No. 760,195. PATENTED MAY 17, 1904.

C. R. GREEN.

FLUID PRESSURE IMPACT TOOL.

APPLICATION FILED DEC. 2, 1903.

NO MODEL.

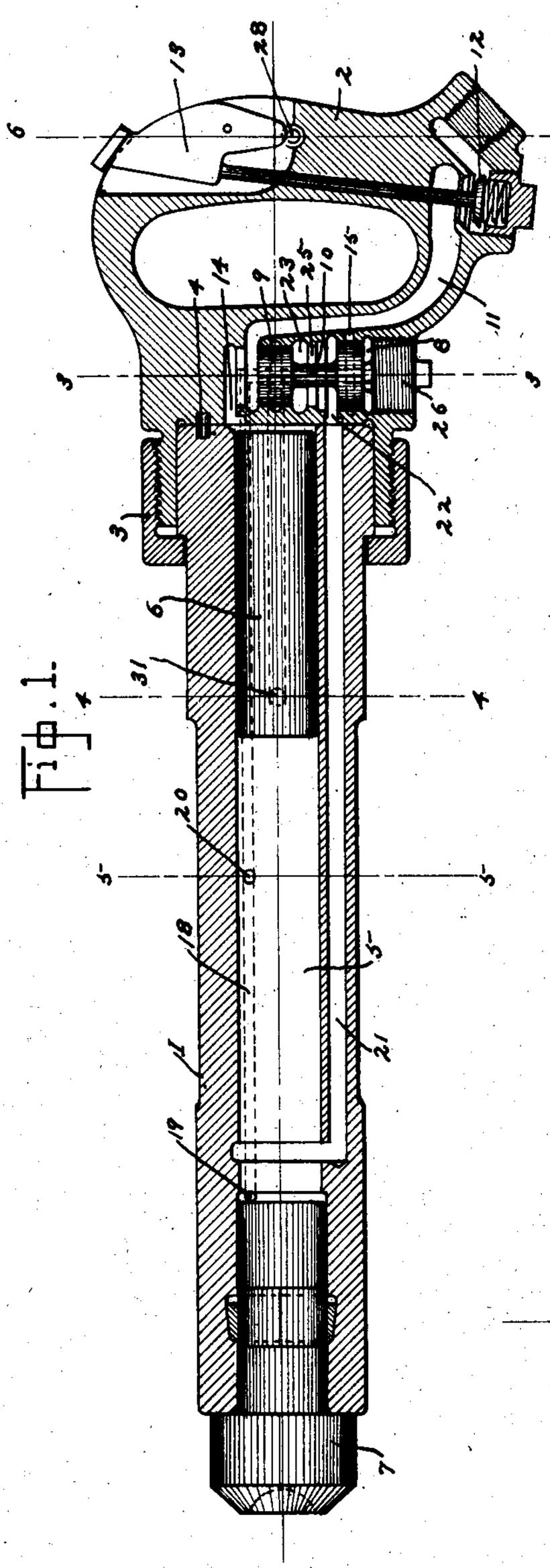

Fig. 1.

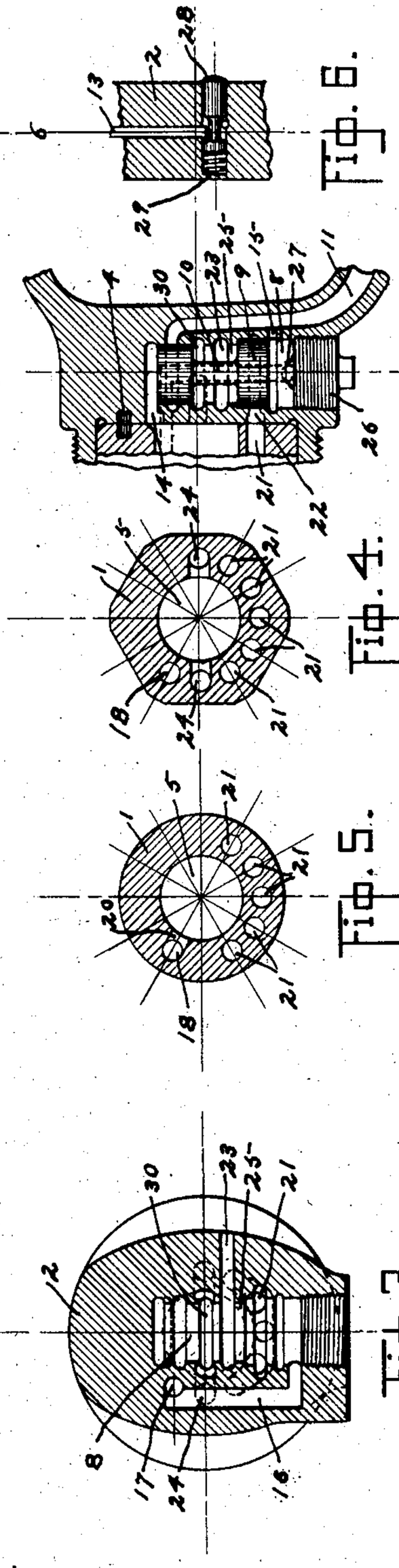

Fig. 2.

