No. 753,438. PATENTED MAR. 1, 1904.

C. H. SHAW.

PNEUMATIC HAMMER.

APPLICATION FILED MAR. 30, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

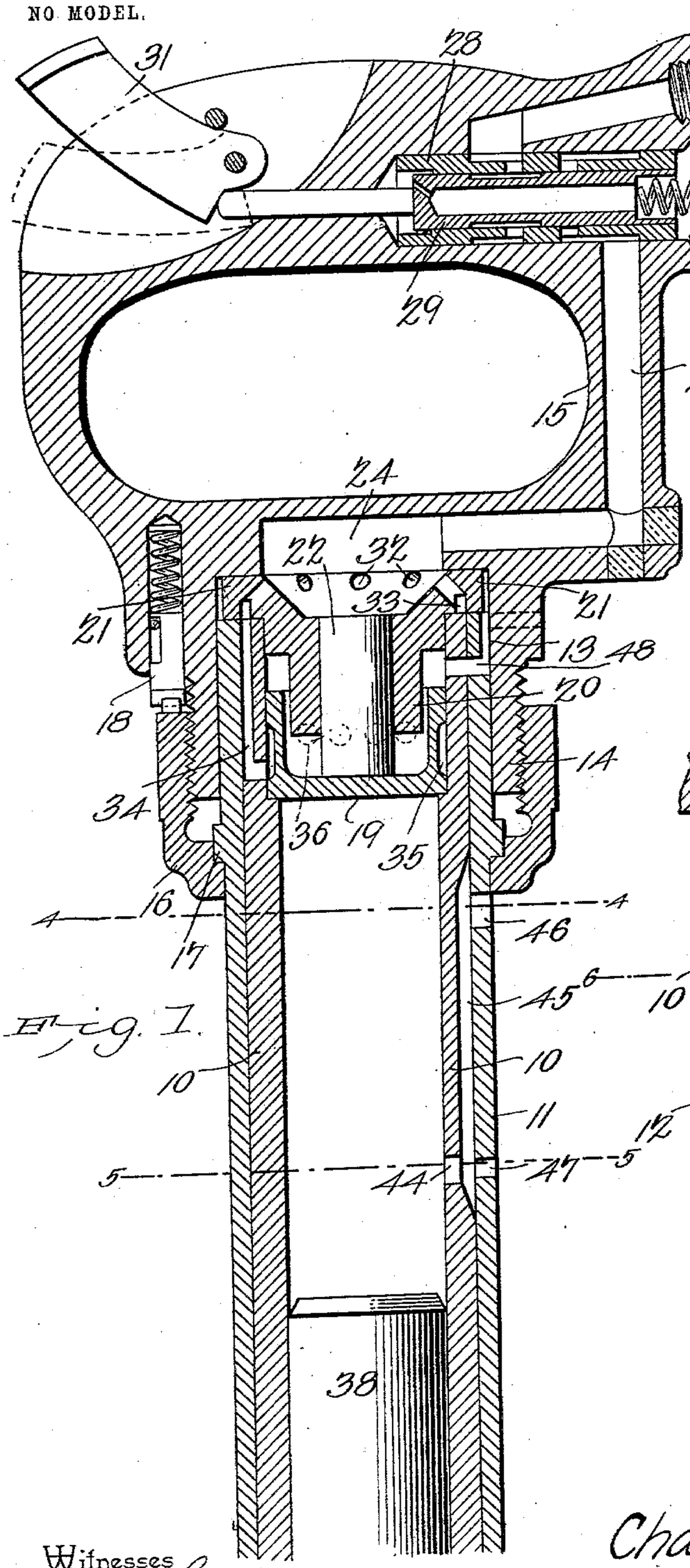

Fig. 1.

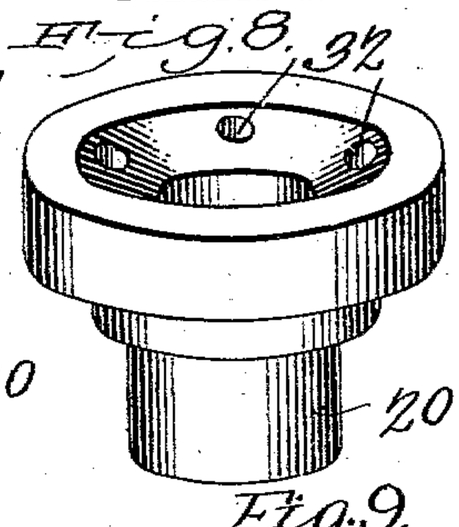

Fig. 8.

