C. L. JONES.

PNEUMATIC HAMMER.

APPLICATION FILED APR. 28, 1908.

946,368.

Patented Jan. 11, 1910.

2 SHEETS—SHEET 1.

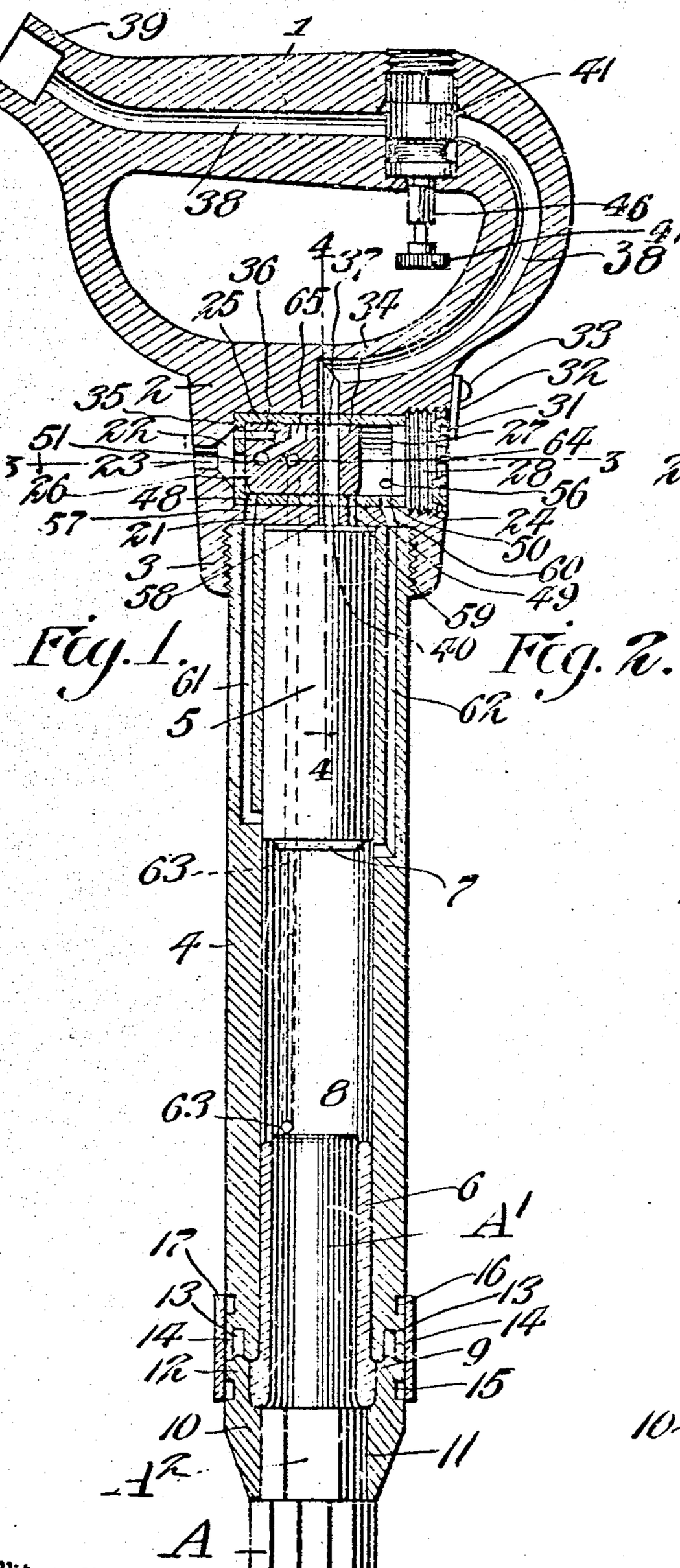

Fig. 1.

