

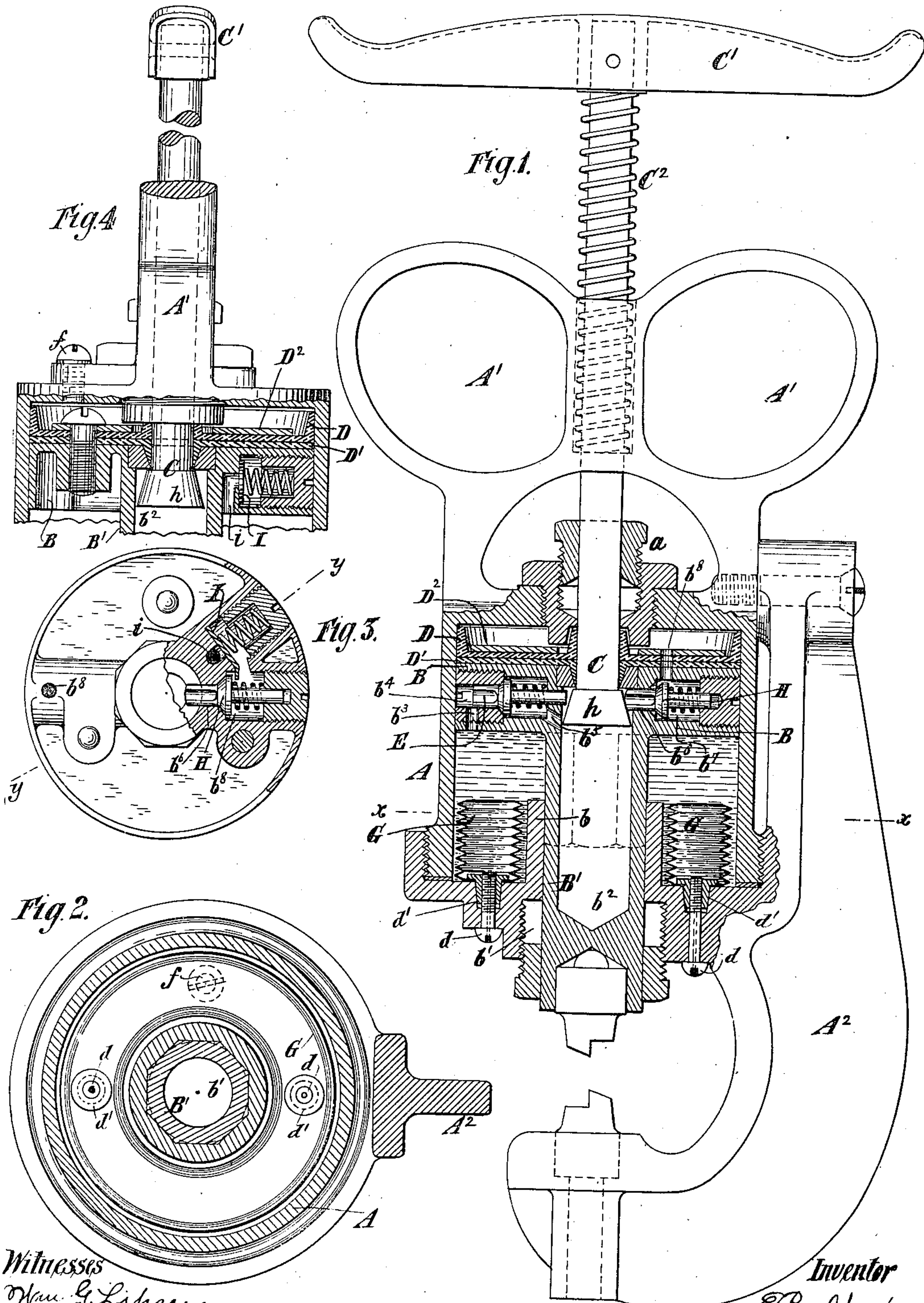
(No Model.)

2 Sheets—Sheet 1.

L. BELDEN.
HYDRAULIC APPARATUS.

No. 337,118.

Patented Mar. 2, 1886.



Witnesses

Wm. G. Lipsey
Jas. R. Bowen

Inventor

L. Belden,
by his attys,
Gifford & Brown

(No Model.)