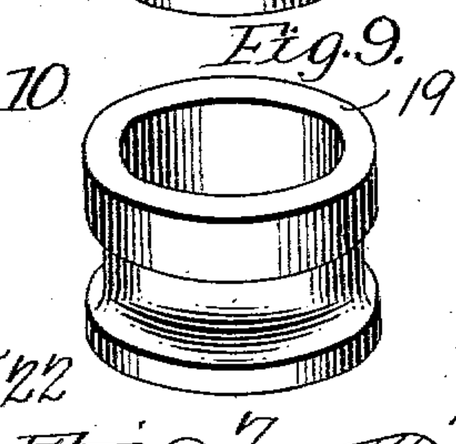

Fig. 9.

Fig. 10

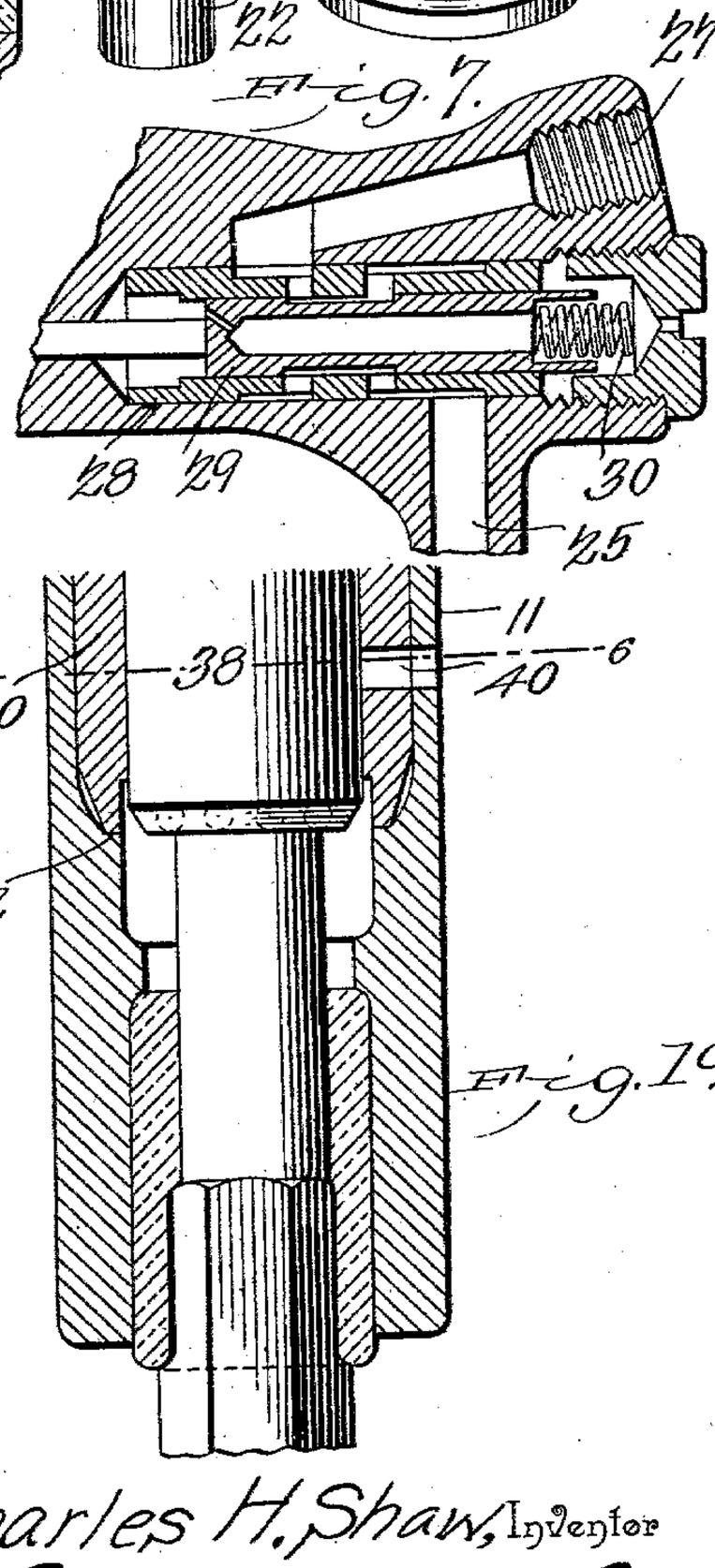

Fig. 7.

