No. 870,523. PATENTED NOV. 5, 1907.

O. W. THOMAS.

PNEUMATIC TOOL.

APPLICATION FILED MAY 15, 1905.

3 SHEETS—SHEET 1.

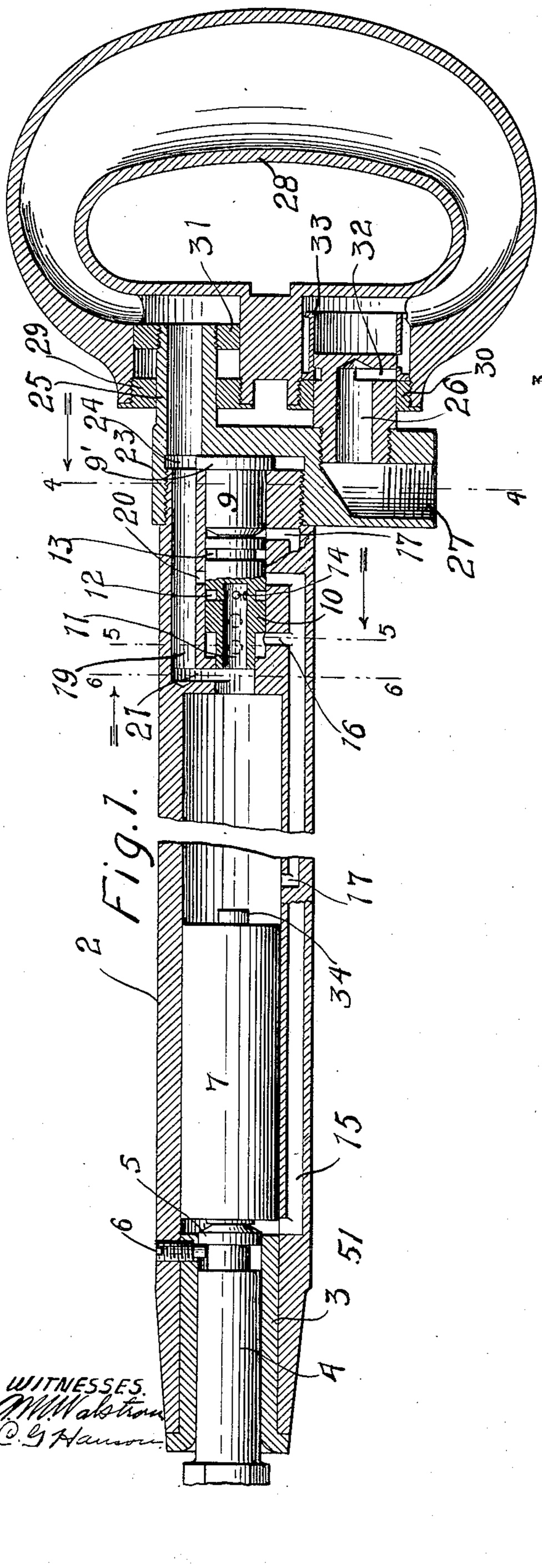

Fig. 1.