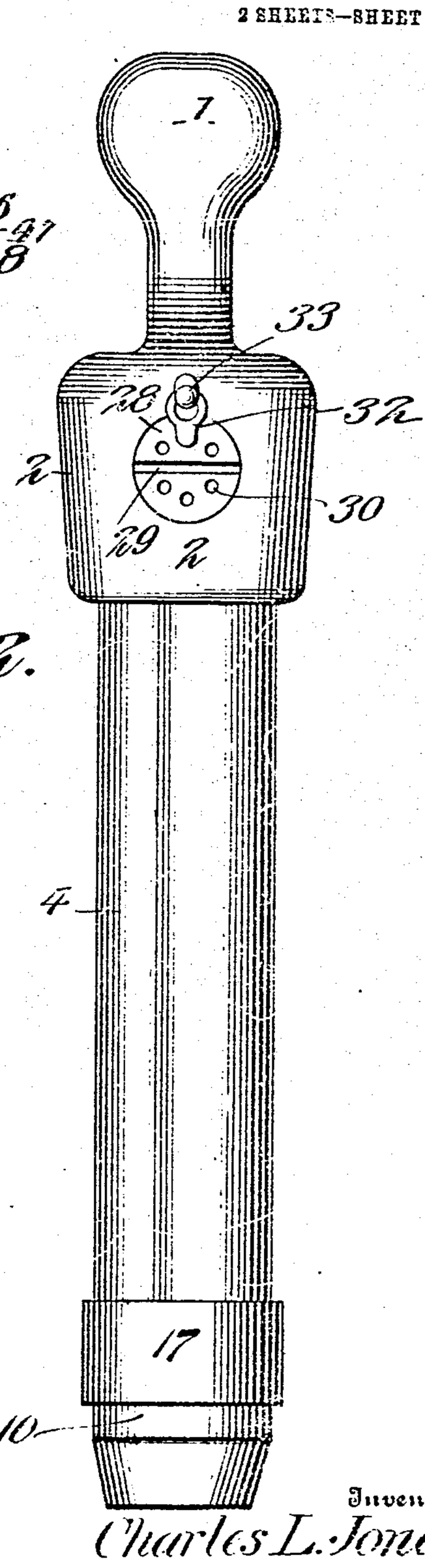

Fig. 2.

Witnesses

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2 SHEETS--SHEET 2.

Fig. 3.

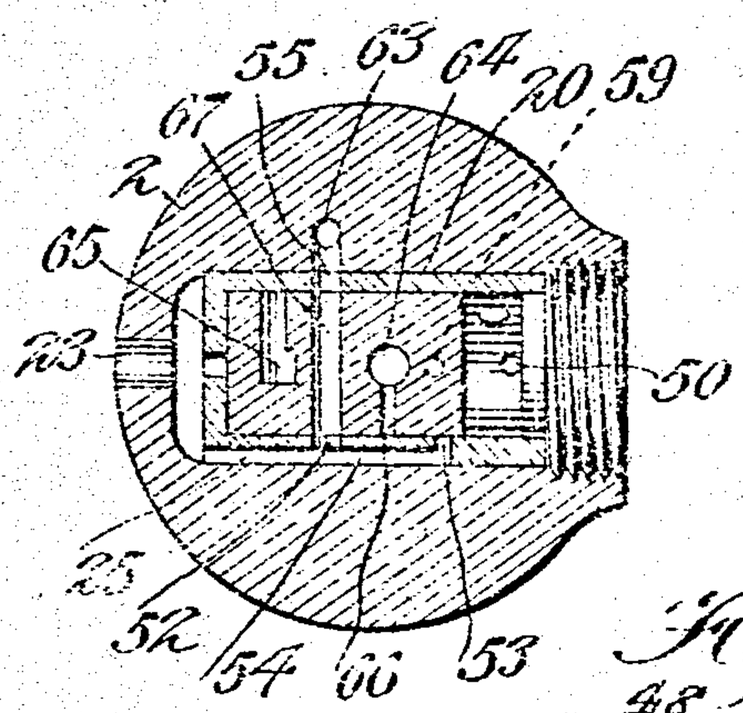


Fig. 4.