Fig. 7a.

Witnesses
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NO MODEL. 2 SHEETS—SHEET 2.

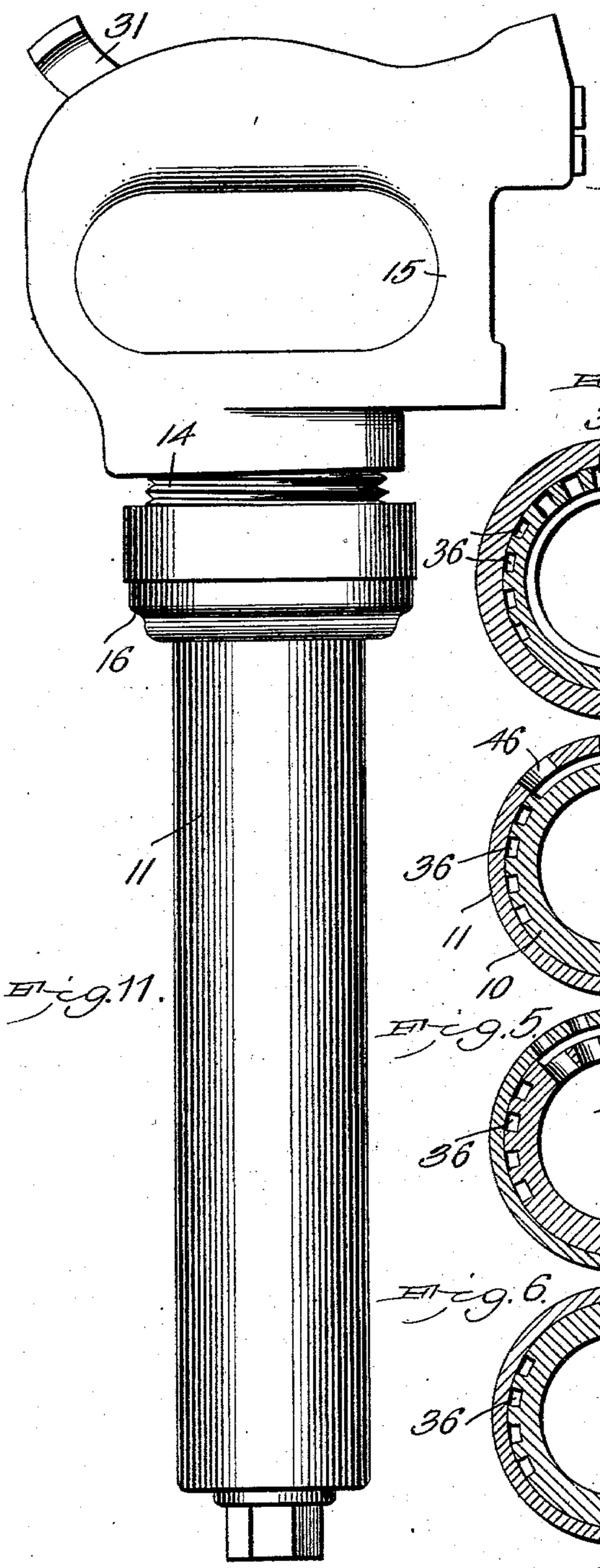

Fig. 11.