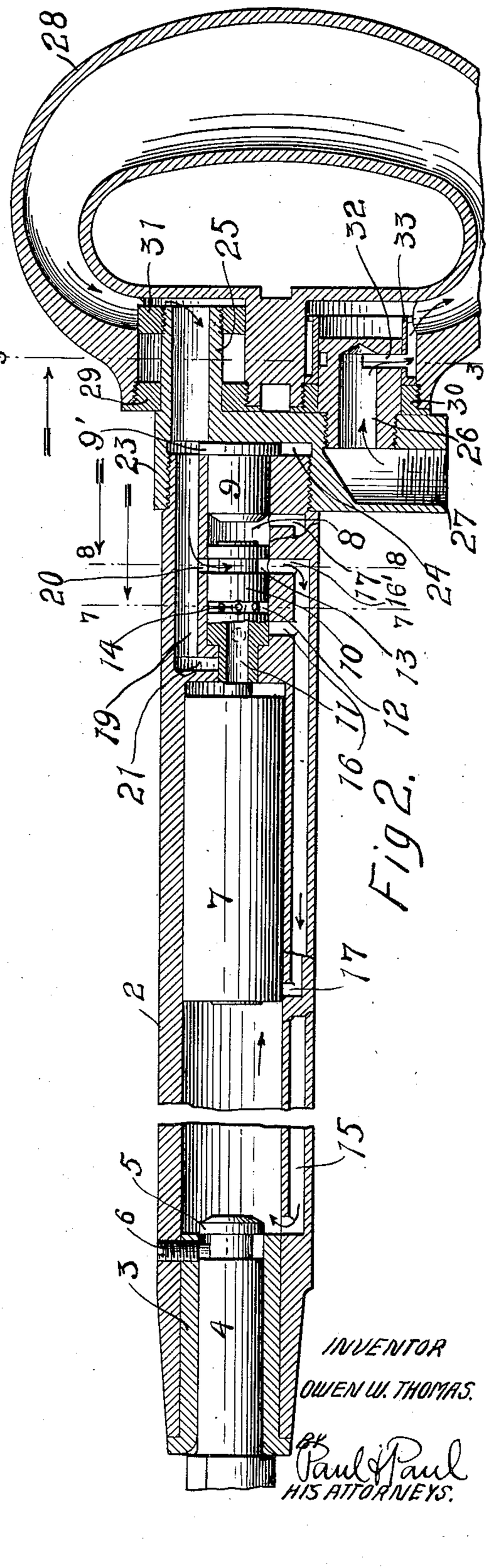

Fig 2.

WITNESSES.
A. W. Walstrom
C. G. Hanson

INVENTOR
OWEN W. THOMAS.
BY Paul & Paul
HIS ATTORNEYS.

No. 870,523. PATENTED NOV. 5, 1907.

O. W. THOMAS.

PNEUMATIC TOOL.

APPLICATION FILED MAY 15, 1905.

3 SHEETS—SHEET 2.

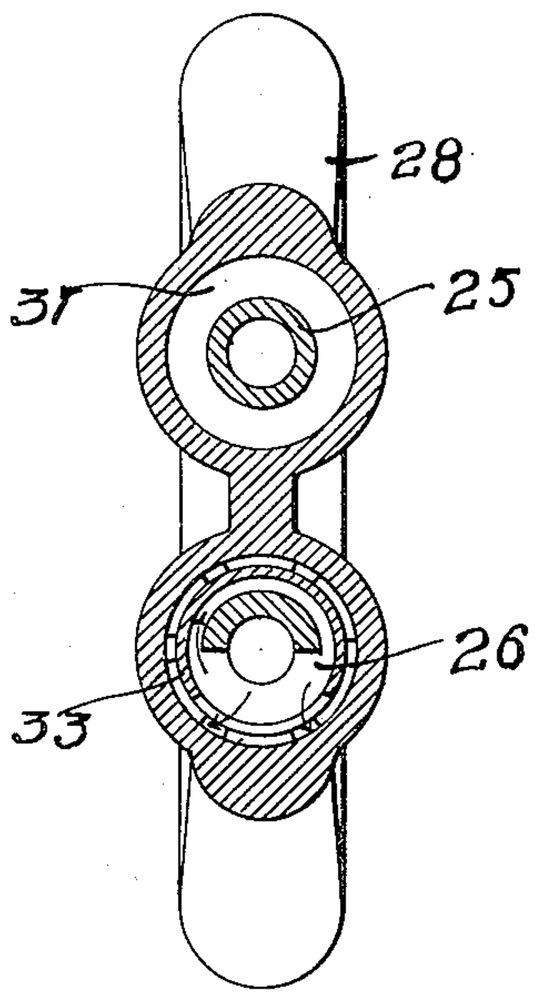

Fig 3

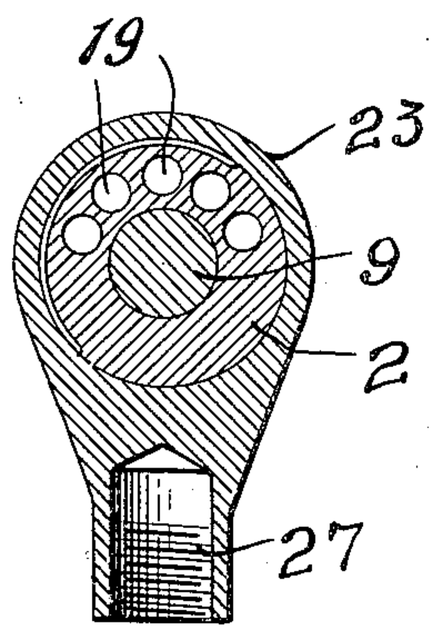

Fig 4.

