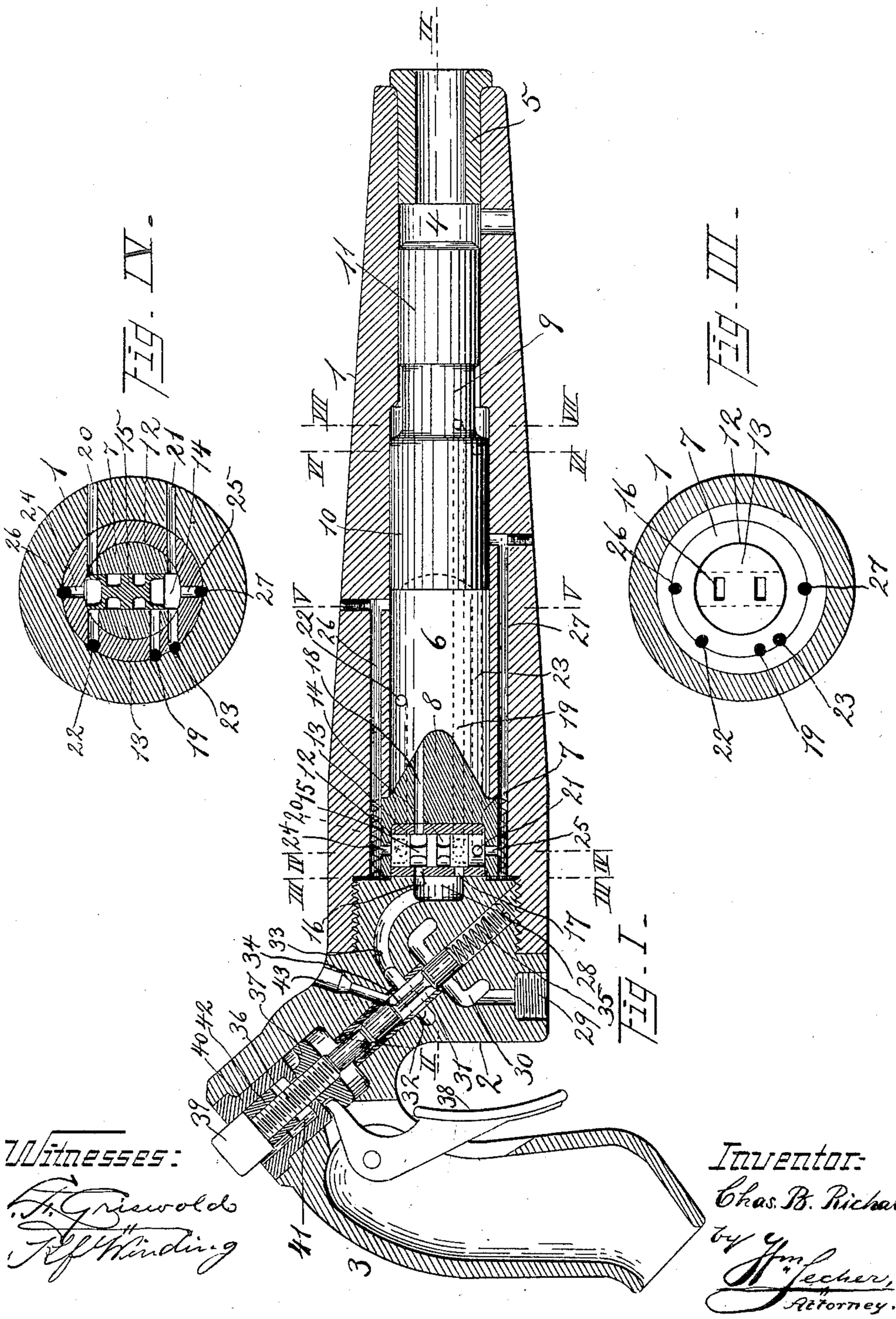
No. 649,754. Patented May 15, 1900.

C. B. RICHARDS.

PNEUMATIC TOOL.

(Application filed May 17, 1899.)

(No Model.) 2 Sheets—Sheet 1.



