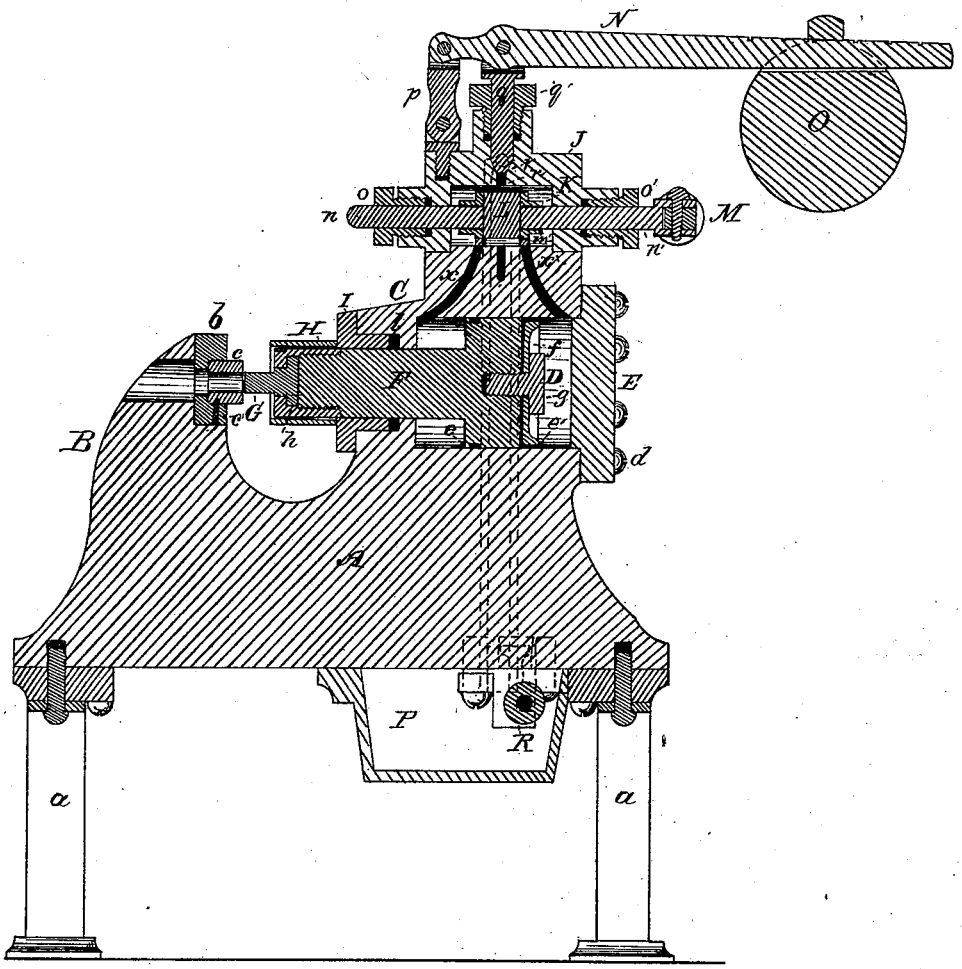

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Fig. 3.