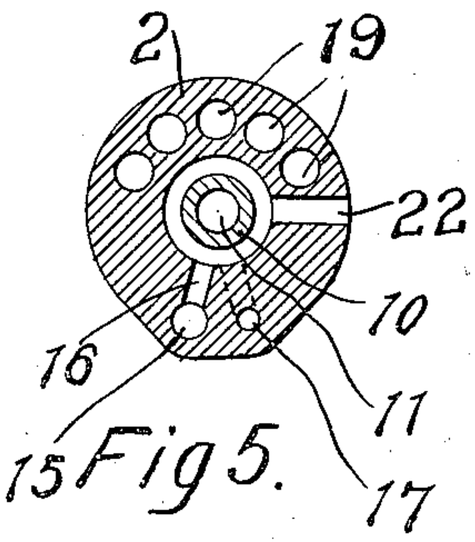

Fig 5.

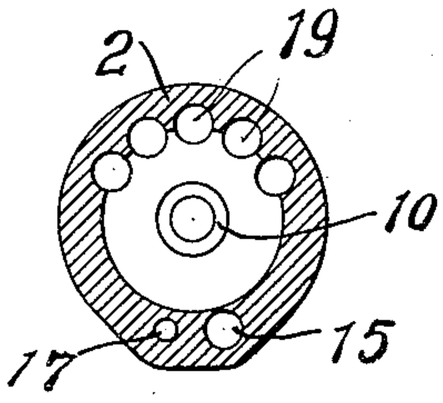

Fig 6.

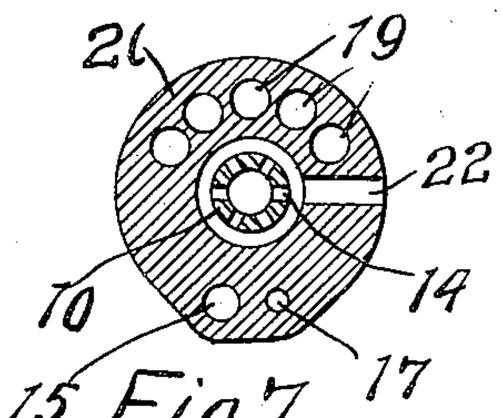

Fig 7.

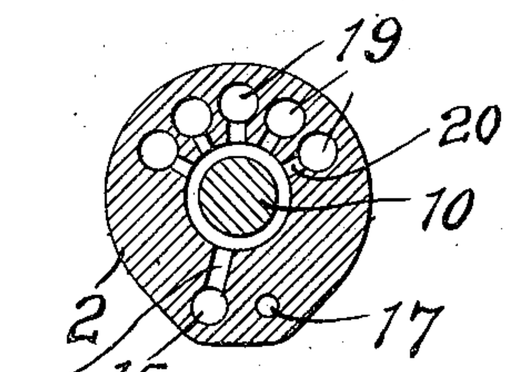

Fig 8.