Fig. 4.

Fig. 5.

Fig. 3.

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No. 760,195. Patented May 17, 1904.

UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE IMPACT-TOOL.

SPECIFICATION forming part of Letters Patent No. 760,195, dated May 17, 1904.

Application filed December 2, 1903. Serial No. 183,436. (No model.)

To all whom it may concern:

Be it known that I, CARL R. GREEN, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Fluid-Pressure Impact-Tools, of which the following is a specification.

My invention relates to long-stroke power-hammers operated by air or other fluid under pressure, and especially to that class of such tools in which the flow of motive fluid to the opposite ends of the cylinder is controlled by a reciprocating valve, one object of my invention having been to devise novel means for insuring the quick and positive reciprocation of the valve at the proper times and a further object having been to simplify and cheapen the construction of the tool by employing therein the fewest parts consistent with efficient action, the parts being of strong and substantial construction, so that they are not likely to be injured or rendered inoperative by the rough handling to which these tools are subjected by the unskilled labor generally employed for operating them, the tool, moreover, being constructed with special reference to readily replacing those parts which are subjected to wear.

In the accompanying drawings, forming a part of the application, Figure 1 is a longitudinal section of a power-hammer intended to be operated by fluid-pressure and constructed in accordance with my invention. Fig. 2 is a view of the valve and the adjacent parts of the hammer, said parts being in section, as in Fig. 1, and the valve being in its shifted position. Figs. 3, 4, and 5 are transverse sections through the hammer on the lines 3 3, 4 4, and 5 5, respectively, of Fig. 1; and Fig. 6 is a fragmentary sectional view on the line 6 6 of Fig. 1.

Similar reference characters designate corresponding parts throughout the several views of the drawings, in which 1 represents the hollow barrel, and 2 the detachable handle structure, that may be secured to the barrel in any suitable manner. As shown, the rear end of the barrel sits in a socket in the handle and is held securely in place by a flanged collar 3, that engages with the barrel and is secured to the handle. To prevent rotation of the barrel in the socket and to secure perfect alinement of the parts, the barrel and handle are each provided with small registering sockets, in which a short pin is placed, as shown at 4. The barrel is provided with a central bore 5, in which reciprocates the piston 6, said piston being adapted to strike the rivet set or other tool 7, that is mounted in the forward end of the barrel.

Within the handle 2, near the rear end of the barrel and extending substantially at right angles thereto, is a valve-chest 8, in which is adapted to reciprocate a double-piston valve 9, the pistons being at the opposite ends of the valve and being connected by a stem 10. For a reason hereinafter made to appear the lower piston is of a slightly larger diameter than the upper one.

The handle 2 contains a passage 11 for live air or other suitable fluid, which communicates at its rear end with the usual flexible conductor, so that air under pressure may be conducted to the hammer, the flow of air into and through the passage 11 being controlled by a throttle-valve 12 and a trigger 13 in a manner common to this class of tools. With the valve in the position shown in Fig. 1 the passage 11 communicates direct with the rear end of the bore 5 through a port 14, and the compressed air acts to drive the piston 6 forwardly against the tool 7. When the valve is shifted, as in Fig. 2, the said port 14 is closed and the passage 11 is thrown into communication with the forward end of the bore 5 through the ports 15, 16, and 17 in the handle and port 18 in the barrel, said latter port opening into the barrel at two points, as indicated at 19 and 20. This admission of live air in front of the piston results in driving it to the rear again. It will be noticed that the ports leading to the forward end of the bore 5 are smaller than the port 14, so that the hammer will not be driven rearwardly with the same velocity that it is driven forwardly.

As the piston 6 moves forward from its position (shown in Fig. 1) the air in the front end of the barrel is exhausted through a series of ports 21, that communicate through ports 22 and 23 with the outside air, the mul-