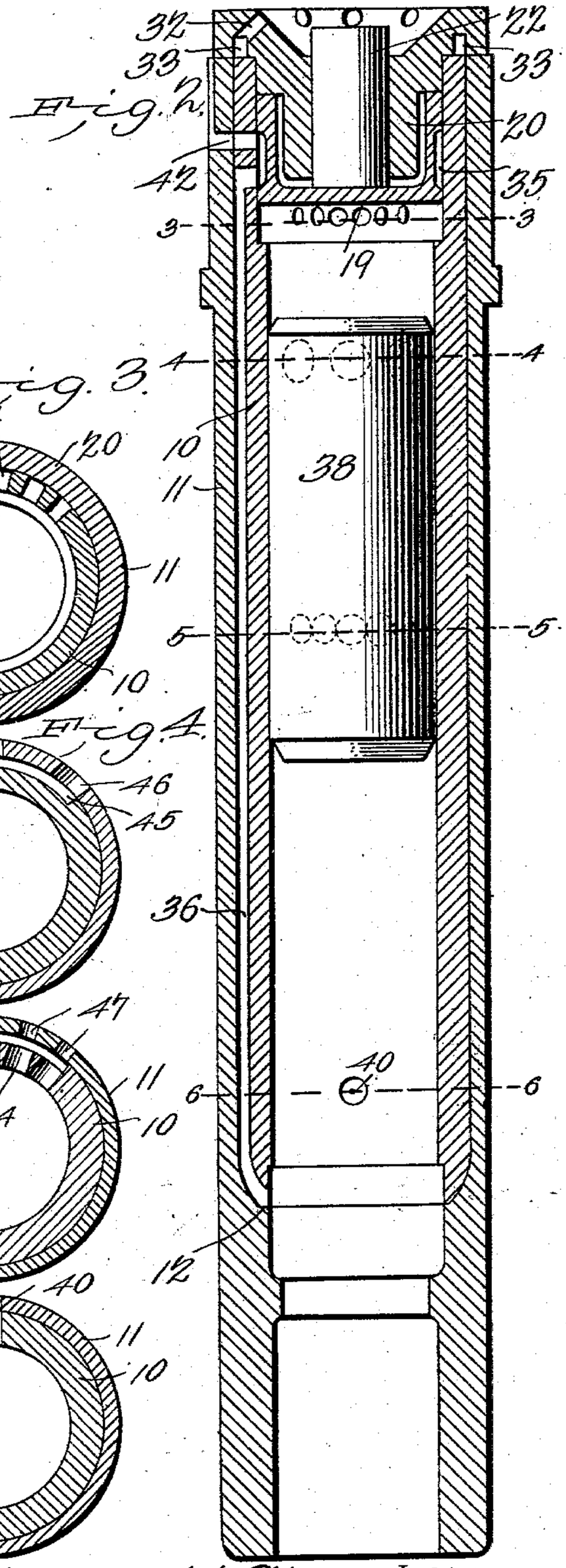

Fig. 2.

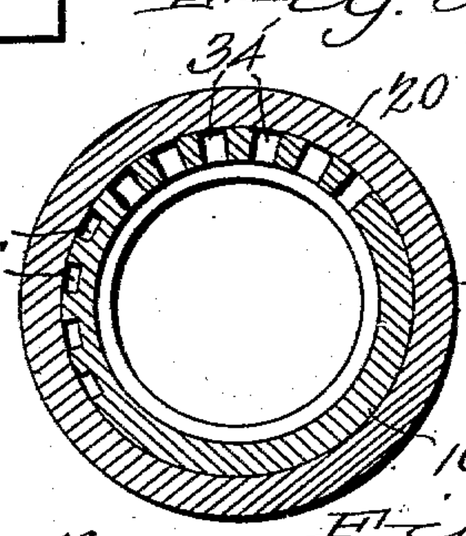

Fig. 3.

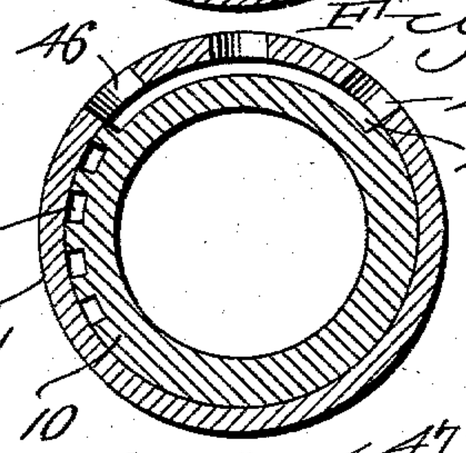

Fig. 4.

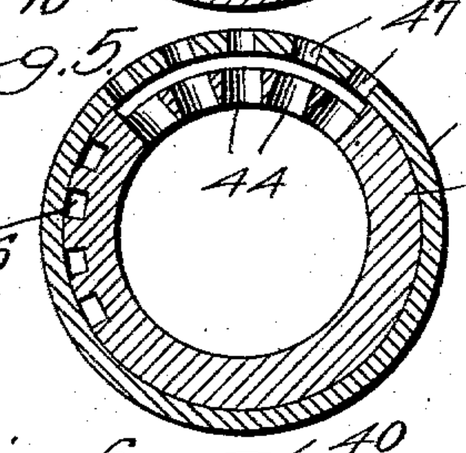

Fig. 5.