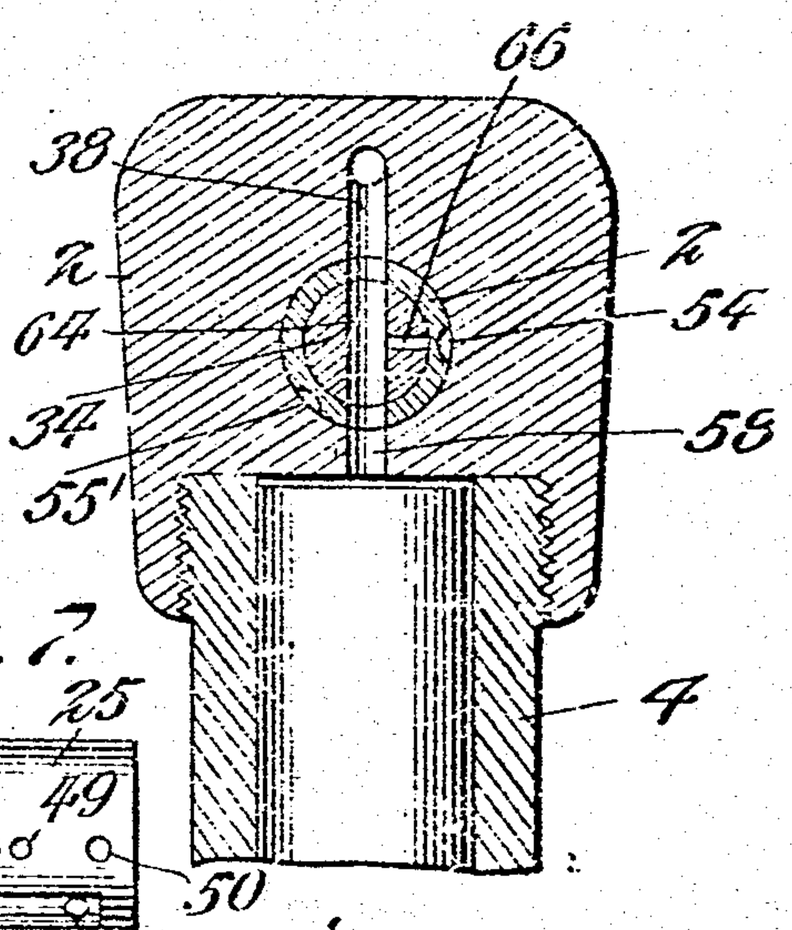


Fig. 5.

Fig. 7.

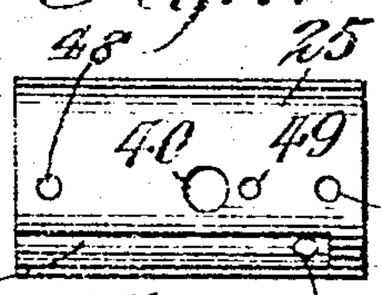


Fig. 9.

Fig. 6.

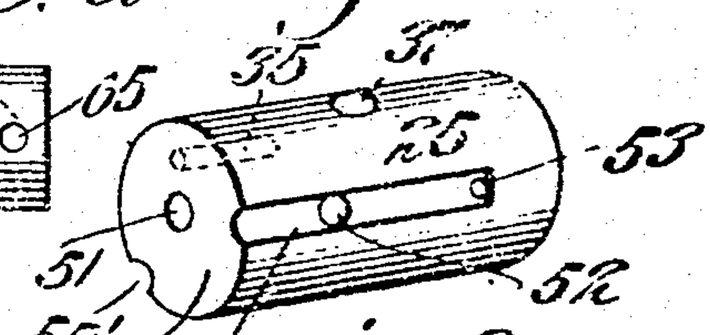


Fig. 11.