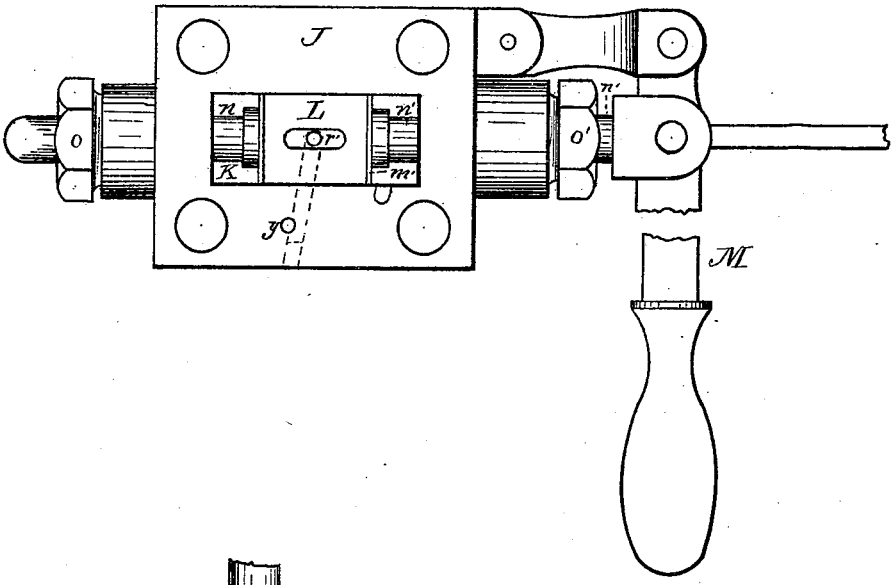
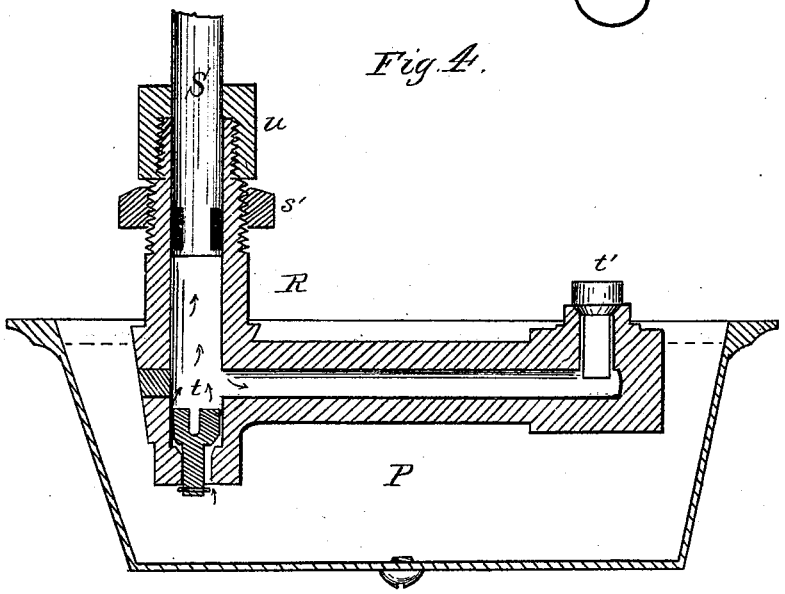


Fig. 4.



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4 Sheets--Sheet 4.

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Hydraulic-Punch.

No. 167,975. Patented Sept. 21, 1875.

Fig. 5

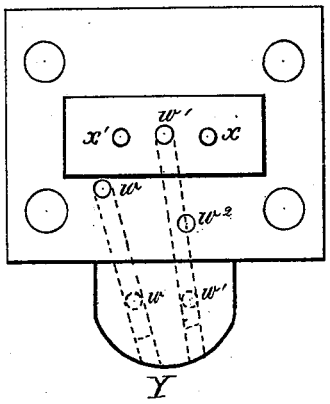
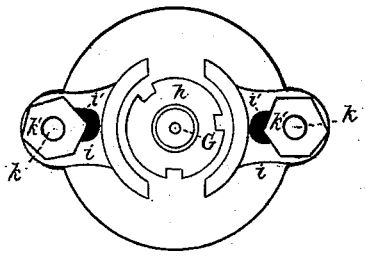


Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSHUA B. BARNES, OF FORT WAYNE, INDIANA.

IMPROVEMENT IN HYDRAULIC PUNCHES.

Specification forming part of Letters Patent No. **167,975**, dated September 21, 1875; application filed July 28, 1875.

To all whom it may concern:

Be it known that I, JOSHUA B. BARNES, of Fort Wayne, in the county of Allen and State of Indiana, have invented a new and valuable Improvement in Hydraulic Punches; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a perspective or side elevation of my invention. Fig. 2 is a vertical section of the same. Fig. 3 is a bottom view, on an enlarged scale, of the oil-chest, showing the slide-valve and connecting parts; Fig. 4, a sectional view of the force-pump, showing its position in the oil-reservoir; Fig. 5, an enlarged plan view of the valve-seat, showing the relative position of the ports or oil-passages; Fig. 6, a face view of the stripper and punch.

This invention has relation to that class of metal punches operated by hydraulic power; and my invention consists in the peculiar arrangements of ports or passages through which the oil passes to and from a cylinder, within which works a piston carrying a punch, the oil entering the cylinder upon either side of the piston, through the medium of a force-pump worked by hand or other power, and placed within a reservoir containing the oil. My invention also consists in the employment of a safety-valve, connected to a lever, having an adjustable weight thereon, for the purpose of regulating the degree of pressure to the thickness of the sheet operated upon. My invention further consists in an adjustable stripper, composed of two curved plates, for the purpose of forming a bearing, against which the metal plate is brought upon the withdrawal or backing out of the punch.