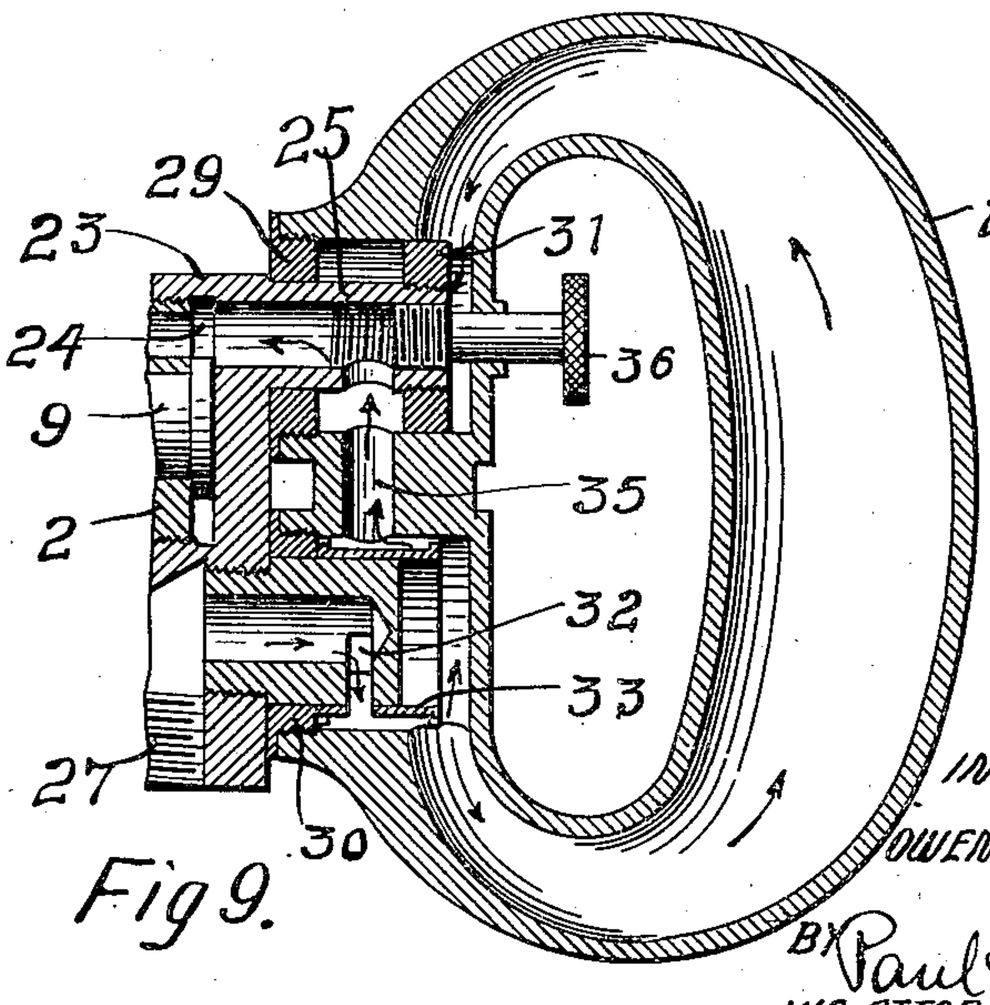

Fig 9.

WITNESSES
W. M. Wabton.
C. G. Hanson.

INVENTOR
OWEN W. THOMAS.
BY Paul & Paul
HIS ATTORNEYS

No. 870,523. PATENTED NOV. 5, 1907.

O. W. THOMAS.

PNEUMATIC TOOL.

APPLICATION FILED MAY 15, 1905.