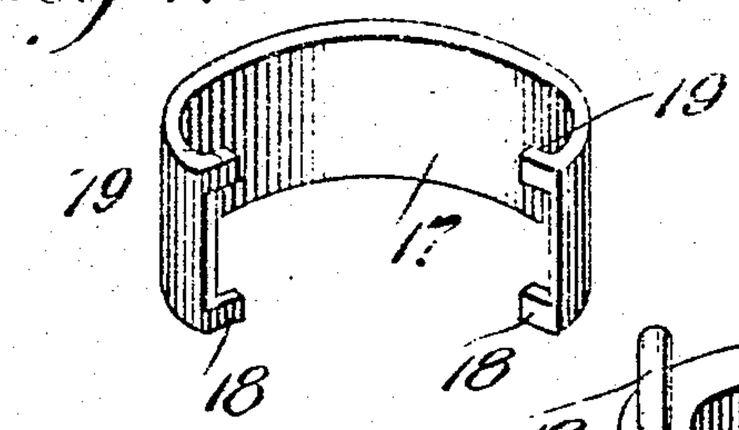
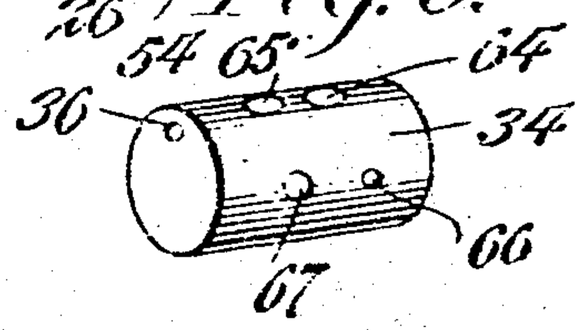


Fig. 8.



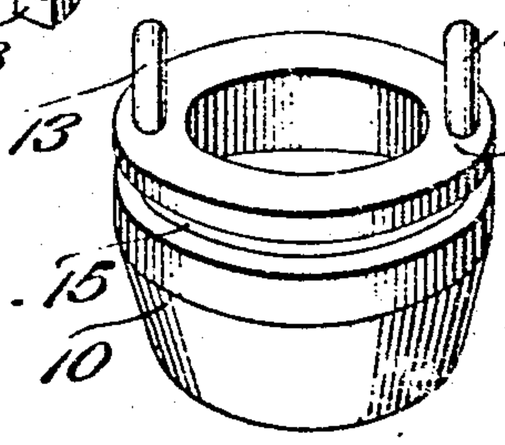


Fig. 10.

Witnesses

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UNITED STATES PATENT OFFICE.

CHARLES L. JONES, OF URBANA, ILLINOIS.

PNEUMATIC HAMMER.

946,368. Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed April 28, 1908. Serial No. 429,756.

To all whom it may concern:

Be it known that I, CHARLES L. JONES, a citizen of the United States, residing at Urbana, in the county of Champaign and State of Illinois, have invented new and useful Improvements in Pneumatic Hammers, of which the following is a specification.

This invention relates to certain new and useful improvements in pneumatic hammers; and its object is to provide a novel construction of air feed passages and valve mechanism for operating the concussion hammer or plunger in both directions, and to provide also a means for the ready application and use of different types of tools.

The invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a vertical longitudinal section through the tool with the parts in position for feeding air for the stroke movement of the hammer and the exhaust of air employed in the previous return stroke. Fig. 2 is a view in side elevation of the tool. Figs. 3 and 4 are, respectively, transverse and longitudinal sections on an enlarged scale taken on the lines 3—3 and 4—4 of Fig. 1. Fig. 5 is a transverse section through the cylinder. Figs. 6 and 7 are views of the valve casing. Figs. 8 and 9 are views of the feed valve. Fig. 10 is a detail view of the chuck head. Fig. 11 is a similar view of the holding clip therefor.

