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C. R. GREEN.

FLUID PRESSURE POWER HAMMER.

APPLICATION FILED NOV. 22, 1906.

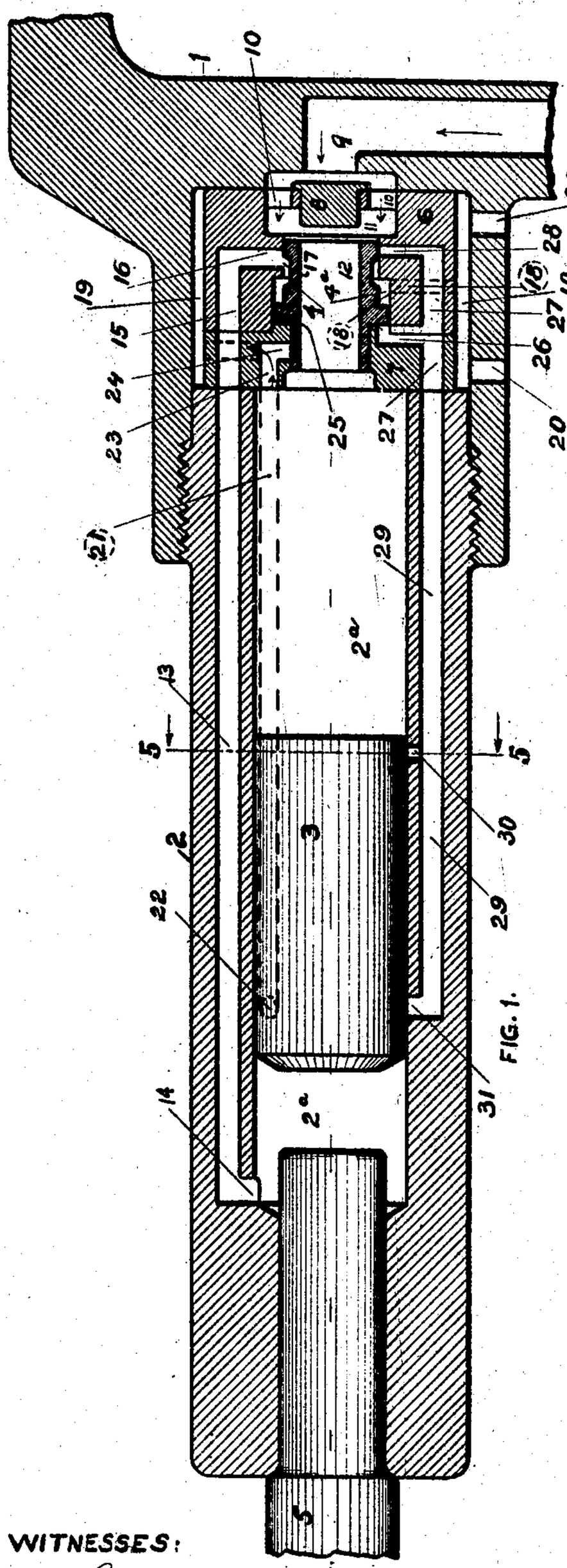

FIG. 1.

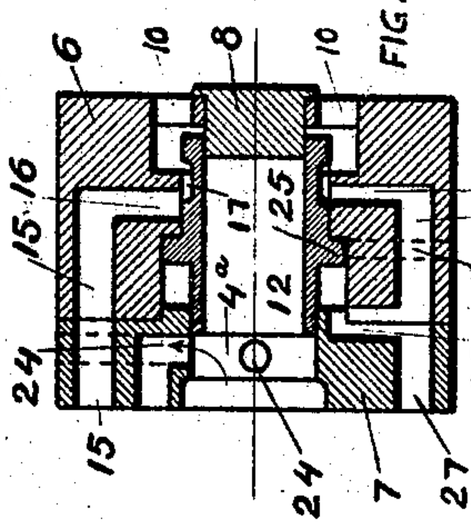

FIG. 2.