In the drawings, A represents the body of the machine, to which the several operating parts are connected, and is supported by suitable legs *a*. This body A is of peculiar shape, cast or otherwise formed of metal, with uprights B C, the former having a horizontal opening in the top, and a dovetail recess for the reception of a correspondingly-formed plate, *b*, held therein by set-screws *b'*, and carrying a die, *c*, retained in place by a set-screw, *c'*. The upright C is formed with a horizontal opening extending its entire length, the larger portion serving the purpose of a cylinder, D, its outer end being closed by a cap, E, and screw-bolts *d*. A piston, F, works within the opening, the piston-head having secured thereto suitable packing-rings *e e'*, the former fitting in an annular groove, and the latter secured to the end of the piston-head by a metal plate or washer, *f*, and a screw-bolt, *g*, thus forming a tight joint between the piston-head and the cylinder D, within which it works.

To the front end of the piston F is secured a punch, G, by a screw-threaded sleeve, *h*, upon each side of which is a stripper composed of two curved plates, H H, with ears *i* having elongated slots *i'*, which pass over screw-bolts *k'*, and secured in place thereon by nuts *k*, the elongated slots *i'* admitting of their adjustment upon the bolts to form a stripper that will act with a corresponding effect upon the metal plate when punches of different sizes are used, its purpose being to form a bearing against which the metal plate is brought upon the withdrawal or backing out of the punch. If, in withdrawing the punch, the stripper which arrests the movement of the plate therewith is at any considerable distance from the punch, the plate may, in some instances, spring, in the effort of withdrawal, and bind upon the punch. This difficulty is wholly avoided by adjusting the stripper so that it shall stand immediately adjacent to the punch. A stuffing-box, I, is inserted in a recess in the upright C, to retain in place a packing-ring, *l*, the stuffing-box being secured to the upright by the same screw bolts and nuts that fasten the stripper. Upon the upper end of the upright C, secured by bolts *m*, is a box, J, forming an oil-chest, K, within which works a slide-valve, L, loosely fitting within a yoke, *m'*, to which is secured the inner ends of valve-stems *n n'*, the same working in boxes *o o'*, the outer end of the valve-stem *n'* being pivoted to a hand-lever, M, for operating the valve L. Secured to the upper part of the box J by a pivoted link, *p*, is an arm or lever, N, serrated or notched upon its upper face and carrying a

suitable weight, O. Pivoted to this arm or lever is a valve-stem, *q*, working in a stuffing-box, *q'*, the lower end of the stem being beveled or conical in form to neatly fit an annular or correspondingly formed seat, *r*, around an opening, *r'*, which communicates with the oil-chest K and acts as a safety-valve, so that when the piston F has moved too far the pressure in the chest K causes the valve-stem *q* to rise off its seat, opening the communication and allowing the oil to escape and flow back through its proper ports or passages to the source of supply, the valve being retained in position off its seat by the arm N resting upon an offset, *y'*, formed on a spring-arm, Q. To the under side of the body A is secured, by suitable screws or bolts *s*, a box, P, forming the tank or reservoir for containing the oil. Within this tank is a pump tube, R, as illustrated in Fig. 4, the upright or vertical portion extending up through an opening in the rim of the body A and held in place by a screw-nut, *s'*, the horizontal portion covering an opening through which the oil passes in supplying the cylinder D. Valves *t t'*, of the construction such as is generally used in pumps of this class, are fitted to seats formed in the pump-tube, around openings which receive and discharge the oil. Working within the upright portion of the pump-tube is a piston, S, passing up through a stuffing-box, *u*, and guided at its upper end by a sleeve, *w'*.

The piston is operated by a lever, T, connected to the piston-rod by a screw-bolt, *v*, with its fulcrum at the lower end of a link, U, secured to the side of the upright C. The pump, if desired, may be operated by other power than hand-power, and a slide, V, may be used to convey motion to the lever T through a connecting link or rod, W.

