No. 735,589. PATENTED AUG. 4, 1903.

C. B. RICHARDS.

IMPACT TOOL.

APPLICATION FILED FEB. 20, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

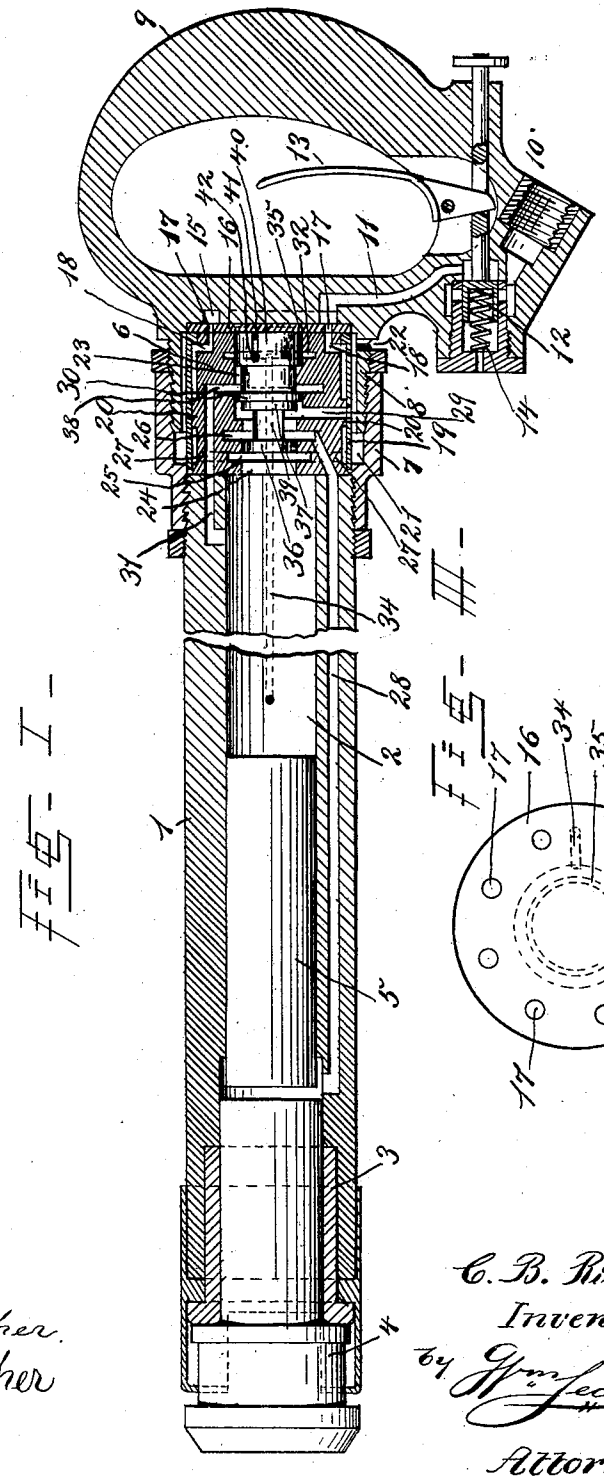

FIG. I.

FIG. II.

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NO MODEL. 2 SHEETS—SHEET 2.

