No. 803,621. PATENTED NOV. 7, 1905.

A. J. PATCH.

PNEUMATIC HAMMER.

APPLICATION FILED DEC. 28, 1903.

2 SHEETS—SHEET 1.

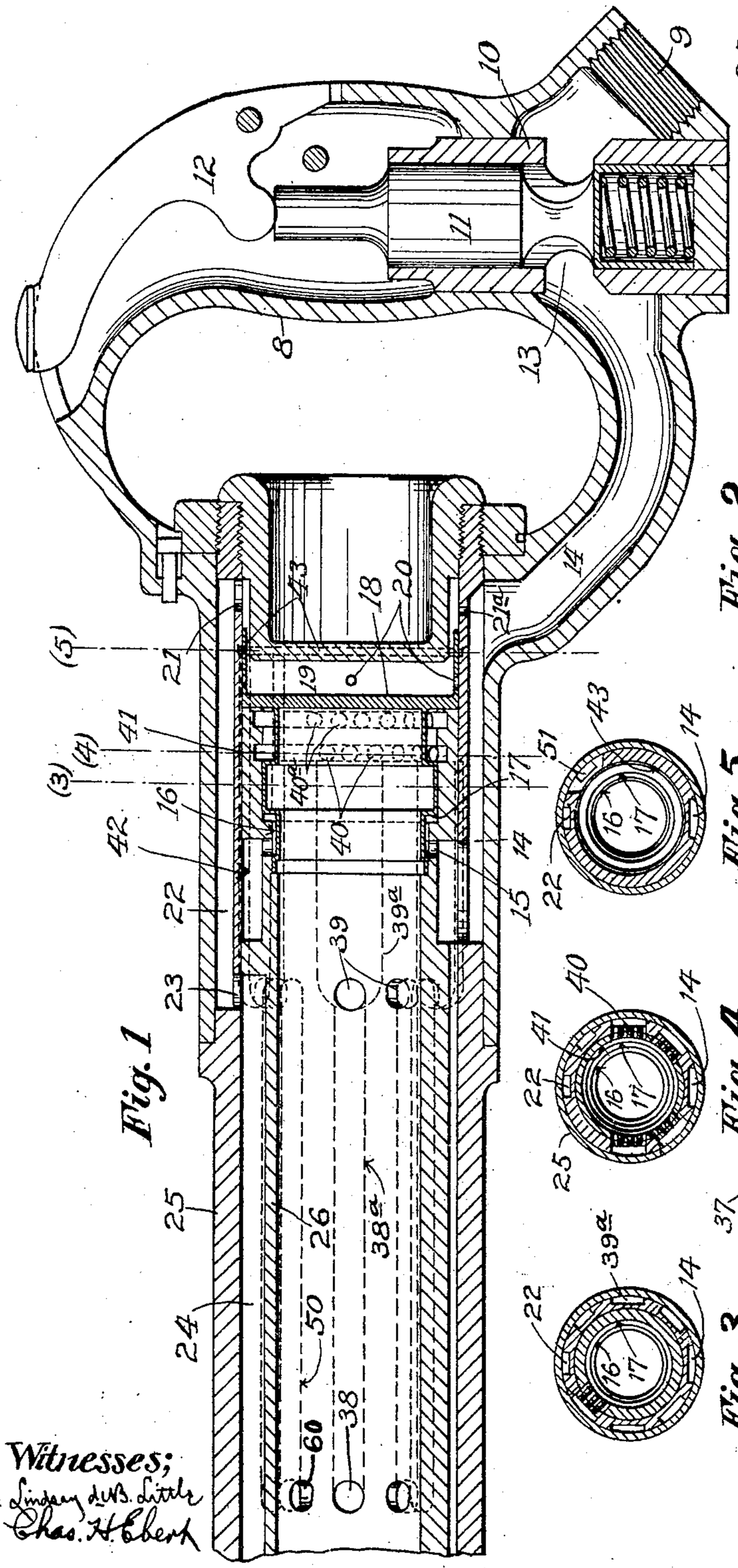

Fig. 1

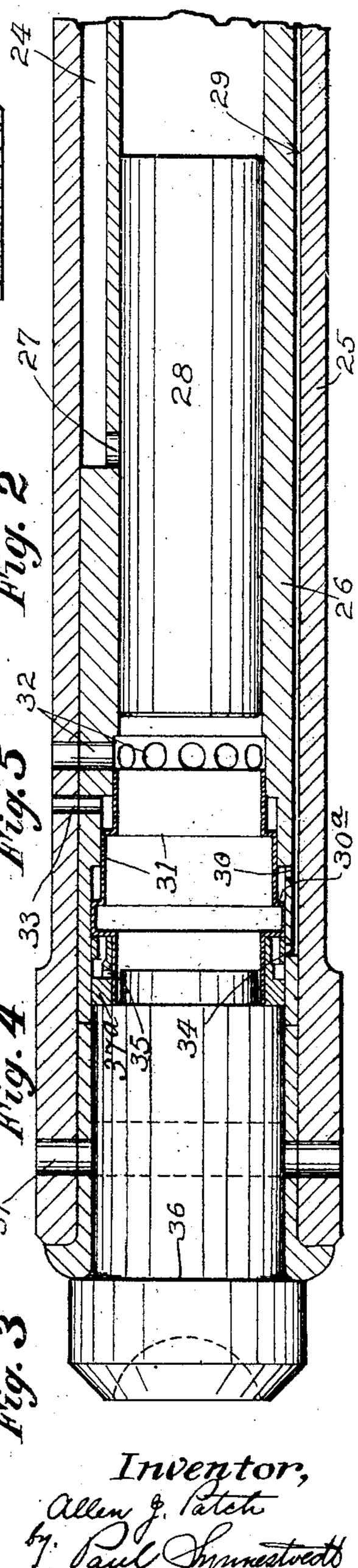

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Witnesses;
Lindsey & W. B. Little
Chas. H. Ebert

Inventor,
Allen J. Patch
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2 SHEETS—SHEET 2.