The body A is cast or otherwise formed with a vertical rib, Y, extending the entire length and upon the side of the upright C. Through this rib are formed openings or passages serving as the supply and exhaust ports *w w'*, the lower end of the port *w* covering the opening in the pump-tube containing the valve *t'*, and forming a communication therewith, and the upper end branching off at a right angle, and passing up through the upper portion of the upright C to the oil-chest K, as illustrated in Fig. 5, the oil in its course passing through the port *w* into the oil-chest K, after which it enters the cylinder D through ports *x x'* at the back or front of the piston-head, according to the position of the slide-valve L, the port w^1 termed the exhaust-port, through which the oil escapes back into the tank or reservoir P. This port w^1 passes upward in a direction parallel to port *w*, and near the top of rib Y it branches out at a right angle, and up into the oil-chest K, between ports *x x'*. The port w^1 has an additional communication with the oil-chest K by the branch port w^2, registering with an opening or port, *y*, passing up through the side of the box J, and thence out at a right angle to communicate with the valve-opening *r'*, said opening in turn communicating with the interior of the oil-chest K.

By this arrangement of ports, two separate outlets for the oil in the chest K is obtained, controlled by the safety and slide valves, respectively.

The operation of the machine will be readily understood from the following explanation: The piston F being in position against the cylinder-head E, and the slide-valve L thrown forward by means of the hand-lever M, opening the port *x'* near the head F of the cylinder D, the pump is put in operation through the lever T, which, when pressed upward, elevates the piston or plunger S, the pressure of oil raising the valve *t* and passing into the tube R, and upon the downward stroke of the piston the pressure of oil in the tube closing valve *t* upon its seat, and opening valve *t'*, the oil being forced up through the port *w* into the chest K, and through port *x'* to the cylinder D, at the back of the piston F. As the oil passes into the cylinder, the piston is caused to move forward, forcing the punch G through the sheet of metal that was previously placed between the die *c* and stripper H. As soon as the punch *c* has passed through the sheet, the position of the lever M is reversed, bringing the slide-valve L over the port *x'* and closing the same, forming a communication of said port with the exhaust-port w^1, through which the oil passes back to the tank or reservoir P. The pump being still in operation, and the port *x* upon the other side of the piston being now open, the oil passes through the same, which causes the piston to recede as the oil behind it flows to the tank or reservoir P. As the punch G recedes, the sheet is carried against the stripper, composed of the plates H, where it remains until the punch has backed entirely out. If, through carelessness, the slide-valve L is not reversed in the proper time, the piston F moves along until it strikes the cylinder-head E. The pressure being immediately increased in the chest K, the safety-valve *q* rises, and in doing so the lever or arm N passes above the offset *y'* on the spring-arm Q, which, falling into place, holds the lever N up, thereby allowing the oil to escape back to the tank D through ports *y* and port w^1.

While in this position there is no danger of harm to the machine, as the oil flows back to the tank or reservoir as fast as it is pumped into the chest.

The weight O upon the lever N may be adjusted so as to change the power according to the size of sheet being punched.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a hydraulic punching-machine, consisting of a piston carrying a punch and working horizontally within a cylinder, and operated by a liquid forced alternately through passages communicating with

the cylinder at the rear and front of the piston-head, said passages being controlled by a slide-valve, of a pump and reservoir arranged beneath the bed of the machine, substantially as and for the purpose set forth.

2. The combination, with a hydraulic punching-machine, having a reservoir and pump arranged beneath the bed of the same, of supply and exhaust passages communicating with the pump and reservoir, and the valve-chest and the cylinder, within which works the piston, the exhaust-passage also communicating with a passage to which is connected a safety-valve, such passage being arranged in relation to each other to operate substantially as and for the purpose set forth.

3. In a hydraulic punching-machine, a regulating safety-valve, by which the degree of pressure upon the piston may be regulated to the thickness of the metal sheet operated upon, substantially as described.

4. The piston F, carrying the punch G, working within the cylinder D, and the reservoir P, with a suitable force-pump, in combination with the chest K and valve L, and the ports w w^1 and x x', substantially as and for the purpose set forth.

5. In combination with the safety-valve, consisting of the stem q, lever N, and adjustable weight O, the spring-arm Q, with off-set y', substantially as and for the purpose specified.

6. The adjustable stripper, consisting of the plates H H, with ears i i and slots i' i', whereby the stripper will admit of longitudinal adjustment in relation to the punch, substantially as and for the purpose specified.

7. The piston F, carrying punch G, and the reservoir P, with suitable force-pump, and the slide and adjustable safety-valves, in combination with the arrangement of ports x, x', w, w^1, w^2, and y r', substantially as described, and for the purpose set forth.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

JOSHUA B. BARNES.

Witnesses:

A. H. BITTINGER,

H. T. SIMPSON.