Referring to the drawings, the numeral 1 designates the handle of the tool, which is loop-shaped and provided upon its outer or forward side with an extension 2 forming a chest for the valve mechanism, said chest or extension being formed with an internally threaded flange 3 to receive the externally threaded inner end of a cylinder 4, in which the hammer, piston or plunger 5 is arranged to reciprocate.

Fitted in the outer end of the cylinder is a concussion tube or bushing 6, in which the shank A′ of the tool or chisel A is inserted to receive the blow of piston 5, whose lower end is reduced to form a striking portion 7 to contact with the inner end of the tool shank 8. The sleeve projects at its outer or forward end beyond the end of the cylinder and is enlarged to provide an annular shoulder 9 [illegible] against the same. Receiving and inclosing the projecting portion of the tube is a tool holder or chuck head 10 formed with a noncircular socket 11 to receive the noncircular end portion A² of the tool. The rear portion of the head which receives the end of the tube 6 is in the form of a flange or collar 12 provided with pins 13 fitted within sockets or recesses 14 in the end of the cylinder, whereby the head is detachably secured against rotary motion. The outer surface of the flange 12 is provided with an annular groove 15, while the cylinder is provided at a point inwardly beyond the socket 14 with a similar groove 16.

A clip 17 is provided for detachably holding the chuck head against outward movement and displacement, and comprises a partially circular spring band having at its free ends flanges or fingers 18 and 19 to respectively engage the said annular grooves in the head and cylinder. By this means the head is detachably secured in position, and yet upon expanding the clip may be readily released and removed, thus permitting of the convenient application and use, as well as the disconnection, of different kinds of interchangeable chucks or tool holders for the reception of the shanks of tools having noncircular portions. The bushing 6 is normally adapted to receive the shank of a tool in which the shank is circular throughout, in which event the use of the chuck is not required.

The extension or chest 2 is bored to form a transverse chamber 20 which is separated from the cylinder receiving space or chamber formed by the flange 3 by a partition 21, against which the inner end of the cylinder closely bears. The chamber 20 is in communication at one end through a flaring recess 22 with a final exhaust port (one or more) 23, while the opposite end of the chamber is internally threaded, as at 24. Within the chamber 20 is arranged a cylindrical or tubular barrel or feed valve casing 25 having a head 26 at one end and open at its opposite end. The casing snugly fits said chamber and its head 26 bears against the end wall of the chamber adjacent the recess 22, while the opposite end of the casing is closed by the reduced inner end 27 of a threaded plug 23 closely fitting within the threaded opening 24 and clamping the casing firmly against the aforesaid end wall. The outer surface of the plug is formed with a groove or niche 29 for the reception of the

blade of a screw driver or other tool in applying and removing it, and is also formed with an annular series of depressions or recesses 30 adapted to be engaged by a locking stud 31 on a key 32, said key being slotted to detachably engage a headed keeper pin 33. The slot in the key is of keyhole form, so that when forced outward the shank of the pin will engage the narrow portion of the slot and thus retain the key in position. By pressing the stud carrying end of the key outward, the stud may be disengaged from the depression 30 in which it is fitted and the key then slipped out of engagement with the pin to permit the plug to be adjusted or removed. When the plug is disengaged, the valve casing and valve, hereinafter described, may be readily inserted or detached so as to permit of the convenient renewal or repair of these parts of the apparatus. The feed valve 34 is in the form of a solid plug or cylinder fitted within the casing and of less length than the same to permit said valve to have the required reverse longitudinal movements for the supply of air to actuate the hammer or plunger in reverse directions. In order to hold said valve from rotation, while permitting free reciprocatory movements thereof, the head 26 of the valve casing is provided with an inwardly extending guide pin 35 fitting within a guide socket 36 in the valve.