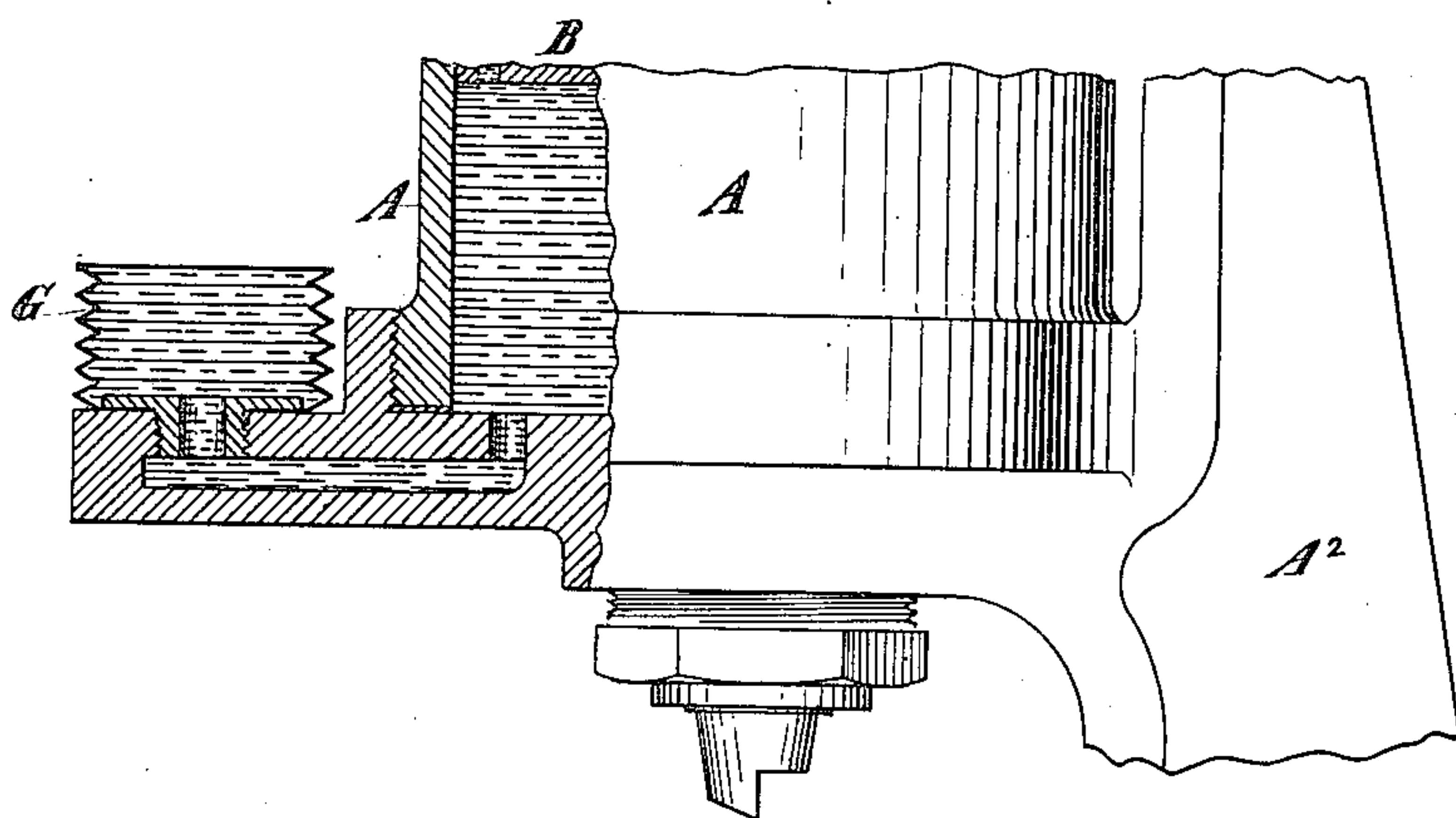
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Fig. 5.



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UNITED STATES PATENT OFFICE.

LESLIE BELDEN, OF NEW YORK, N. Y.

HYDRAULIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 337,118, dated March 2, 1886.

Application filed July 11, 1885. Serial No. 171,285. (No model.)

To all whom it may concern:

Be it known that I, LESLIE BELDEN, of the city, county, and State of New York, have invented a new and useful Improvement in Hydraulic Apparatus, of which the following is a specification.

The object of my improvement is to produce a portable tool which may be operated by hydraulic pressure to perform work requiring great power, and withal to so construct the tool that it may be used in any position.

I will describe a tool embodying my improvement, and then point out the essential features in claims.