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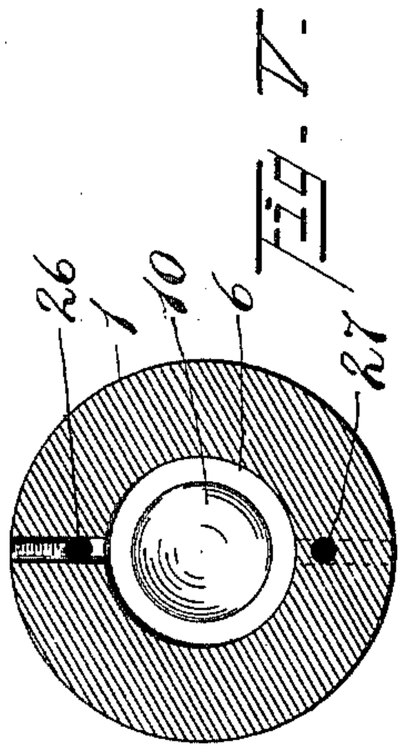

Fig. V.

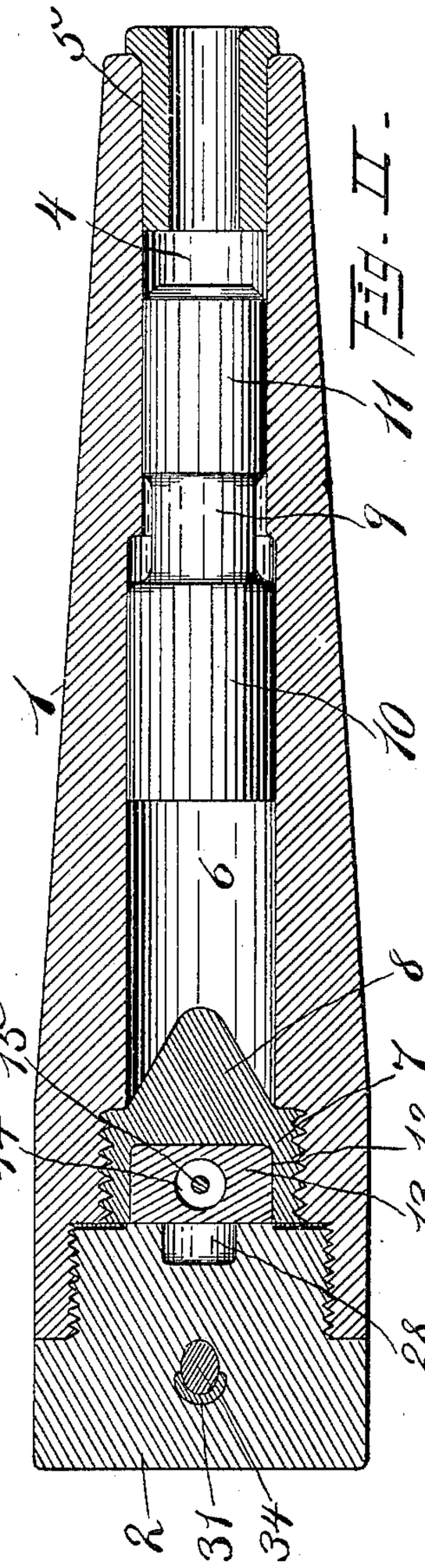

Fig. II.

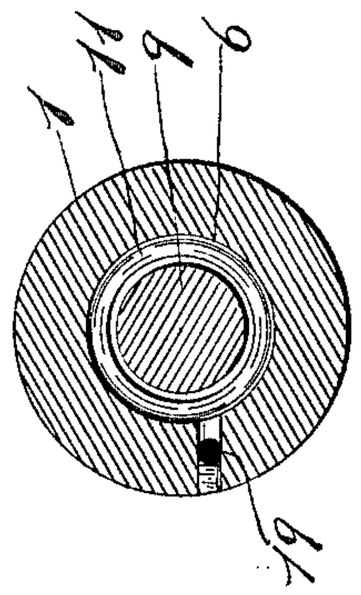

Fig. VII.

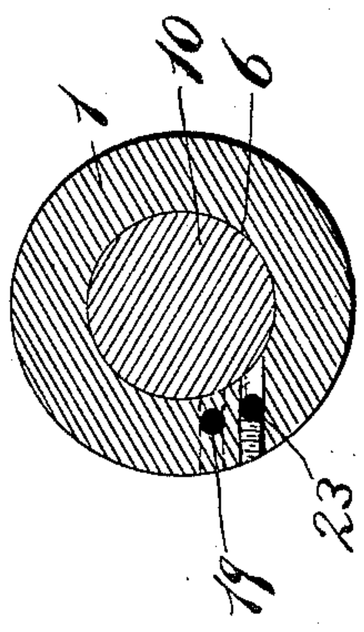

Fig. VI.

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UNITED STATES PATENT OFFICE.

CHARLES B. RICHARDS, OF CLEVELAND, OHIO, ASSIGNOR TO THE CLEVELAND PNEUMATIC TOOL COMPANY, OF SAME PLACE.

PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 649,754, dated May 15, 1900.

Application filed May 17, 1899. Serial No. 717,238. (No model.)

To all whom it may concern:

Be it known that I, CHARLES B. RICHARDS, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Pneumatic Tools, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

The annexed drawings and the following description set forth in detail one mechanical form embodying the invention, such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure I represents an axial section of my improved pneumatic tool; Fig. II, an axial section taken in a plane at right angles to said former section, and Figs. III, IV, V, VI, and VII, transverse sections on the lines III III, IV IV, V V, VI VI, and VII VII on Fig. I.

The tool has a barrel portion 1 and a breech-piece 2, formed with a handle 3, preferably of pistol-grip shape. The barrel is formed with an axial bore 4, in the outer end of which a socket 5, in which the tool is inserted, is secured, and with an axial bore 6 of greater diameter than the former bore. A breech-plug 7 is screwed into the rear of said larger bore, in a female-threaded recess in the same, and has a tapering forward end 8 in the form of a rounded cone projecting into said bore. The hammer 9 has a large plunger 10, which fits in the large bore and serves as an actuating-piston, and a smaller head 11, which fits and reciprocates in the smaller bore and acts against the end of the tool inserted in the socket. The breech-plug has a circular recess 12 in its rear face, into which a valve-casing 13 is secured. Said casing has a diametrical cylindrical distributing-valve chamber 14, in which a three-piston distributing-valve 15 slides. Said valve has a middle piston and two end pistons. The rear face of the valve-casing has two inlet-ports 16 and 17, which enter the valve-chamber and may be alternately uncovered by the end pistons of the valve at the extremes of the stroke of the latter. One port, 16, is opposed to the port of a channel 18, extending through the conical breech-plug into the rear end of the larger bore or piston-cylinder 6, and the other port, 17, is opposed to the port of a channel 19, extending from the valve-chamber to the forward end of the piston-cylinder. Exhaust-ports 20 and 21 extend from near the ends of the valve-chamber and out through the walls of the barrel. Exhaust-channels 22 and 23 extend, respectively, from near the rear end of the piston-cylinder slightly in advance of the end of the conical plug and from near the front end of the piston-cylinder slightly to the rear of the port of the channel 19 to near the ends of the valve-chamber, so that their ports in said chamber may be covered or uncovered by the end pistons of the valve at the same time as the exhaust-ports. Ports 24 and 25 are respectively formed in the ends of the valve-chamber and communicate with channels 26 and 27 in the sides of the barrel, which extend, respectively, to about the middle of the piston-cylinder and to a point a short distance forward of the middle of said cylinder. The breech-piece is screwed into the rear end of the barrel and has a chamber 28, which communicates with the inlet-ports of the distributing-valve chamber. An inlet 29 is provided in the breech-piece, to which the supply-pipe for the actuating fluid may be connected, and said inlet communicates with an annular inlet-port 30, formed around a controlling-valve chamber 31 in the breech-piece. An annular port 32 is formed around said chamber a short distance above said former port and communicates by a channel 33 with the distributing-chamber 28 and with the inlet-ports of the distributing-valve chamber. A two-piston controlling-valve 34 slides in the controlling-valve chamber and has its pistons so spaced that they may connect the two ports in said chamber when the valve is moved downward against the pressure of a spring 35 in the bottom of the valve-chamber, which spring normally forces the valve to close the inlet-port with its lower piston. A screw-threaded stem 36 has its inner end bearing against the upper end of the valve. A collar 37 is firmly secured upon said stem and is engaged by

the inner arm of a finger-lever 38, fulcrumed in the handle, to have its outer arm project from the inner side of the handle to be operated by the fingers of the hand grasping the handle. The upper end of the stem has a head 39, by which the stem and valve may be depressed and the stem may be turned. Said head slides in a thimble 40, secured in the breech-piece, and said thimble has a longitudinal feather 41 upon its inner side, upon which a grooved sleeve 42 is guided. Said sleeve slides within the thimble and the screw-thread of the stem turns in the interior screw-thread in said sleeve, so that the sleeve may be adjusted in its relation to the stem and the bottom of the thimble by turning the stem. The length of the downstroke of the stem and valve may be adjusted by moving the stop-sleeve to cause it to strike the bottom of the thimble sooner or later in the downstroke of the stem, whereby the opening stroke of the valve is controlled and less or more of the inlet-port exposed. An oil-hole 43 is formed in the breech-piece to enter the controlling-valve chamber at a point where it will be uncovered when the controlling-valve is in its uppermost or closing position, while it will be covered by the upper piston immediately upon the depression or opening of the valve.