tiplicity of these ports permitting a very rapid forward movement of the piston. The ports 21 terminate a short distance to the rear of the tool 7, so that a small portion of the air in the barrel is confined and compressed by the piston near the forward end of the stroke. This compressed air acts backwardly through the ports 18, 17, and 16 against the larger piston of the valve and lifts the latter to the position shown in Fig. 2, which cuts off the live air from behind and admits it to the front of the piston, as heretofore described. The compression of the air between the piston and the tool will of course weaken the impact of the former, and it should be continued only to the point that is necessary to effect the movement of the valve. For this reason I have provided the opening 20, that communicates between the bore 5 and the port 18, said opening being separated from the opening 19 a distance slightly greater than the length of the piston 6, so that the compressed air in the front end of the barrel may escape to the rear of the piston if the pressure is lower there, although it will be remembered that the air behind the piston is prior to the shifting of the valve in direct communication with the passage 11. The pressure from the air that is thus confined in front of the piston is sufficient to shift the valve or to raise the pressure in the ports 18, 17, and 16 practically to that required for shifting the valve, so that the admission of live air through the opening 20 will instantly result in moving the valve. At this instant the valve has live-air pressure on both pistons; but as the lower piston is of larger diameter than the upper piston the excess pressure on the lower piston will move the valve upwardly. The air being admitted to the front of the piston thrugh the ports 15, 16, 17, 18, and 19, the piston will be driven to the rear, the air escaping from the rear end of the barrel through the ports 24 at either side thereof, as shown more particularly in Fig. 4 of the drawings. These ports 24 communicate with the valve-chest 8 through port 30 just below the upper piston of the valve when it is in its upper position, so that the air may reach and pass out through the exhaust-port 23. At this time the exhaust-ports 21 and 22 are closed by the lower piston of the valve, said piston resting with its upper edge against a seat 25 in the valve-chamber.

While it is desirable to move the piston 6 rearwardly as rapidly as practicable, provision must be made for bringing the same to a stop slowly. For this reason the port 24 has its opening into the barrel some distance from the rear end of the cylinder, as shown at 31, so that the piston will cut off the escaping air and compress the remaining portion in the rear end of the cylinder. The air compressed by the piston 6 at this time acts against the smaller piston of the valve 9 through port 14 to shift it downwardly; but it is opposed by live-air pressure on the larger piston of the valve, which is connected to the front end of the cylinder 5 by ports 16, 17, 18, and 19. As these ports are larger than port 15, which supplies air to return the piston, the air is wiredrawn through port 15, so that the air behind piston 6 is compressed to a higher unit-pressure than the air in front of it, and therefore the total pressure on the smaller end of the valve is greater than the total pressure on the larger end, and the valve is thereby shifted downwardly.

From the foregoing description it will be seen that when the piston 6 is traveling forward the smaller end of the valve has a pressure of live air against it, while the larger end is in direct communication with the atmosphere until ports 21 are closed by piston 6, and that while the piston is traveling backward the large end of the valve has a pressure of live air against it, while the smaller end is in direct communication with the atmosphere until ports 24 are closed by piston 6. It will also be seen that the space between the two pistons of valve 9 is always in direct communication with the atmosphere through port 23.

The valve-chest is closed at its lower end by a plug-nut 26, on the inner side of which is a boss 27, against which the valve rests when in its lower position, the boss and the seat 25 determining the extent of movement of the valve.

It sometimes happens in devices of this character that the trigger 13 is accidentally depressed and the piston driven forward without having the tool 7 braced, with the result that the tool and piston are blown away. To prevent this, I provide the handle with a locking-bolt 28, that is normally held by a spring 29 in position to intercept the lower end of the trigger, so that it cannot be depressed. When the operator grasps the handle, however, he presses the locking-bolt inwardly, as shown in Fig. 6, so as to bring a groove in the same in line with the trigger, which can then be operated to open the valve 12.

From this description it will be seen that I have provided a hammer with a very simple valve that is arranged at right angles to the length of the barrel, so as to shorten the tool. The smaller piston of the valve controls the air in the rear end of the cylinder and the larger piston controls the air in the front end of the cylinder. The lower piston is of larger diameter than the upper in order that the valve may be lifted against the direct pressure of the air on the top end of the valve.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A fluid-pressure power-hammer having a cylinder and a reciprocating hammer therein, a valve which governs the flow of motive fluid into and its exhaust from said cylinder,

an exhaust-port communicating with the cylinder some distance from its forward end whereby the fluid will be compressed at this end of the piston, and a port leading from said end to the valve so that the said compressed fluid will shift the latter, said port communicating with the cylinder at a second point which permits live fluid to enter at the end of the forward stroke of the hammer for supplementing the pressure of the compressed air to facilitate the shifting of the valve.

2. A fluid-pressure power-hammer having a cylinder with reciprocating hammer therein, a valve-chest having a double-piston valve which controls the flow of motive fluid into and its exhaust from each end of the said cylinder, that piston of the valve at one end being less in diameter than the piston at the opposite end, and the exhaust-passages communicating with the cylinder some distance from the ends of the same, whereby movement of the valve in one direction is effected by air compressed in the forward end of the cylinder and acting upon the larger piston of the valve and movement in the opposite direction is effected by air compressed in the rear end of the cylinder and acting upon the smaller piston of the valve, the valve-controlled passage for conveying motive fluid to the rear end of the cylinder being of greater area than that which conveys motive fluid to the forward end of the cylinder, substantially as specified.

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

CARL R. GREEN.

Witnesses:
D. J. DWYER,
C. M. HARPER.