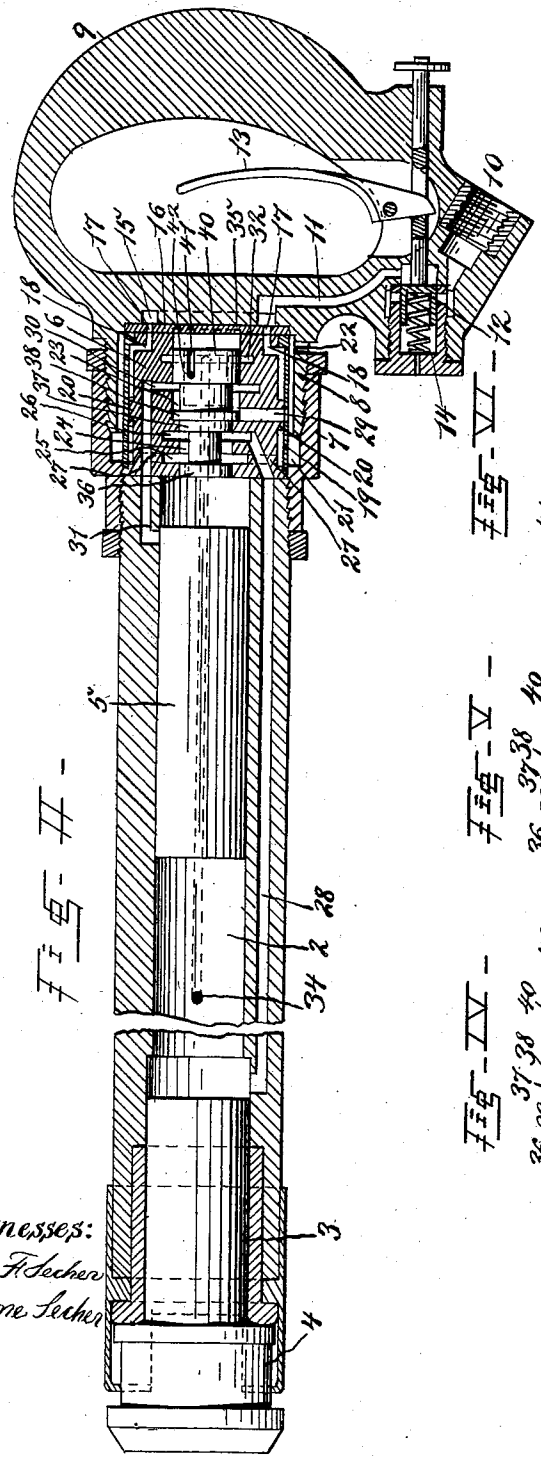

FIG. II.

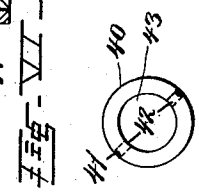

FIG. VI.

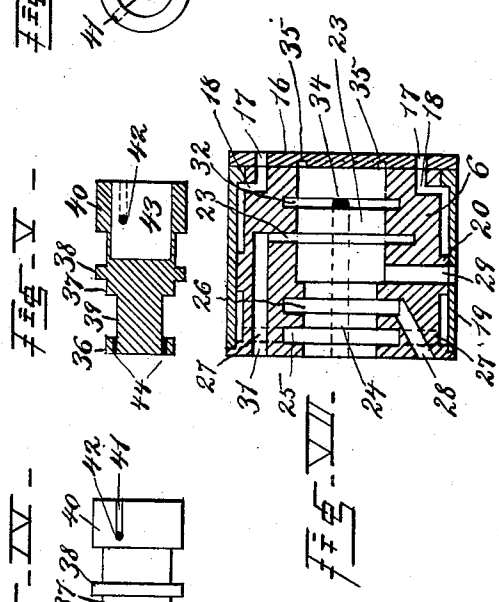

FIG. V.

FIG. IV.

FIG. III.

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No. 735,589. Patented August 4, 1903.

UNITED STATES PATENT OFFICE.

CHARLES B. RICHARDS, OF CLEVELAND, OHIO, ASSIGNOR TO THE CLEVELAND PNEUMATIC TOOL COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

IMPACT-TOOL.

SPECIFICATION forming part of Letters Patent No. 735,589, dated August 4, 1903.

Original application filed December 24, 1900, Serial No. 41,005. Divided and this application filed February 20, 1902. Serial No. 94,923. (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 Impact-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.

This invention is essentially the same as that disclosed in my application for Letters Patent, Serial No. 41,005, filed December 24, 1900, and of which this application is a division, and I do not wish to herein claim certain features of invention for which claims are made in said earlier application.

In said annexed drawings, Figure I represents an axial section of my improved impact-tool, showing the plunger at the extreme of its forward throw; Fig. II, a similar view of the tool, showing the plunger at the extreme of its inward throw; Fig. III, a rear face view of the disk closing the valve-block; Fig. IV, a side view of the valve; Fig. V, an axial section of the valve; Fig. VI, a rear end of the valve, and Fig. VII an axial section of the valve-block.