3 SHEETS—SHEET 3.

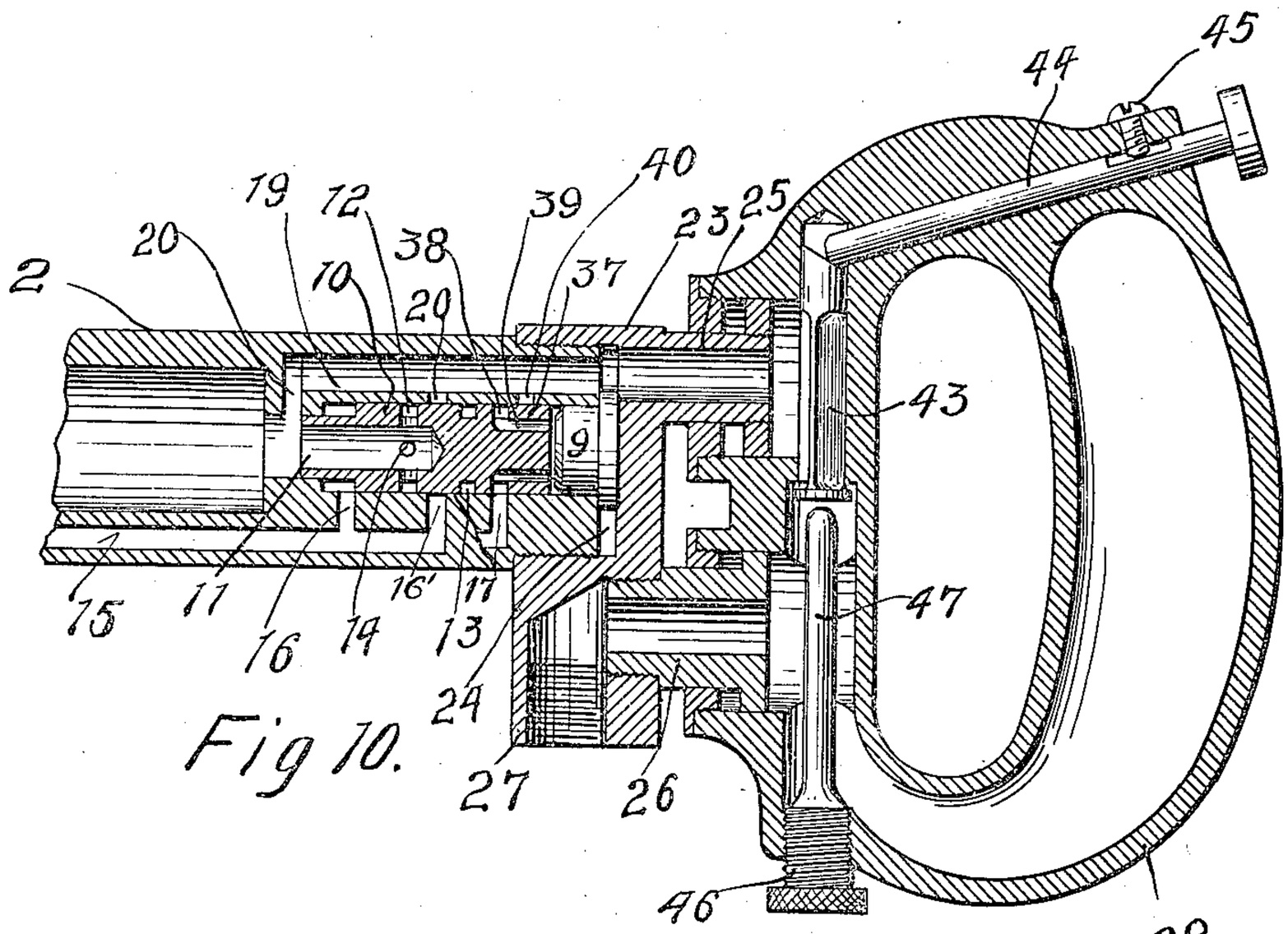

Fig 10.