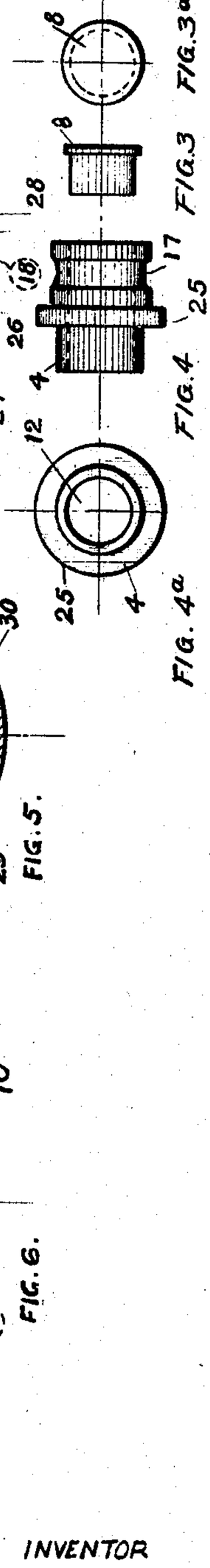

FIG. 3 FIG. 3a FIG. 4 FIG. 4a

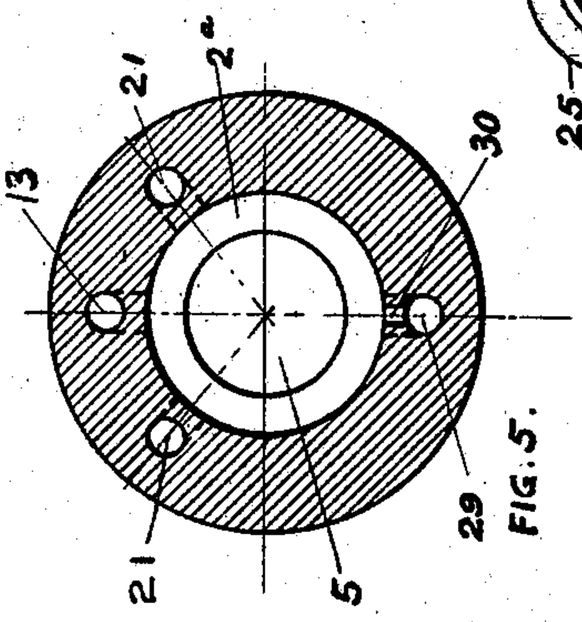

FIG. 5.

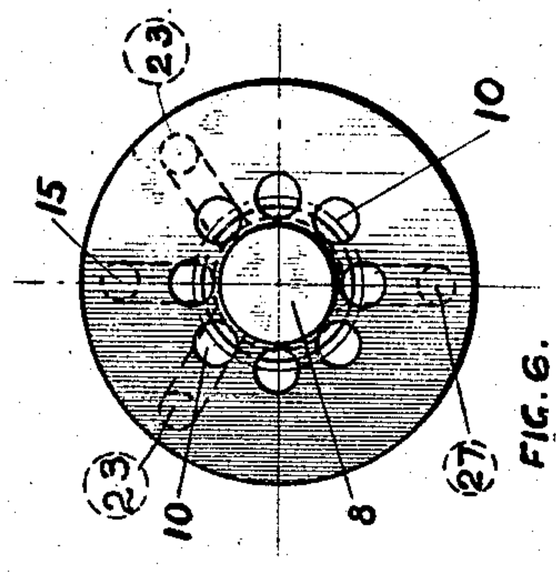

FIG. 6.

WITNESSES:

J. Stastny

Nathan F. Fretter.

INVENTOR

Carl R. Green

BY Bakewell, Fouse & Hull

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CARL R. GREEN, OF DAYTON, OHIO, ASSIGNOR TO THE COLUMBUS PNEUMATIC TOOL COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF OHIO.

FLUID-PRESSURE POWER-HAMMER.

No. 867,033. Specification of Letters Patent. Patented Sept. 24, 1907.

Application filed November 22, 1906. Serial No. 344,549.

To all whom it may concern:

Be it known that I, CARL R. GREEN, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented a certain new and useful Improvement in Fluid-Pressure Power-Hammers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to pneumatic power hammers, and particularly to devices of that character in which the pistons are driven in both directions by live-air pressure.

The commercial development of this art has reached the stage at which even slight changes in the details of construction, if they result in increased economy in manufacture, become important improvements.

My present invention has for its objects the increase in economy in manufacture, as well as the increase of efficiency in operation.