The tool has a barrel 1, formed with a cylindrical bore 2, in the outer end of which a tool-socket 3 is secured for the reception of the shank of the tool to be actuated—in the present instance a rivet set 4. A cylindrical plunger 5 is fitted to reciprocate in the working cylinder formed by the barrel-bore. A valve-block 6 is held against the rear end of the barrel by means of a coupling-sleeve 7, screwed upon the rear end of the barrel and upon a sleeve 8, which surrounds the rear portion of the valve-block and is formed upon the inner portion of a closed loop-handle 9, by which the tool is held and manipulated. An internally-threaded socket 10 is formed at the lower portion of the closed handle for the attachment of an air-hose or other means for supplying the actuating fluid, and an inlet-channel 11 is formed in the handle and communicates with the socket through a throttle-valve 12, operated to open by means of a trigger 13 and to close by a spring 14. The trigger projects into the loop of the handle, so as to be actuated by the fingers of the hand grasping the handle. The inlet-channel terminates in an annular channel 15 in the bottom of the socket formed by the handle-sleeve. A disk 16 is fitted against said bottom and closes the open rear end of the valve-block, and said disk has an annular row of holes 17, which register with the annular portion of the inlet-channel. Said holes register with a series of rectangular holes and bores 18 in the rear end of the valve-block, the ends of which bores open through the sides of the valve-block into an annular live-air space between the circumference of the valve-block and a cylindrical shell 19, spaced from the block by radiating lugs 20. An exhaust-space 21 is formed between the shell and the handle-sleeve, through which exhaust-ports 22 are formed. The valve-block has an axial valve-chamber formed by a larger cylindrical chamber 23, having its rear end closed by the disk 16, and a smaller cylindrical chamber 24, opening into the inner end of the working cylinder. Two annular ports 25 and 26 are formed in the circumference of the smaller chamber, and the outer or forward of these ports communicates by radiating channels 27 with the live-air space surrounding the valve-block, thus forming the live-air port. The inner or rear port 26 communicates with a longitudinal distributing-channel 28 in the wall of the working cylinder, which channel enters the outer end of said cylinder to the rear of the inner end of the tool-shank, the port 26 being thus a distributing-port for the outer or forward end of the working cylinder. The larger valve-chamber has a port 29 leading through the valve-block and its radial lug and the shell into the exhaust-space around the shell. An annular port 30 to the

rear of the exhaust-port has a channel 31 extending forward from the port through the valve-block and the inner end of the barrel and opening into the working cylinder a short distance from the inner end of the same. An annular port 32 is formed in the large chamber, near the rear or inner end of the same, and communicates with a channel 34, extending through the valve-block and barrel and entering the working cylinder through a port at a point slightly to the rear of the rear end of the plunger when the latter is at the extreme of its forward throw. An annular groove 35 is formed in the face of the disk 16 at the circumference of the rear end of the valve-chamber. A valve slides in the valve-chamber and has a piston 36 at its forward end, which piston fits to slide in the small chamber and to close the forward end of the same when the valve is shifted forward. A piston 37 upon the valve fits to close the rear end of the small chamber when the valve is shifted forward. A large piston 38 fits to slide in the large chamber and is immediately behind the piston 37. The two small pistons are connected by a thin neck 39, and the large piston is connected by a neck to a long and large piston 40, which slides in the rear end of the large chamber. This piston has one or more longitudinal grooves 41, which extend rearward to the end of the valve from one or more ports 42, registering with the rear annular channel when the valve is in its rear position. Said ports 42 in the valve-piston communicate with a cylindrical recess 43 in the valve and open at the rear end of the same. The rear ends of the longitudinal grooves register with the annular groove in the rear end or bottom of the valve-chamber. Small leak-ports 44 are formed through the forward piston of the valve and permit leakage of live air from the live-air inlet into the inner end of the working cylinder when the valve is in its forward position.