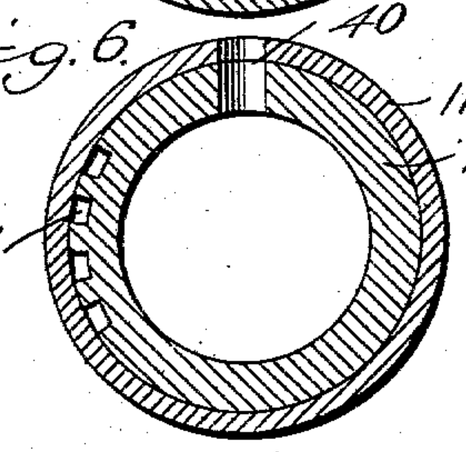

Fig. 6.

Witnesses
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Attorneys

No. 753,438. Patented March 1, 1904.

UNITED STATES PATENT OFFICE.

CHARLES HENRY SHAW, OF DENVER, COLORADO.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 753,438, dated March 1, 1904.

Application filed March 30, 1903. Serial No. 150,332. (No model.)

To all whom it may concern:

Be it known that I, CHARLES HENRY SHAW, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented a new and useful Pneumatic Hammer, of which the following is a specification.

The invention relates to certain improvements in pneumatic hammers, and has for its principal object to provide an improved form of valve to be automatically operated by air-pressure in both directions of movement, said valve serving to control the entrance of air or other fluid under pressure to both ends of the cylinder and the exhaust of air from one end of said cylinder.

A further object of the invention is to provide an improved construction of hammer, wherein the effective pressure on the working stroke of the piston is materially increased and correspondingly decreased on the return stroke to lessen the strain on the operator.

A still further object of the invention is to provide an improved form of valve which is constantly subjected to working pressure, tending to maintain the valve at the limit of movement in one direction and in which the working pressure exerted on the opposite face of the valve during the working stroke of the piston is materially reduced before the piston reaches the limit of its outward movement to thereby permit the valve to close and cut off the supply of air before the piston reaches the limit of its outward movement.

A still further object of the invention is to provide a valve disposed within a cylinder and forming a movable head, and in which the valve area within the cylinder is exposed to variable pressure, while the opposite face of the valve receives the thrust of a pin of much smaller area than the valve and exposed to constant working pressure.

A still further object is to provide an improved form of valve in which a portion of the valve is subjected to constant pressure, tending to maintain the valve at the limit of movement in one direction, and a larger valve area is exposed to variable pressure, which is automatically reduced on the forward or out stroke of the piston and increased on the backward or in stroke thereof.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figures 1 and 1ª represent a longitudinal sectional elevation of a pneumatic tool embodying the invention. Fig. 2 is a similar view taken in a plane at right angles to Fig. 1 and a portion of the handle being omitted. Figs. 3, 4, 5, and 6 are sectional plan views on the planes designated by the corresponding section-lines of Fig. 2. Fig. 7 is a detail view of the throttle-valve and its casing, showing the valve in open position. Fig. 8 is a detail perspective view of the breech-block detached. Fig. 9 is a similar view of the valve. Fig. 10 is a similar view of a pin serving to transmit movement to the valve, and which may be formed integral therewith, if desired. Fig. 11 is a side elevation of the tool, drawn to a somewhat smaller scale.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

For convenience in arranging the ports, as well as to strengthen the structure, the cylinder is formed of two members comprising the cylinder proper, 10, and an outer casing 11, the latter being provided at its lower end with a chuck for the reception of a tool-shank and having an annular flange or shoulder 12 for the reception of the lower end of the cylinder-section 10. The two cylindrical members fit within a cylindrical recess 13, formed in a threaded boss 14, projecting from a handle member 15, and are confined in place by a nut 16, which engages an annular flange 17 on the section 11 and screws on the threaded boss.

In order to lock the nut in position, its upper face is toothed for engagement with a spring-pressed locking-pin 18, carried by the handle.