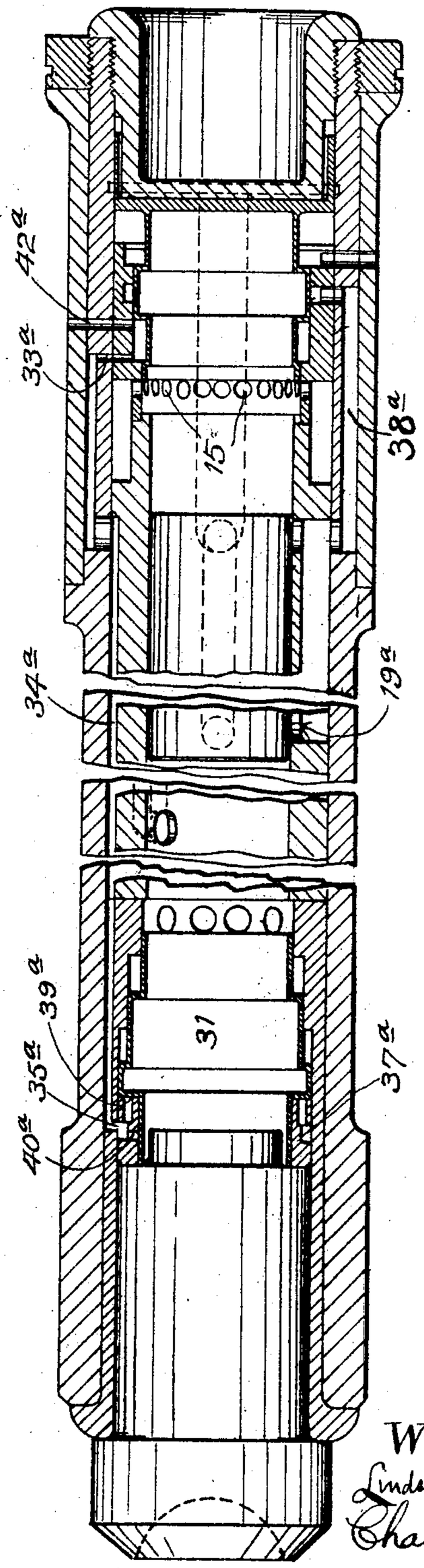

Fig. 6

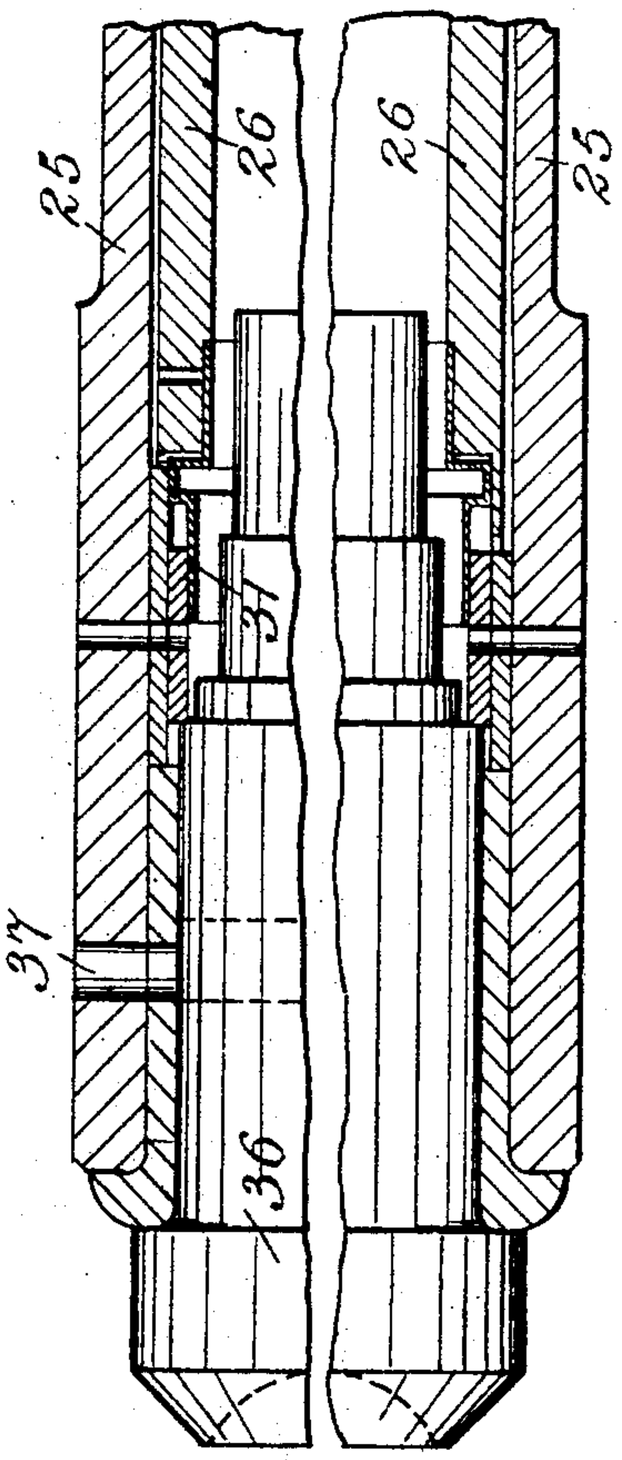

Fig. 7

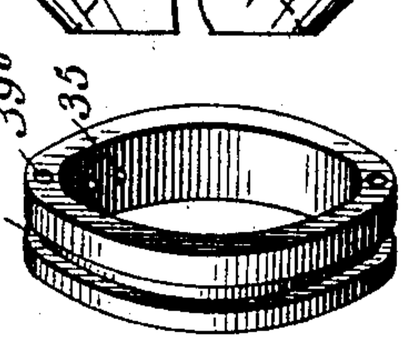

Fig. 8.

Witnesses;
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UNITED STATES PATENT OFFICE.

ALLEN J. PATCH, OF BELOIT, WISCONSIN, ASSIGNOR TO FAIRBANKS, MORSE & CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

PNEUMATIC HAMMER.

No. 803,621. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed December 28, 1903. Serial No. 186,843.