The valve casing is provided at what shall, for convenience of description, be termed its upper side with a port 37 communicating with an air feed passage 38 formed in the handle 1, which latter is provided with a suitable form of extension or connection 39 for the reception of the end of an air supply tube or pipe, while in the bottom portion of the valve casing diametrically opposite the said port 37 is a port 40, such ports 37 and 40 constituting main feed ports for the supply of air from the passage 38 to the cylinder for the purpose of impelling the hammer on its working stroke. The feed of air through the passage 38 is controlled by a suitable construction of throttle valve 41 having a stem or controlling member 46 which projects into the receiving space or opening in the handle and carries an operating knob or finger piece 47.

Formed in the underside of the feed valve chamber in alinement with the port 40 are ports 48, 49 and 50, while in the closed end of said chamber is formed an exhaust port 51 communicating with the port 23. The front side of the chamber is also formed with ports 52 and 53 opening into a longitudinal groove 54 extending through the closed end of the casing for communication with the port 23. In the rear side of the valve chamber or casing diametrically opposite the port 52 is provided a port 55, and below said port the casing is formed with an exhaust groove or channel 55′ for communication with the passage 23, and communicating with said groove 55′ is an exhaust port 56.

The ports 40, 48, 49 and 50 respectively register with ports 58, 57, 59 and 60 in the partition 21, the ports 57 and 59 communicating with the upper end of the cylinder, while the ports 57 and 60 communicate with passages 61 and 62 in the walls of the cylinder and which open into the same at different distances above the bushing 6. When the hammer 5 is at the limit of its upward movement it closes the lower end of the passage 61, but extends above the lower end of the passage 62, while, when said hammer is fully projected and in contact with the tool, it closes the passage 62 and uncovers the passage 61. In addition, the cylinder is provided with a longitudinal combined feed and exhaust passage 63 extending at its upper end into the chest 2 for coöperation with the port 55 and opening at its lower end into the cylinder adjacent the lower end of the bushing.

The valve is provided with passages to coöperate with the aforesaid passage. Extending diametrically through the valve is a main feed passage 64, which connects the ports 37 and 40 when the valve is in the position shown in Fig. 1. Also formed in the valve alongside said passage 64 is an angle passage 65 extending downwardly and rearwardly and adapted when the valve is shifted to the right to connect the port 37 with the upper end of the passage 63. An exhaust passage 66 extends at right angles from the passage 64 for coaction with the port 53 of the valve casing, while a passage 67 extends at right angles diametrically through the velve from front to rear for connecting the passage 63 with the ports 52 and 55 of the valve casing.

Assuming the parts of the valve mechanism to be in the position shown in Fig. 1 with the hammer retracted, it will be apparent that upon opening the throttle valve 41 air from the passage 38 will feed through the ports 37, 64 and 40 into the upper end of the cylinder and impel the hammer on its concussion stroke, in which its lower end contacts with the tool shank A′, while its upper end closes the port 62 and opens the port 61, allowing a portion of the air behind the hammer to feed through the passage 61 behind the left hand end of the valve and shift the same to the right, so that the passage 64 will be moved out of register with the ports 37 and 40 and into register with the port 49, while the passage 65 will connect the port 37 with the upper end of the passage 63. The air feeding up through the passage 61 after shifting the valve will exhaust through the ports 51 and 23, while air from the passage 38 will flow downward

through the passage 65 and passage 63 into the cylinder below the hammer and force the latter back to the normal position shown in Fig. 1, in which it closes the port 61 and opens the port 62.

On the upward or return movement of the hammer, the unexpelled air in the cylinder above the same exhausts through the ports 59 and 49, passage 64, passage 66, port 53, groove 54 and port 23, thus preventing the formation of a cushion between the partition and hammer on the return stroke, while as soon as the port 62 is uncovered air from below the hammer will flow upward through said port into the valve casing through the ports 60, and 50 and shift the valve back to the normal position shown in Fig. 1 for the feed of air for the succeeding concussion stroke of the hammer. The air thus flowing upward through the passage 62 to shift the valve to the left, exhausts through the port 56, groove 55' and port 23, while the remainder of the air in the lower portion of the cylinder exhausts on the impelling stroke of the plunger through the passage 63, port 55, passage 67, groove 54 and port 23, thus preventing the formation of a cushion on such stroke.