The upper portion of the cylinder 10 is counterbored for the reception of a cup-shaped valve 19, and within said counterbored portion also fits a breech-block 20, having an annular flange 21 confined between the upper end of the cylinder and the bottom wall of the recess 13. The annular flange or ring of the cup-shaped valve is free to move within a chamber formed partly by the counterbored portion of the cylinder and partly by a reduced portion of the breech-block 20, and said block is provided with a central opening in which is guided a longitudinally-movable pin 22, the lower end of which is forced into contact with the transverse lower wall of the valve by the pressure of the actuating fluid before the latter enters the cylinder. The transverse wall of the valve forms a movable cylinder-head and is moved in one direction by the air compressed in advance of the piston on the return stroke of the latter and in the opposite direction by the pressure-pin 22. Above the breech-block 20 is a chamber 24, with which communicates a passage 25, leading to a valve-chamber 26, which is also in communication with an inlet-opening 27, through which air or other fluid under pressure is admitted. In the valve-chamber is a ported bushing 28, adapted to receive a cylindrical valve 29, provided with an annular port or passage through which air may pass from the inlet 27 to the passage 25. The valve is normally held in closed position by a spring 30 and is operatively connected to a trigger 31, which when depressed places the passages 27 and 25 in communication and admits the actuating fluid to the chamber 24. The upper portion of the breech-block is provided with a plurality of ports 32, leading to an annular recess 33 in a flange 21 of said block, and in alinement with said recess are a number of openings or cylinder-ports 34, leading to the counterbored portion of the cylinder in alinement with an annular port or passage 35 of the valve when the latter is in the position illustrated in Fig. 1. In the outer wall of the cylinder-section 10 are one or more air-passages 36, which open into the upper counterbored portion of the cylinder in alinement with the annular valve-port 35 and communicates with the lower end of the cylinder at a point adjacent to the limit of outstroke of the piston, so that when the valve is in the position shown in Fig. 1 and the throttle-valve is open air or other fluid will flow into the lower part of the cylinder and raise the piston 28 in the direction of the valve. As this is the backward or non-working stroke of the piston, it is not desirable to keep said piston under full pressure during the full length of the stroke, although it is necessary to employ a considerable volume of air to overcome the inertia of the piston at the beginning of its stroke. After the back stroke of the piston has commenced the piston uncovers the cylinder-port 40, leading directly to the outer air, reducing the pressure, and thus preventing shock and jar on the back stroke and making the tool easier for a workman to handle. During the downstroke of the piston this escape-port permits a portion of the air in advance of the piston to escape and permits the full pressure of air to actuate the piston on the working stroke. In the upper portion of the cylinder-sections are a number of passages 42, communicating with the outer air and leading into the counterbored portion of the cylinder immediately above the ports 36, so that when the valve is raised to the position shown in Fig. 2, which occurs as the piston is completing its inward movement, the lower end of the cylinder will be placed in communication with the outer air through the passages 36, the valve-port 35, and the ports 42, the air escaping also through the port 40 and ceasing to act on the piston. When the piston is on its inward stroke, air is compressed between the inner face of the piston and the transverse wall of the valve and raises said valve to the position shown in Fig. 2 against the constant pressure exerted on the upper end of the pin 21, the pressure at the inner portion of the cylinder being materially increased and forming an air-cushion to check the movement of the piston. When the valve is raised, air flows directly from the chamber 24 through the ports 32 and 34 to the inner end of the cylinder and starts the piston on its working stroke, the pressure being rendered more effective by the escape of air in advance of the piston through the ports 36 and 40, so that no air-cushion is formed between the tool and the piston. In order to allow the valve to close at the proper time, the working pressure at the inner end of the cylinder must be reduced before the piston completes its outstroke, and for this purpose the cylinder is provided with a number of ports 44, leading to a vertical passage 45, formed in the outer wall of the cylinder-section 10, and from this passage lead a number of upper and lower escape-ports 46 and 47 to the outer air, it being desirable to employ a plurality of small ports in order to prevent as far as possible the entrance of dirt and dust when the hammer is not in use. After the piston has traveled outward for a distance sufficient to uncover the ports 44 the pressure in the inner portion of the cylinder is materially reduced, and as the upper end of the pin 22 is constantly exposed to the working pressure said pin is moved downward or inward and by bearing against the valve 19 moves the same to the position shown in Fig. 1.

It will be observed that the single valve controls the admission of fluid under pressure to

both ends of the cylinder and the escape of air from one end of said cylinder, the exhaust at the opposite end of the cylinder being controlled by the piston, so that the working pressure cannot be reduced to permit the closing movement of the valve until the piston has traveled for a predetermined distance.