To all whom it may concern:

Be it known that I, ALLEN J. PATCH, a citizen of the United States, residing at Beloit, in the county of Rock and State of Wisconsin, have invented certain new and useful Improvements in Pneumatic Hammers, of which the following is a specification.

This invention has reference to fluid pressure impact tools, and particularly to those tools in this class which employ a double or two-part valve mechanism.

The first of the objects of my present invention is to provide an impact tool of the character described in which there is utilized, at the rear end of the cylinder, a main controlling valve and at the forward end a supplemental or auxiliary valve, co-operating with the main valve and fluid actuated by force controlled, in part at least, by the main valve.

In constructions of this character, heretofore employed, it has been common to use a two-part valve, in which one part of the valve was located at the forward end of the cylinder and the other part at the rear, and provide connecting bars or rods, by which the movement of one portion of the valve was imparted to the other portion mechanically. In the practice of my present invention, I aim to perform all of the valve functions by fluid pressure control, obviating the necessity for any rod connections between the valve parts.

A further object of my invention is, the provision of a fluid pressure impact tool, particularly applicable to long stroke hammers, employing two separate valve structures, one in the rear and one in the forward end of the cylinder, and inter-communicating passages whereby the movements of said valve structures are controlled.

In order that my invention may be better understood I have illustrated the same in preferred form in the accompanying drawings in which—

Figure 1 is a sectional view showing a rear portion of the cylinder, with the valve employed in conjunction therewith, and the handle construction;

Figure 2 is a sectional view of the forward portion of the cylinder with the valve located therein;

Figure 3 is a cross section on the line (3) of Figure 1;

Figure 4 is a sectional view on the line (4) of Figure 1;

Figure 5 is a sectional view on the line (5) of Figure 1;

Figure 6 is a sectional view with certain of the parts broken out, so as to shorten the length of the drawing, showing a slight modification of my improvement with the valve parts in different positions; and

Figure 7 is another sectional view of an improved arrangement of forward valve and rivet set.

Figure 8 is a view in perspective showing a detail of the means employed to prevent the hammer hitting the tool when the latter is removed from the work.

By examination of the drawing it will be seen that the location of the main distributing valve is near the rear end of the piston chamber, and that the said valve is provided with three different pressure areas, to all of which motive fluid is intermittently admitted through certain ports controlled by the piston, while the auxiliary valve is located near the forward end of the piston chamber and controls the exhaust ports at the forward end of said chamber. The auxiliary valve is provided with two different pressure areas, and to the larger of these the motive fluid is intermittently admitted through passages controlled in turn by the main distributing valve. This valve is so arranged that it will automatically close the exhaust ports at the forward end of the piston chamber when the tool is removed from the work, thereby forming an air cushion which will prevent the piston striking the tool.

The operation of the hammer is as follows:

Motive fluid is admitted at the opening 9 by way of the throttle valve 11, and passages 13 and 14, to the annular passage 42.

Starting with the piston 28, and valves 18 and 31, in the position shown in Figure 6, motive fluid enters the piston chamber at the rear end of the piston, through the radial holes 15, driving the piston forward and holding the valve 18 in its rearward position until the rear end of the piston has passed the port 60 through which motive fluid is admitted by way of the passage 50, port 51, and the radial valve ports 20 to the large area of the valve at 19, and after filling the passage

22, through the port 21, the port 27 being closed by the piston during the remainder of the forward stroke, acts to move the main valve toward its forward position until the port 21[a] is uncovered by the valve, and the annular passage 43 closed, when motive fluid admitted through the port 21[a] acts to complete the forward movement of the valve, thereby opening communication between the rear end of the piston chamber and the atmosphere, by way of the ports 38 and 39, port 40 and radial holes 40[a], and releasing the pressure behind the piston, before it strikes the tool 36, thereby preventing the recoil which would result if fluid pressure existed in the piston chamber after the piston stopped.