In the accompanying drawings forming a part of this application, Figure 1 is a longitudinal sectional view taken through my improved power hammer, the piston and a portion of the tool being shown in elevation. Fig. 2 is a sectional view of the valve-block taken on the same plane as in Fig. 1, but showing the valve in another position. Figs. 3 and 3ª show a side and an end elevation respectively of the valve plug. Figs. 4 and 4ª show a side and an end elevation respectively of the valve. Fig. 5 is a transverse section through the hammer taken substantially on the line 5—5 of Fig. 1, and Fig. 6 is a view of the rear end of the valve-block.

Taking up the detailed description by reference to the drawings, 1 represents the handle, and 2 the barrel of the hammer, said handle and barrel being screwed or otherwise securely fastened together. Within the bore 2ª of the barrel, the piston 3 is adapted to reciprocate, the direction of motion of the piston being controlled by the position of the valve 4, which is mounted to reciprocate horizontally in a bore or chamber 4ª.

5 represents the tool, which may be provided with a riveting head or a chisel for chipping, as may be desired. When a riveting head is employed the barrel will be comparatively long so as to secure a heavy stroke; but when the tool is used for chipping, a shorter barrel and a lighter stroke will suffice.

Centrally formed within the front portion of the handle 1 at the rear of the barrel 2, is a chamber for the valve blocks 6 and 7, said valve blocks constituting in effect but one member, the same being formed in the two pieces 6 and 7 for convenience in manufacture. The blocks 6 and 7 are of the same diameter, and are mounted coaxially, so that the various ports of the block will be in proper alinement. In a bore at the center of the rear end of the valve block 6, I secure a valve plug 8, said plug being opposite the passage 9 for live air, which passage is formed within the handle 1. Surrounding the plug 8 are a series of ports 10, said ports connecting the passage 9 with an air chamber 11 within the valve block 6.

It is desirable, in devices of this character, that the live air be supplied to the rear of the piston as rapidly as practicable. For conducting the air from the chamber 11 to the bore of the barrel, I provide the valve 4 with a large central port 12, said port being directly in front of the plug 8. As the port is of substantially the same diameter as the projecting end of said plug, when the valve is in its rear position, said plug will enter the port 12 and completely close the same, as shown in Fig. 2. When the valve is in its forward position, as shown in Fig. 1, the live air can pass directly and without abrupt turns, through the ports 10 and 12 into the rear of the cylinder. By providing a plurality of ports 10, and by making the port 12 of large diameter, such a large inlet is provided for the air as will cause the piston to be driven forward with great momentum.

Extending longitudinally into the barrel from its rear end, and preferably above the bore 2ª, is a port 13, said port terminating at the front end of the said bore and communicating therewith at its extreme forward end, as is shown at 14. Within the valve-blocks, and in alinement with the port 13, is a port 15, the latter port terminating at its rear end in an inwardly extending passage 16, said passage communicating at its inner end with the bore 4ª for the valve.

Near its rear end the valve 4 is provided with a circumferential groove 17, said groove being so positioned with respect to the passage 16 as to be in communication therewith, regardless of the position of the valve. Communicating with the bore of the valve is a port 18, said port being shown in dotted lines in Figs. 1 and 2. This port extends outwardly and communicates at its outer end with an annular space 19 that surrounds the valve block within the handle. This annular space is connected with the outside air through outwardly extending passages 20. When the valve is in the position shown in Fig. 1, the cylinder bore 2ª, in front of the piston, is open to the outside air, through the ports and passages thus described, so that the air may be freely exhausted from in front of the piston. As a further means of exhaust, I provide a port 21 in the barrel, said port communicating with the bore 2ª of the cylinder at a point 22, some distance at the rear of the forward end of the said bore. At its rear end the port 21 registers with a port 23 in the piece 7 of the valve block, said port 23 communicating at its rear end with a radial port 24 that extends from the annular passage 19 to the bore 4ª of the piston. If preferred, a plurality of ports 21 and 23 may be employed, and in Figs. 5 and 6 I have shown two of these ports.

When the valve 4 is in the position shown in Fig. 1, the port 24 is closed at its inner end, but the outer end thereof is always in communication with the annular passage 19. When the valve is shifted to the position shown in Fig. 2, the inner end of the port 24 is opened, so that the port 21 is in free communication with the bore of the valve, and, through it, with the rear end of the bore for the piston 3. In said figure, I have indicated a second port 24, as I prefer to provide a number of such ports so as to permit the air to be exhausted very freely, both from the barrel and from the large port 12 in the valve.