When the tool is properly connected to a source of fluid under pressure, preferably by a flexible hose, and the operating-tool is brought to bear against the work, the throttle-valve is opened and the live air passes through such valve and the inlet-channel into the live-air space and ports. When the distributing-valve is in the position illustrated in Fig. I, the live air passes in front of the forward valve-piston into the inner end of the working cylinder, driving the plunger forward to deliver the actuating stroke upon the tool-shank. The air in the cylinder in front of the plunger passes out through the outer port and back through the channel of said port, by which it is conducted back of the forward small valve-piston to the exhaust-port. When the plunger arrives at the end of its forward stroke, it uncovers the kicker-port and channel 34 and admits live air through said channel to the rear annular valve-chamber port, whence it passes through the ports in the long and large valve-piston into the recess in the same and through the grooves in the side of said piston to the annular channel in the bottom of the valve-chamber, so that the live air under its normal pressure bears against the larger rear area of the valve and forces the latter forward against the same normal pressure against the smaller forward area of the forward small valve-piston. This shifts the valve forward, bringing the forward distributing-channel in connection with the live-air port between the two small pistons and bringing the channel at the rear or inner end of the working cylinder in connection with the exhaust. This will drive the plunger back, until it arrives at the position in Fig. II, when it will close the exhaust-channel in the rear end of the working cylinder and compress the thus inclosed body of air and the live air leaking through the small leak-ports in the forward piston, so as to force the valve rearward, when the operation is repeated. The air back of the valve can escape through channel 34 to the forward portion of the working cylinder, from which the air is escaping. The valve is thus shifted forward by the actuating fluid under normal pressure and against a larger area and backward by air compressed beyond normal pressure by the plunger and against a smaller area. The small leak-ports in the forward piston of the valve may be omitted, but are desirable, as they provide an additional body of air to be compressed by the return stroke of the plunger, and thus expedite the shifting of the valve.

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 an impact-tool, the combination with a plunger-cylinder having air-distributing ports and channels at both ends and having the inner end exhaust a distance from the inner end, and a plunger reciprocating in said cylinder, of a valve-chamber having one end open to the inner end of said cylinder, a valve in said chamber and having one end exposed to the pressure at said cylinder end, and a leak-passage from the live-air inlet to such exposed end of the valve.

2. In a pneumatic impact-tool, the combination with a plunger-cylinder having distributing-channel 28 and exhaust-channel 31, and a plunger in said cylinder, of a valve-block having live-air passages 27 and having the end of its chamber open to the inner end of the cylinder, and the valve in said chamber having a piston 36 at its forward end exposed to said cylinder end and formed with leak-passages 44.

3. In an impact-tool, the combination with a plunger-cylinder having distributing-channel 28 and exhaust-channel 31, and a plunger in said cylinder, of a valve-chamber having distributing-ports and having one end open to the inner end of the cylinder and formed with a port 32 and provided with channel 34, and a distributing-valve in said chamber having one end exposed to the inner end of the cylinder and provided at the other end with a recessed piston provided with port 42.

4. In an impact-tool, the combination with the valve-chamber having the annular live-air port 32, of the valve having the recess 43 in its end and having the ports 42 and channels 41.

5. In an impact-tool, the combination of a barrel having external screw-threads upon its inner portion, a handle having a socket formed with external screw-threads, a valve-block confined in the socket and by the end of the barrel, a sleeve having internal screw-threads fitted upon the threads of the barrel and socket, and lock-nuts upon the barrel and socket and bearing against the ends of the sleeve.

6. In an impact-tool, the combination of a barrel, a tool loosely inserted in the end of said barrel and formed with a circumferential groove, and a sleeve secured upon the end of the barrel and having its outer end longitudinally slitted or cut away to form spring-tongues formed with inwardly-projecting lips engaging the groove of the tool.

7. In an impact-tool, the combination of a barrel, a tool-socket secured in the end of said barrel, a tool loosely inserted in said socket and formed with a circumferential groove, and a sleeve fitted around the end of the barrel and having an internal annular rib held between the flange of the tool-socket and the end of the barrel and having its end longitudinally cut away to form spring-tongues having inwardly-projecting lips engaging the groove of the tool.

8. In an impact-tool, the combination with the barrel formed with the channels 28 and 31 and the small channel 34, and the plain cylindrical plunger 5 in the bore of said barrel, of the valve-block formed with the small bore 24 and large bore 23 and with the inlet-port 27, distributing-port 26, exhaust-port 29, barrel exhaust-port 30, and annular port 32, and the valve formed with piston 36 having leak-holes 44, pistons 37 38, and large piston 40 formed with recess 43 and ports and grooves 42 41.

9. In an impact-tool, the combination with a plunger-cylinder and a plunger reciprocating therein, of a distributing-valve having a piston-face exposed to be acted upon to shift the valve by the compressing action of the plunger at the end of its stroke upon an inclosed air-cushion, and a live-air passage to said inclosed air-cushion.

In testimony that I claim the foregoing to be my invention I have hereunto set my hand this 8th day of February, A. D. 1902.

CHARLES B. RICHARDS.

Witnesses:
H. D. MAXWELL,
WM. SECHER.