With the main valve in its forward position, the auxiliary valve 31 remains in its forward position, leaving the forward end of the piston chamber open to the atmosphere through the radial exhaust ports 32, being held in that position by motive fluid applied to its smaller pressure area 30[a], of Figure 2, by way of the passage 29 and ports 30, until the piston has reached the end of its forward stroke, when motive fluid admitted by way of the valve 18, the port 33[a], as shown in Figure 6, passage 34[a], and ports 35[a], reaches the larger area 39[a] of the valve 31 (Figure 6), and acts to move it to its rearward position, thereby closing the exhaust ports 32 and opening the port 40[a], through which motive fluid is admitted to the forward end of the piston chamber, where it acts to move the piston toward the rear.

During the backward stroke of the piston the main valve is held in its forward position by motive fluid admitted to its larger area by the port 21[a].

When the forward end of the piston, in its rearward stroke, passes the ports 19[a], as shown in Figure 6, the pressure in the forward end of the piston chamber will drop to that of the atmosphere through the passage 38[a] and the main exhaust ports of the rear end, thereby lowering the pressure on the large area of the valve, by way of the port 21, so that the motive fluid acting upon the small area of the valve will move the same toward its rearward position until the ports 15 are opened to the rear end of the piston chamber, admitting motive fluid to the rear end of the piston and to the forward internal area of the valve 18, where it acts to complete the rearward movement of the valve, thereby closing the exhaust ports 40, and opening communication between the larger area of the valve 31 and the atmosphere, by way of the ports 42[a] and relieving the pressure therefrom, and permitting the motive fluid, acting constantly upon the smaller area of the valve 31, to move the same to its forward position, reopening the exhaust ports 32, and closing the port 40[a], and allowing the repetition of the operation described.

When the tool 36 is removed from the work, motive fluid acting upon the smaller area of the valve, forces the same, and the tool, forward until arrested by the tool retaining pin 37 passing through the tool, when the ring 37[a] will have closed the port 35[a] Figure 6 and opened the port 34, Figure 2, thereby allowing motive fluid admitted by way of the passage 29 to act upon the larger area of the valve, and move it to its rearward position, closing the exhaust ports 32 and forming an air cushion which will prevent the piston from striking the tool.

The detail construction of the ring 37[a] is indicated in Figure 8, from which it appears that it is provided with a peripheral channel 35[b] adapted to register with the port 35[a] when the parts are in the position shown in Figure 6, but to cut off such port when by removal of the tool from the work the ring moves forward. In the perspective one of the ports through which air is admitted from the channel 35[b] to act upon the larger area of the valve is indicated at 39[b], but it is to be understood there are a plurality of such ports around the ring.

Having thus described my invention and illustrated its use, what I claim as new, and desire to secure by Letters Patent, is the following:

1. A pneumatic hammer comprising in combination a cylinder, a piston, a main valve located at the rear of said cylinder and controlling certain ports and passages for admission of fluid pressure to said piston and exhaust of pressure therefrom, and a supplementary valve at the forward end of said cylinder controlling the exhaust from such forward end and in itself controlled by fluid pressure admitted to and exhausted by means of the main valve.

2. A double valve pneumatic hammer comprising in combination a cylinder, a piston, a main valve, and a supplementary valve, said supplementary valve being independently fluid pressure actuated, in both directions substantially as described.

3. A pneumatic hammer comprising in combination a piston, a cylinder within which said piston operates, and a main distributing valve located at the rear end of the piston chamber, said valve being provided with three pressure areas acted on by admission or exhaust of motive fluid intermittently governed through ports controlled by said piston to operate the valve, substantially as described.

4. A pneumatic hammer comprising in combination a piston, a cylinder within which said piston operates, and a main distributing valve located at the rear end of the piston chamber, said valve being provided with three pressure areas to which motive fluid is intermittently admitted through ports controlled by said piston, and an auxiliary valve located near the forward end of the piston chamber and

controlling the exhaust ports in advance of the piston, substantially as described.

5. A fluid pressure impact tool comprising in combination a cylinder, a piston, a valve located near the forward end of said cylinder, and means co-operating with said valve, whereby when the tool is removed from the work the air pressure will act to force the valve to the rear and cause the piston to cushion and thus prevent the piston from striking the tool, substantially as described.

In testimony whereof I have hereunder signed my name in the presence of the two subscribed witnesses.

ALLEN J. PATCH.

Witnesses:
GEO. B. INGERSOLL,
J. T. CALLOHON.