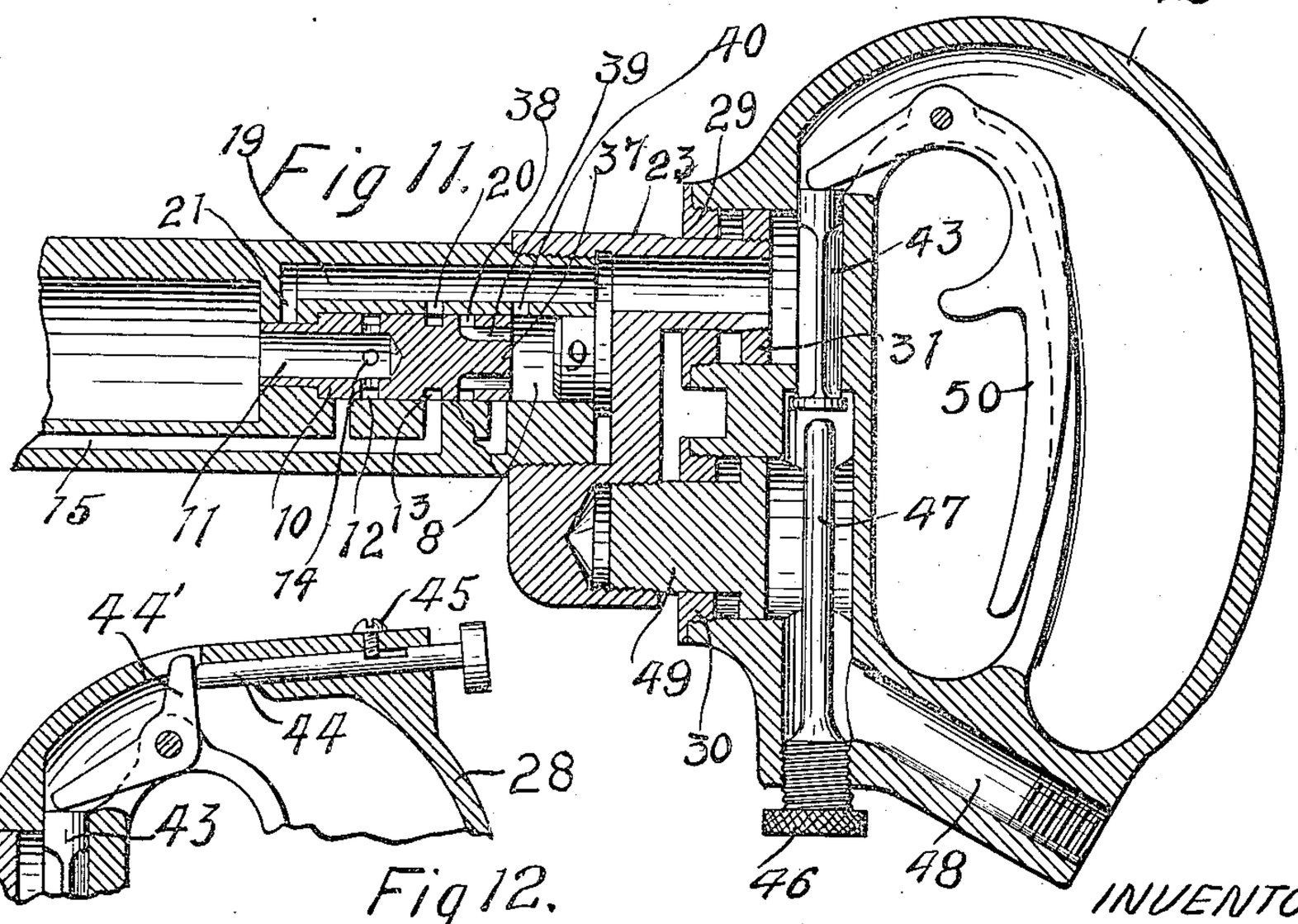

Fig 11.

Fig 12.

WITNESSES.

INVENTOR

OWEN W. THOMAS.

BY Paul & Paul

HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

OWEN W. THOMAS, OF ST. PAUL, MINNESOTA, ASSIGNOR TO ANNA HELWIG, OF ST. PAUL, MINNESOTA.

PNEUMATIC TOOL.

No. 870,523. Specification of Letters Patent. Patented Nov. 5, 1907.

Application filed May 15, 1905. Serial No. 260,577.

To all whom it may concern:

Be it known that I, OWEN W. THOMAS, of St. Paul, in the county of Ramsey, State of Minnesota, have invented certain new and useful Improvements in Pneumatic Tools, of which the following is a specification.

This invention relates to improvements in pneumatic tools and particularly to hammers that are designed for riveting and for operating chisels or other tools.

The objects I have in view are to provide a tool of this kind that is simple in construction, in which the throttle or controlling valve may be easily operated and quickly adjusted so as to permit of any desired amount of movement, and in which a pneumatic cushion will be provided between the handle and the main cylinder of the tool.

A further object of the invention is to provide an improved valve for controlling the supply of air to the reciprocating piston.

The invention consists generally in the constructions and combinations, hereinafter described and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification; Figure 1 is a longitudinal section of a tool embodying my invention. Fig. 2 is a similar view showing the parts in a different position. Fig. 3 is a section on line 3—3 of Fig. 2 looking in the direction of the arrow. Fig. 4 is a section on line 4—4 of Fig. 1 looking in the direction of the arrow. Fig. 5 is a section on line 5—5 of Fig. 1 looking in the direction of the arrow. Fig. 6 is a section on line 6—6 of Fig. 1 looking in the direction of the arrow. Fig. 7 is a section on line 7—7 of Fig. 2 looking in the direction of the arrow. Fig. 8 is a section on line 8—8 of Fig. 2 looking in the direction of the arrow. Fig. 9 is a section of a portion of the cylinder and handle showing means for regulating the throttle opening. Fig. 10 is a partial longitudinal section showing a modified construction of throttle valve and a modified construction of valve. Fig. 11 is a section similar to Fig. 10 showing the same construction of valve at the other limit of its movement and showing the throttle valve of Fig. 10 with a modified means for moving the same. Fig. 12 is a detail showing a modified means for operating the throttle valve.

In all of the drawings, 2 represents the main cylinder of the tool, which may be of any suitable size. This cylinder is open at one end and has arranged in its open end a sleeve 3 within which is arranged a shank 4 of a suitable tool or tool-holder. This shank is provided with a head 5 adapted to receive the impact or blow from the reciprocating piston and the shank is preferably held in position by means of a screw 6 passing through the wall of the cylinder 2 and through the sleeve 3 and engaging a groove in the shank 4. Within the cylinder 2 is a reciprocating piston or hammer 7 which may be of any suitable size and which is adapted to reciprocate within the cylinder and to deliver blows in rapid succession to the head 5 of the tool or tool-holder shank 4.

It will be understood that air under pressure is supplied to the cylinder and, through a suitable controlling valve, is conducted first to one end and then to the other of the piston, and that, by this means, the piston is rapidly reciprocated in the cylinder. It is preferable to conduct the air to the cylinder either through the handle or through a portion thereof, and I provide a cushioning device in the connection between the handle and the cylinder so as to do away with the jar upon the hand of the operator which otherwise would be experienced from the effect of the rapid blows delivered upon the head of the tool by the reciprocating hammer. It is also desirable to provide means arranged within the tool for throttling the air supplied to the cylinder.