The construction of valve and pressure pin, as herein described, permits the manufacture of the hammer with less labor and expense than those of the ordinary construction and owing to the small area exposed to friction will remain air-tight and serviceable for a much longer period than valves where the friction-surface is necessarily increased by the employment of a plurality of valve-ports.

In order to prevent the accumulation of air between the valve and the breech-block in the event of leakage, the chamber formed between the two members is placed in communication with the atmosphere through a port 48.

Having thus described my invention, what I claim is—

1. In a pneumatic tool, a pneumatically-operated valve movable in one direction by pressure within the cylinder on the instroke of the piston, and a movable member bearing against the valve and of less area than said valve, said movable member being exposed to the constant working pressure of the tool.

2. In a pneumatic tool, a valve exposed to variable pressure within the cylinder, and movable in one direction by the cylinder-pressure on the instroke of the piston and a movable member bearing against the valve and exposed to the constant working pressure of the tool.

3. In a pneumatic tool, a controlling-valve disposed at one end of the cylinder and movable in one direction by air compressed in the cylinder on the instroke of the piston, an air-chamber in communication with the pressure-supply, and a movable member bearing against the valve and extending into said chamber and there exposed to the constant working pressure of the tool to effect a movement of the valve in the opposite direction.

4. In a pneumatic tool, a cylinder, a piston therein, a valve disposed at one end of the cylinder and movable by the compression of air on the instroke of the piston, inlet and exhaust ports controlled by the valve for regulating the admission to and its escape from the lower end of the cylinder, a chamber in communication with the pressure-supply, a valve-operating member extending into said chamber, and air-passages leading from said chamber to the valve-chamber.

5. In a pneumatic tool, a cylinder provided at its upper end with a counterbored portion forming a valve-chamber, a recessed breech-block closing the upper end of the valve-chamber, air inlet and escape ports leading from the valve-chamber, a ported valve disposed in the chamber and forming one end of the cylinder, said valve being movable in one direction by air-pressure on the inward movement of the piston, and a pin for communicating movement to the valve in one direction and extending into the recessed portion of the breech-block.

6. The combination in a pneumatic tool, of a cylinder having a counterbored portion forming the valve-chamber, a cup-shaped valve therein, a breech-block extending partly within the valve-chamber, a handle secured to the cylinder and confining the breech-block in place, there being a central opening extending through said breech-block, a pin guided in said opening and serving to communicate movement to the valve in one direction, the inner end of said pin being exposed to constant pressure at the top of the breech-block, and air-ports leading through the breech-block and the cylinder to the valve-chamber.

7. In a pneumatic tool, a pneumatically-operated valve having a surface of small area exposed to constant transmitted pressure, and a surface of greater area exposed to variable pressure within the cylinder of the tool and the pressure on the larger surface serving on the instroke of the piston to move the valve in one direction.

8. In a pneumatic tool, a valve having a surface of small area exposed to constant transmitted pressure, a cylinder of which said valve forms a movable head or end, a piston adapted on its instroke to compress air at the end of the cylinder and to move the valve against the constant pressure, and piston-controlled exhaust-ports leading from the cylinder to permit the reduction of pressure in the cylinder and the movement of the valve under the constant pressure.

9. In a pneumatic tool, a cylinder having a counterbored portion forming a valve-chamber, a valve therein, a breech-block extending partly within the valve-chamber and closing the upper end of the same, and a pressure-relief port leading from the outer air to that portion of the chamber between the breech-block and the valve.

10. In a pneumatic tool, a ported cylinder having a counterbored portion forming a valve-chamber, a valve therein forming one end of the cylinder, inlet and exhaust ports extending between the outer end of the cylinder and the valve-chamber, a pressure-inlet port leading to said valve-chamber, valve-ports for governing the admission of air to and its exhaust from the outer end of the cylinder, a cylinder-port leading directly from the upper portion of the cylinder to the outer air, and a piston adapted on its inward movement to compress the air in the inner end of the cylinder and raise said valve for the admission of air under pressure to said cylinder.

11. In a pneumatic tool, a cup-shaped valve arranged at one end of the cylinder and having a transverse wall forming a movable head

for said cylinder, an air-chamber disposed outside of the cylinder, and a pin extending within the air-chamber and exposed to the constant working pressure of the tool, said pin bearing directly against the valve and serving to move said valve in one direction.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CHARLES HENRY SHAW.

Witnesses:
M. T. Goss,
JOHN STROMBERG.