It is, of course, necessary to shift the valve automatically; and, for this purpose, I provide the valve with a circumferential bead or shoulder 25, that is almost midway the length of the valve and in front of the groove 17. This shoulder presents a forward surface against which the live air may act, as hereinafter described; and, as this surface is of greater area than the extreme rear surface of the valve, the latter will be shifted rearwardly when said shoulder is exposed to the action of the air.

In front of the shoulder 25, and below the valve, I provide in the valve blocks 6 and 7 an outwardly extending port 26, said port communicating with a horizontal port 27 in said valve blocks. At its rear end, this port 27 is provided with an inwardly extending port 28, said latter port communicating with the bore 4^a for the valve, and being of small size as compared with the ports 26 and 27. Within the barrel 2, and in alinement with the port 27, I provide a port 29, said port communicating with the bore 2^a for the piston through the radial ports 30 and 31. The port 30 is located at the rear of the tool holder a distance somewhat greater than the length of the piston, so that the said port is uncovered by the piston a short time before the latter strikes the tool. The port 31 is located some distance in front of the port 30, as appears in Fig. 1.

The operation of the hammer is as follows: When the parts are in the position shown in Fig. 1, live air is entering the bore 2^a at the rear of the piston through the ports 9, 10, and 12, and the piston is traveling toward the tool, the valve being held in the position shown by the pressure of the live air on its rearward end. The air in front of the piston is exhausted through the ports 14, 13, 15 and 16, the annular groove 17 in the valve, the bore 4^a for the valve, the port 18, the annular passage 19 and the ports 20 to the open air. Furthermore, prior to the time when the piston covered the port 22, the air in front of the piston could escape through the ports 22, 21 and 24 to the said annular chamber 19, and thence to the open air, as before described. As soon as the piston 3 has uncovered the port 30, the live air at the rear of the piston passes through ports 30, 29, 27 and 26 to the front of the annular shoulder 25 on the valve; and, as the area on the front surface of said shoulder is larger than the area of the extreme rear end of the valve, the unit pressure on these areas being substantially the same, the valve will be shifted to its rearward position, as is shown in Fig. 2, in which position the large port 12 through the valve is closed by the plug 8. When the valve is thus shifted, the air at the rear of the piston can exhaust very freely through the bore 4^a for the valve and through the ports 24 to the annular space 19, and thence to the open air through the ports 20. At the same time, the live air passes through the annular groove 17 in the valve, and thence through the ports 16, 15, 13 and 14 to the front end of the piston for driving the latter rearwardly. The live air also passes through said annular groove 17 into the constricted port 28, and thence into the ports 27 and 26, so that the front surface of the shoulder 25 in the valve is still exposed to live air pressure, which holds the valve temporarily in its rearward position. As the piston moves rearwardly, it uncovers the port 31, so that the live air can pass from the port 27 through the ports 29 and 31 to the front of the piston, from whence it is exhausted through the ports 22, 21, 23, 24, the space 19, and the ports 20, hereinbefore described. As the exhaust ports are of greater area than the constricted port 28, the air will be exhausted more rapidly than it can be supplied through the said constricted port, with the result that the pressure in front of the shoulder 25 will drop sufficiently to be overcome by the live air pressure on the rear end of the piston, so that the latter will be again shifted to its forward position.

From the above description, it will be seen that I have provided a pneumatic power hammer in which the inlet for the motive fluid for driving the hammer forwardly is of large area and is practically free from abrupt turns, so that the hammer is driven forward with great momentum. I have also provided for the very free exhaust of air from both ends of the cylinder, so that the operation of the hammer is very rapid.

Having thus described my invention, I claim:

1. In a fluid pressure power hammer, a barrel, a hammer piston mounted to reciprocate in a bore in said barrel, a valve for controlling the motive fluid for operating said piston, said valve being provided with a longitudinal port through the center thereof, a plug for closing said port when the valve is in one position, said means leaving the port open when the valve is in its opposite position, an annular groove surrounding said valve, and means for conducting live fluid from said groove to the front of the piston, whereby, when the port in the valve is closed by the said plug, the fluid will be transmitted through said groove to the front of the piston.