It will be seen from the foregoing description that the device is entirely automatic in operation as long as the throttle valve is held open, and that the feed valve is shifted solely by air pressure to its different positions for the movement of the hammer in reverse directions, thus dispensing with the use of springs for controlling in part the movement of such valve. Also it will be seen that the parts of the valve mechanism are readily accessible and may be conveniently removed for repairs or the substitution of new parts.

Having thus fully described the invention, what is claimed as new is:—

1. In a pneumatic hammer, a cylinder having two exhaust passages and a combined feed and exhaust passage opening at different points therein, a chest having coacting exhaust ports and a combined feed and exhaust port registering with said passages and also provided with an air supply passage, a main feed port and a final exhaust port, a reciprocating plunger operating in said cylinder, a barrel removably mounted in the chest and provided with an outlet port communicating with said final outlet port, main feed ports communicating respectively with the air supply passage and main feed port in the chest, a combined feed and exhaust port communicating with said combined feed and exhaust passages, a pair of external exhaust grooves communicating with said final exhaust port, a pair of exhaust ports communicating with one of said grooves, and a single exhaust port communicating with the other groove, and a reciprocatory valve in said barrel movable in reverse directions to open and close said exhaust ports and having a main feed passage adapted in one position of said valve to connect the main feed ports and in the other position of the valve to connect one of said exhaust ports in the chest with one of the ports of the double-ported exhaust groove, an angular passage adapted in the second named position of the valve to connect the initial main feed port of the barrel with the combined feed and exhaust passage, an exhaust port for connecting the combined feed and exhaust passage with the other port of the double-ported groove through said combined feed and exhaust port in the barrel when the valve is in its first named position, and a port communicating with the main feed ports in the barrel when the valve is in its second named position.

2. In a pneumatic hammer, a cylinder having two exhaust passages and a combined feed and exhaust passage opening at different points therein, a chest having coacting exhaust ports and a combined feed and exhaust port registering with said passages and also provided with an air supply passage, a main feed port and a final exhaust port, said chest being open and internally threaded at one end, a reciprocating plunger operating in said cylinder, a barrel removably mounted in the chest and provided with an outlet port communicating with said final outlet port, main feed ports communicating respectively, with the air supply passage and main feed port in the chest, a combined feed and exhaust port communicating with said combined feed and exhaust passage, a pair of external exhaust grooves communicating with said final exhaust port, a pair of exhaust ports communicating with one of said grooves, and a single exhaust port communicating with the other groove, a guide pin upon the interior of the barrel, and a reciprocatory valve in said barrel movable in reverse directions to open and close said exhaust ports and having a main feed passage adapted in one position of said valve to connect the main feed ports and in the other position of the valve to connect one of said exhaust ports in the chest with one of the ports of the double-ported exhaust groove, an angular passage adapted in the second named position of the valve to connect the initial main feed port of the barrel with the combined feed and exhaust passage, an exhaust port for connecting the combined feed and exhaust passage with the other port of the double-ported groove through said combined feed and exhaust port in the barrel when the valve is in its first named position, and a port communi-

cating with the main feed port for connecting the exhaust port in the barrel with the port of the single-ported exhaust groove through said main feed port when the valve is in its second-named position, said valve being further provided with a socket receiving said guide pin to hold the valve from rotary motion, a screw plug closing the open end of the chest and having a reduced portion closing the open end of the barrel, and means for locking said plug in adjusted position.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES L. JONES.

Witnesses:

HARRY H. GRIESHEIMER,

WILLIAM GILLESPIE.