In the accompanying drawings, Figure 1 is a sectional elevation of a tool embodying my improvement. Fig. 2 is a transverse section of the same, taken at the plane of the dotted line $x x$, Fig. 1. Fig. 3 is a partly sectional end view of a piston comprised in the tool, as the same appears looking from the side which is undermost in Fig. 1. Fig. 4 is a sectional elevation, the parts not in section being shown as they appear in a plane at right angles to the plane of Fig. 1, and the section being taken on the plane of the dotted line $y y$, Fig. 3; and Fig. 5 is a view, partly broken away and partly in section illustrating a modification thereof.

The frame of this tool consists, essentially, of a cylinder, A, for containing water or other liquid, finger-pieces A', and an extension, A².

As shown, the cylinder A and finger-pieces A' are formed integral, and the extension A² is made approximately in the shape of the letter J, and made integral with a movable head or end of the cylinder.

A convenient way of securing the J-shaped extension A² to the cylinder A and finger-pieces A' is to provide the removable head of the cylinder with an internally screw-threaded flange engaging with a screw-thread upon the exterior of the cylinder, and to insert a screw through the upper part of the J-shaped extension and engage it with a tapped hole in the upper portion of the cylinder A. The lower portion of the J-shaped extension extends into a position which is approximately opposite the center of the cylinder. This J-shaped extension has fastened to it one of a pair of instruments which are to be used in the tool—as, for instance, one of a pair of shears—or it

may have a rest to hold a piece of material which is to be operated upon by a movable instrument.

The movable instrument used in the tool derives its motion from a piston, B, fitted in the cylinder A. The piston B has a shank or rod, B', which extends through that end of the cylinder which is opposite the end of the extension A². In this instance the rod of the piston passes through the removable head of the cylinder, and such head is provided on the inner side with a flange, b , whereby the rod and the piston will be effectively guided, and on the outer side with a stuffing-box, b' .

The movable instrument used in the tool is fastened in the outer end of the piston in any suitable manner.

In the piston and piston-rod a cylindrical cavity, b'' , is formed. A ram or plunger, C, operates in this cavity. This plunger extends through the piston at the side which is most distant from the piston-rod, passing through a suitable packing, which prevents leakage around it. The plunger C also passes through a stuffing-box, a , formed upon the adjacent end of the cylinder A. The plunger outside the cylinder A passes through a connection between the two finger-pieces A', and at the outer extremity is provided with a cross-bar, C'. A spring, C², surrounds the plunger between cross-bar C' and a portion of the connection between the finger-pieces A'. The spring C² moves the plunger outwardly. The plunger may be forced inwardly by placing the palm of the hand upon the outer side of the cross-bar C', grasping the finger-pieces A', and then contracting the hand, so as to move the cross-bar toward the finger-pieces.

A simple means for packing the plunger C in the piston B consists of two disks, D D', of leather or other suitable material, having their inner edges bent in different directions into contact with the plunger C. The disk D, having its outer edge bent at right angles, so as to bear against the interior of the cylinder A, also serves to pack the piston B in the cylinder A. A ring or annular plate, D², fastened to the piston in any suitable manner—as, for instance, by screws passing through it, through the disks D D', and entering tapped holes in the piston B—serves to retain the disks D D' in place. It is intended that the plunger shall

be forced inward to its full extent, and then allowed to be moved outwardly by the spring C' alternately. Liquid which is contained in the cylinder A between the piston B and the removable head of the cylinder will flow into the cavity b^2 during the outward movement of the plunger C. The liquid in the cavity b^2 will be forced into the cylinder A at the other side of the piston B when the plunger C is moved inwardly. The liquid flows into the cavity b^2 from between the removable head of the cylinder A and the piston B through a port, b^3 , thence into a valve-chamber, b^4 , and ultimately through a port, b^5 , its passage through the valve-chamber being permitted by the opening of a valve, E. The opening of this valve is resisted by a spring which surrounds its shank or stem. The liquid is caused to flow into the cavity b^2 past the valve E by reason of a reduction of the pressure induced by the outward movement of the plunger C within the cavity b^2 and the pressure of the atmosphere acting upon the liquid through a vent with which the removable head of the cylinder A is provided. The air-vent just mentioned is shown as consisting of a hole extending longitudinally through a screw, d . This vent does not extend to the liquid within the cylinder A, but to a portion of the cylinder A which is separated from the liquid-containing portion of the cylinder by means of a diaphragm, G. The diaphragm may consist of a movable piston; but as here shown it is of flexible construction, being made in form of an annular vessel occupying the space between the flange b of the removable head of the cylinder and the interior of the cylinder A. It is of bellows-like construction. When a reduction of pressure is caused by the outward movement of the plunger C, the pressure of the atmosphere, acting through the vent d upon the diaphragm G, causes the liquid to flow, as described, from the cylinder A into a cavity, b^2 . The liquid expelled from the cavity b^2 by the inward movement of the plunger C passes out through a port, b^6 , into a valve-chamber, b^7 , and thence through a port, b^8 , into the cylinder A at the side of the piston B which is most distant from the piston-rod. In the valve-chamber b^7 is a valve, H, which opens inwardly into this valve-chamber to permit the liquid to pass by it. This valve H is closed by the pressure of liquid when a reduction of pressure is caused within the cavity b^2 by the outward movement of the plunger C. Its closing is also aided by a spiral spring which is combined with it. The inner end of the plunger does not fit tightly within the cavity b^2 ; hence the liquid contained in the cavity b^2 can pass by the inner end of said plunger. The forcing of the liquid from the cavity b^2 into the cylinder A in the manner described causes the piston B to move toward the removable head of the cylinder A. The movable instrument used in the tool is thus forced with great power toward the J-shaped exten-