In practice the inlet in the breech-piece is connected by a flexible pipe to a receiver or generator of fluid under pressure, such as compressed air, gas, or steam. The present hammer is principally intended for use with compressed air as a motive fluid. When no tool is inserted in the socket, the hammer-head may slide out to the end of the socket, whereby the feed-port in the outer end of the piston-cylinder will be covered by the piston and the piston cannot be brought back to start its operation even though the controlling-valve should by accident or otherwise be opened. When the tool is inserted, said inlet-port will be uncovered as the hammer and piston are pushed back, and operation of the hammer will be started by admission of the actuating fluid through the controlling-valve. If the parts are supposed to be in the position illustrated in the drawings and the controlling-valve is opened by drawing inward upon the finger-lever, and thus pushing the valve down, the fluid enters the upper inlet-port in the distributing-valve chamber and passes through the same and the upper feed-passage to the rear of the piston, forcing the same forward and causing the hammer-head to strike the tool. As soon as the piston is forced far enough forward to uncover the port of the passage leading to the upper end of the valve-chamber the fluid will pass through said passage and force the valve down, thereby opening the rear exhaust and connecting the forward inlet-duct to the inlet-port in the valve-chamber. This will cause the piston to travel backward until it uncovers the port of the passage leading to the lower end of the distributing-valve chamber, when the valve will again be shifted and the piston driven forward. The piston will be cushioned on its back stroke by shutting off the exhaust-port before arriving at the end of the stroke, thereby confining a cushion of the actuating fluid around the conical portion of the breech-plug, which portion will thus form a deep but narrow space of confined fluid, which will make an efficient cushion, diffusing the force of the back jar to the sides of the barrel. The rear face of the piston is preferably hollowed, so as to admit of its partly fitting over the cone at the extremity of the back stroke, thus still more confining the cushion. By pouring oil or other lubricant into the controlling-valve chamber and then opening said valve the oil-hole is closed and the oil in the chamber will be carried by the actuating fluid into the distributing-valve chamber and thence into the piston-chamber, thus lubricating all parts of the tool. The breech-plug and the valve-casing are easily accessible by removing the breech-piece, and said parts are securely held in place and protected by said piece.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism thus disclosed, provided the principles of construction set forth, respectively, in the following claims are employed.

I therefore particularly point out and distinctly claim as my invention—

1. In a tool operated by fluid-pressure, the combination of a piston-cylinder provided with a tapering projection at one end and an exhaust-channel communicating with the interior of said cylinder at a point a distance in advance of the end of the projection, and a piston reciprocating in the cylinder, whereby the exhaust-channel is closed by the piston at the rear portion of the back stroke of the same and said stroke of the piston is cushioned by the fluid confined in the narrowing space formed by the tapering projection, substantially as set forth.

2. In a tool operated by fluid-pressure, the combination of a barrel, a piston reciprocating in said barrel, a breech-plug screwed into the breech end of said barrel and formed with a recess in its rear face, a valve-casing secured in said recess and containing the distributing-valve mechanism, and a breech-piece screwed into the breech of the barrel to confine the breech-plug and the valve-casing in the same, substantially as set forth.

3. In a tool operated by fluid-pressure, the combination of a barrel, a piston reciprocating in said barrel, a breech-plug screwed into the breech end of said barrel and formed with a tapering forward portion projecting into the piston-cylinder of the barrel and with a recess in its rear face, a valve-casing secured in said recess and containing the distributing-valve mechanism, and a breech-piece screwed

into the breech of the barrel to confine the breech-plug and the valve-casing therein, substantially as set forth.

4. In a tool operated by fluid-pressure, the combination of a controlling-valve chamber, a controlling-valve sliding therein, a spring bearing against one end of said valve, a screw-threaded stem at the other end of the valve, a stop-sleeve having said stem threaded through it, and a thimble in which said sleeve is guided to slide and to be held from turning and against the bottom of which the sleeve may strike, substantially as set forth.

5. In a tool operated by fluid-pressure, the combination of a controlling-valve chamber, a controlling-valve sliding therein, a spring bearing against one end of said valve, a screw-threaded stem at the other end of the valve, a collar upon said stem, a finger-lever engaging said collar, a stop-sleeve having said stem threaded through it, and a thimble in which said sleeve is guided to slide and to be held from turning and against the bottom of which the sleeve may strike, substantially as set forth.

In testimony that I claim the foregoing to be my invention I have hereunto set my hand this 1st day of May, A. D. 1899.

CHARLES B. RICHARDS.

Witnesses:
WM. SECHER,
K. F. WINDING.