At the handle end of the cylinder is a valve chamber 8, the end of which is closed by a plug 9 and within this chamber is arranged a reciprocating valve 10. This valve is provided with a central opening 11 and with two annular grooves 12 and 13. The central opening extends from the end of the valve chamber nearest the cylinder to a point beyond the groove 12 and it is provided with a series of ports 14 extending from the central opening into the groove 12. This valve is adapted to move from the position shown in Fig. 1 to that shown in Fig. 2. A duct 15 extends parallel with the cylinder and communicates therewith at its forward end. It also has two openings communicating with the two openings 16 and 16′ communicating with the valve chamber 8. A second duct 17 communicates with the rear end of the valve chamber and with the cylinder at a point near the middle thereof. A series of ducts 19 extend parallel with the valve chamber and communicate therewith through the ports 20 and also through the chamber 21 which extends around the valve chamber (see Fig. 6). An exhaust port 22 extends from the valve chamber through the outer wall of the cylinder (see Fig. 7). The end of the cylinder nearest the handle is preferably screw-threaded and a head 23 is internally screw-threaded and is screwed on to the threaded end of the cylinder. The plug 9 which fits into the end of the valve chamber is provided with a flange 9′ that fits against the end of the cylinder and the head 23 being screwed on until it comes in contact with this flange, an annular air chamber 24 is formed around said flange. This air chamber communicates with all of the ports 19. The head 23 is provided with the projecting inlet tube 25 preferably formed integrally therewith and also with the tube 26 screwed into said head, or other-

wise suitably secured thereto. The inlet opening 27 is provided in the head 23 and this opening communicates with the tube 26.

A handle 28 preferably hollow and adapted to form an air passage, is slidably secured to the tubes 25 and 26. This handle is provided with two cylindrical openings having therein the annular washers 29 and 30 which fit upon the tubes 25 and 26, forming an air-tight joint therewith. The tube 25 is also provided with the annular washer 31, while the end of the tube 26 is closed except for an opening 32 in the side wall thereof. A sleeve 33, also provided with an opening, is arranged outside of the tube 26 and when the handle is drawn out, the openings in the tube and in the sleeve do not register and the air is shut off from the cylinder. These parts form a throttle valve, by means of which the supply of air to the cylinder may be regulated. By pushing the handle inward to the position shown in Fig. 2, the throttle is opened, and the air then passes through the handle and enters the tube 25, then passes into the chamber 24 and from this chamber into the series of ports 19. The construction shown provides an air cushion between the cylinder and the handle and prevents any jar upon the hand of the operator when the device is in use.

When the parts are in the position shown in Fig. 1, the air passes through the ports 19 and enters the cylinder and forces the piston forward therein. As the piston approaches the end of its stroke, air from the cylinder passes into the duct 17 and from this duct enters the valve chamber in the rear of the valve, forcing said valve from the position shown in Fig. 1 to that shown in Fig. 2. The opening to the rear end of the cylinder is now closed by the valve and the air now passes through the opening 20 around the valve through the groove 13 and enters the duct 15, and, through this duct, enters the forward end of the cylinder, forcing the piston backward in the cylinder. As the piston moves backward in the cylinder, the air in advance of the piston escapes through the central opening in the valve to and through the exhaust. As the piston reaches the limit of its movement, a stem 34 on the end of the piston, the diameter of which is slightly greater than the opening in the center of the valve, closes the central opening in the valve and the air within the cylinder, from the movement of the piston, is compressed and throws the valve backward from the position shown in Fig. 2 to that shown in Fig. 1.

While the valve is in the position shown in Fig. 2 the rear end of the cylinder is in communication with the exhaust opening through the central opening in the valve and through the ducts communicating with the groove 12. When the valve is moved to the position shown in Fig. 1, the forward end of the cylinder is in communication with the exhaust opening through the port 16 (see Fig. 1). By this means as the handle is pushed forward the throttle valve is opened and the air, passing through the handle, is admitted first to one end of the cylinder and then to the other and the piston is rapidly reciprocated in the cylinder.