sion A'. This movement of the piston is not interfered with by the liquid contained in the cylinder A between the piston and the removable head, because the diaphragm G will be free to yield and expel air to an extent which will be sufficient to accommodate this liquid in the outward movement of the plunger C. During its operation for the purpose of causing the movement of this piston B toward the removable head of the cylinder A, a head, h , which is formed at the inner end of the plunger, is not moved outwardly as far as it is possible to move it. After the tool has performed the work required of it, and it becomes therefore desirable to return the movable instrument to its original position, the cross-bar C' is grasped and pulled outwardly, the head at the inner end of the plunger C is drawn outwardly to its extreme position, and owing to such head being made of an outwardly-tapering form it forces the valve H inwardly in its valve-chamber. In this movement the valve H is forced against a valve, I, controlling a port, i , that communicates with the valve-chamber b^7 , in which the valve H is arranged, and extends thence through the piston B toward the removable head of the cylinder A. Owing to the valve I being thus opened the liquid which is contained in the cylinder A at the side of the piston B which is most distant from the piston-rod may pass through the port b^8 into the valve-chamber b^7 , and thence through the port i into the cylinder A at the other side of the piston B, thereby permitting of the drawing of the piston B in the direction last described by pulling on the cross-bar C'.

The various parts of my tool may be made of metal, except as otherwise described, and with the exception of the diaphragm G, when it is of a flexible construction. In order that it shall be of a flexible construction, providing a considerable range of movement, it will be preferably made of india-rubber or leather, although where but a small range of movement is required of it it may be made of a plate of spring metal made flat or corrugated, similarly to the diaphragm of a gage.

The diaphragm G which I have shown is secured to the removable head of the cylinder A by means of the screw d and a nut, d' , engaging with the same. There may be any desirable number of screws d and nuts d' .

The cylinder A may be charged with liquid through holes in its heads, closed afterward by means of screws f .

The combination of parts which involves the cylinder, piston, diaphragm, and air-vent may be used in other apparatus.

I want it to be distinctly understood that the form of my diaphragm may be greatly varied. Its function is to separate liquid used in the cylinder from the atmosphere and to yield to variations in pressure. It may even be a flexible chamber or receptacle outside the cylinder. I have illustrated such a chamber or receptacle in Fig. 5.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an apparatus constructed to be operated with hydraulic pressure, the combination
5 of a cylinder for containing liquid, a piston fitted therein, an air-vent, and a diaphragm between the liquid-space of the cylinder and the atmosphere, substantially as specified.

2. In an apparatus constructed to be operated with hydraulic pressure, the combination
10 of a cylinder for containing liquid, a piston fitted therein, a plunger, a cavity receiving the plunger, ports and valves whereby liquid may pass from one side of the piston to the
15 cavity in which the plunger works, and subsequently from the cavity to the other side of the piston, an air-vent, and a diaphragm between the liquid-space of the cylinder and the atmosphere, substantially as specified.

3. In an apparatus constructed to be operated with hydraulic pressure, the combination
20 of a cylinder for containing liquid, a piston fitted therein, a plunger, a cavity receiving the plunger, ports and valves whereby liquid may pass from one side of the piston to the
25 cavity in which the plunger works, and subsequently from the cavity to the other side of the piston, a valve which will open when the piston is moved back to its normal position, an air-vent, and a diaphragm between the
30 liquid-space and the atmosphere, substantially as specified.

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