2. In a fluid pressure power hammer, a barrel, a hammer piston mounted to reciprocate in a bore in said barrel, a valve for controlling the motive fluid for operating said piston, said valve being provided with a longitudinal port through the center thereof, a stationary plug that is adapted to enter said port when the valve is in one position, said plug being free from the port when the valve is in its opposite position, an annular groove surrounding said valve, and means for conducting live fluid from said groove to the front of the piston, whereby when the port in the valve is closed by the said plug, the fluid will be transmitted through said groove and said conducting means to the front of the piston.

3. In a fluid pressure power hammer, a barrel, a hammer piston mounted to reciprocate in said barrel, a valve for controlling the live fluid for driving the said piston, said valve being provided with a central longitudinal port, said port conducting live air directly to the rear of the piston, means for permitting the live air to act upon the rear end of the valve for holding the same in its forward position, a shoulder surrounding said valve, the front face of said shoulder being of greater area than the rear end of the valve, a passage for live fluid connecting the bore in the barrel with the said front face of said shoulder, whereby, when said passage is opened, by th forward movement of the piston, the live fluid will pass through the center of the valve, and through said passage where it acts against the said face of the shoulder to shift the valve, and a stationary plug for closing the port in the valve when it is thus shifte[d]

4. In a fluid pressure power hammer, a barrel, a hammer piston mounted to reciprocate in said barrel, a valve for controlling the live fluid for driving the said piston, said valve being provided with a central longitudinal port, said port conducting live air directly to the rear of the piston, means for permitting the live air to act upon the rear end of the valve for holding the same in its forward position, a shoulder surrounding said valve, the front face of said shoulder being of greater area than the rear end of the valve, a passage for live fluid connecting the bore in the barrel with the said front face of said shoulder, whereby, when said passage is opened, by the forward movement of the piston, the live fluid will pass through the center of the valve, and through said passage where it acts against the said face of the shoulder to shift the valve, a stationary plug for closing the port in the valve when it is thus shifted, and means for simultaneously admitting live air to the front of the piston for driving the latter rearwardly, and to the front of the shoulder of the valve, for holding the valve in rearward position.

5. In a fluid pressure power hammer, a barrel, a hammer piston mounted to reciprocate in said barrel, a valve for controlling the live fluid for driving the said piston, said valve being provided with a central longitudinal port, said port conducting live air directly to the rear of the piston, means for permitting the live air to act upon the rear end of the valve for holding the same in its forward position, a groove and a shoulder surrounding the said valve, the front face of the shoulder being of greater area than the rear end of the valve, a passage for live fluid connecting the bore in the barrel with the said front face of said shoulder whereby, when said passage is opened by the forward movement of the piston, the live fluid will pass through the center of the valve and through said passage where it acts against the said face of the shoulder to shift the valve rearwardly, a stationary plug for closing the port in the valve when it is thus shifted, means connecting said groove with the bore of the barrel in front of the piston for driving the latter rearwardly, and ports connecting the said groove with the front of the shoulder on the valve whereby live air is admitted to said shoulder from said groove for holding the valve in its rearward position.

6. In a fluid pressure power hammer, a barrel, a hammer piston mounted to reciprocate in said barrel, a valve for controlling the live fluid for driving the said piston, said valve being provided with a central longitudinal port, said port conducting live air directly to the rear of the piston, means for permitting the live air to act upon the rear end of the valve for holding the same in its forward position, a groove and a shoulder surrounding the said valve, the front face of the shoulder being of greater area than the rear end of the valve, a passage for live fluid connecting the bore in the barrel with the said front face of said shoulder whereby, when said passage is opened by the forward movement of the piston, the live fluid will pass through the center of the valve and through said passage where it acts against the said face of the shoulder to shift the valve rearwardly, a stationary plug for closing the port in the valve when it is thus shifted, means connecting said groove with the bore of the barrel in front of the piston for driving the latter rearwardly, ports connecting the said groove with the front of the shoulder on the valve whereby live air is admitted to said shoulder from said groove for holding the valve in its rearward position, and means for exhausting the air from in front of said shoulder, whereby the pressure of live air on the rear of the valve shifts the latter forwardly.

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

CARL R. GREEN.

Witnesses:
NINA GREEN,
N. D. KEMP.