In some instances I prefer to provide a direct communication for the air from the throttle valve to the inlet tube 25. For this purpose I may use the construction shown in Fig. 9 of the drawings. In this instance while the handle is hollow, the air does not pass through it, but passes directly into the tube 25 through a suitable duct 35. The hollow handle in this instance serves as a dead air space and this air space serves as a cushion for the handle. I have also shown in this instance a regulating screw 36, by means of which the opening into the inlet tube 25 may be partially closed.

In Fig. 10 of the drawings I have shown the valve provided with a rear extension 37 and a groove 38 with a series of holes 39 extending from said groove through the rear extension of the valve. I have also shown the valve chamber somewhat longer to accommodate this extension of the valve and additional ports 40 extending from the ducts 19 into the valve chamber. With this construction, when the position of the valve is to be changed from that shown in Fig. 10 to that shown in Fig. 11, the air from the cylinder passing through the duct 17, enters the groove 38 and moves the valve forward. A slight movement of the valve closes the duct 17 and opens the port 40, permitting the air from the inlet openings to enter the valve chamber in the rear of the valve and complete its forward movement. This enables me to secure a direct pressure from the inlet opening upon the rear of the valve so as to secure a positive and complete movement of said valve.

In Fig. 10 of the drawings I have shown a sliding throttle valve 43 adapted to be moved by a pressure pin 44 held in position by a screw 45. By pressing the thumb upon the head of the pin 44, the valve is moved backward against the air pressure and the air passes around said valve and enters the inlet tube 25. A regulating screw 46, provided with a stem 47, is arranged in the handle in line with the valve 43 and by means of this screw, the movement of the valve 43 may be regulated.

In Fig. 11 I have shown an inlet opening 48 provided in the handle and in this instance the tube 26 is replaced by a cylindrical plug 49, which simply acts as a guide for the handle. I have, in this instance, also shown a lever 50 arranged within the handle for the purpose of moving the throttle valve 43.

In Fig. 12 the pin 44, instead of engaging the valve direct, engages one arm of a bell-crank-lever 44′, the other arm of said lever engaging the valve 43.

It will be seen that in all of these constructions the movement of the hammer is under the absolute control of the operator through the regulation provided by the throttle valve. The sliding valve is positively moved in both directions by the air pressure and directs the air into first one end and then the other of the cylinder. The parts of the tool are all easily made and require no fine adjustment and, by means of the construction described, a simple and reliable tool is provided.

I claim as my invention:

1. In a machine of the class described, the combination, with a main cylinder, a hammer piston arranged therein, and a valve chamber arranged in line with said cylinder and provided with an opening leading from said chamber into said cylinder, the duct 15 extending parallel and communicating with the cylinder at its forward end and with the valve chamber through the openings 16 and 16′, and the duct 17 communicating with the rear end of the valve chamber and with the cylinder at a point near the middle thereof, the ducts 19 arranged parallel with the valve chamber and communicating therewith, of a reciprocating controlling valve 10 arranged in said valve chamber and having a reduced end arranged to project through and

close the opening leading from the chamber into said cylinder and having also the central opening 11, the annular grooves 12 and 13, and the series of ports 14 leading from the central opening into the groove 12.

2. In a machine of the class described, the combination, with the main cylinder provided with a valve-chamber and a piston-controlling valve, of a head secured upon said cylinder and provided with projections, one of which has an inlet opening extending through it and communicating with said valve chamber, a handle slidably secured upon said projections, and an air duct in said handle communicating with the inlet opening in said projection, substantially as described.

3. In a machine of the class described, the combination, with a main cylinder, of a head screw-threaded and provided with suitable projections, a handle slidably secured upon said projections, said handle being provided with an air inlet opening and one of said projections being provided with an opening communicating with the interior of said cylinder, and a valve arranged in said handle and controlling the passage of air to said cylinder.

4. In a machine of the class described, the combination, with a main cylinder provided with an air inlet tube projecting therefrom, of a handle slidably arranged upon said tube and provided with an air inlet and with an air passage communicating with said tube, a valve arranged in said handle and controlling the passage of air to said tube and the adjusting device for regulating the movement of said valve.

5. In a machine of the class described, the combination, with a main cylinder, provided with a reciprocating piston and a controlling valve, of an inlet tube projecting therefrom, a handle slidably arranged upon said tube, an air passage arranged in said handle and communicating with said tube, a valve arranged in the air passage in said handle, means for operating said valve and an adjusting device for limiting the movement of said valve.

In witness whereof, I have hereunto set my hand this 29th day of April 1905.

OWEN W. THOMAS.

Witnesses:
C. G. HANSON,
A. C. PAUL.