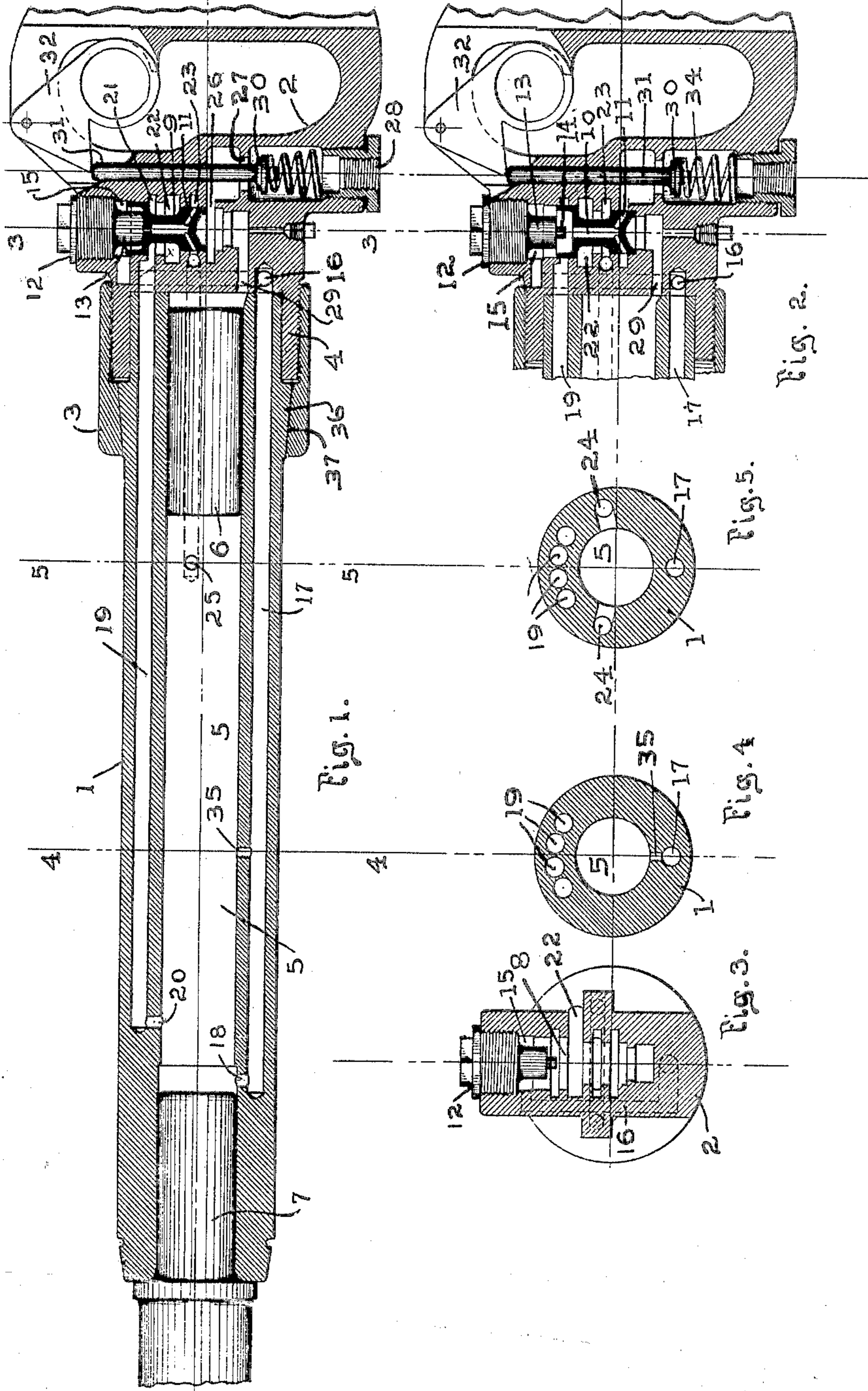


C. R. GREEN.
FLUID PRESSURE HAMMER.

APPLICATION FILED APR. 13, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

J. H. Hull.
Brennan West.

Carl R. Green,
INVENTOR.

BY *D. E. Foster*
ATTY.

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2 SHEETS—SHEET 2.

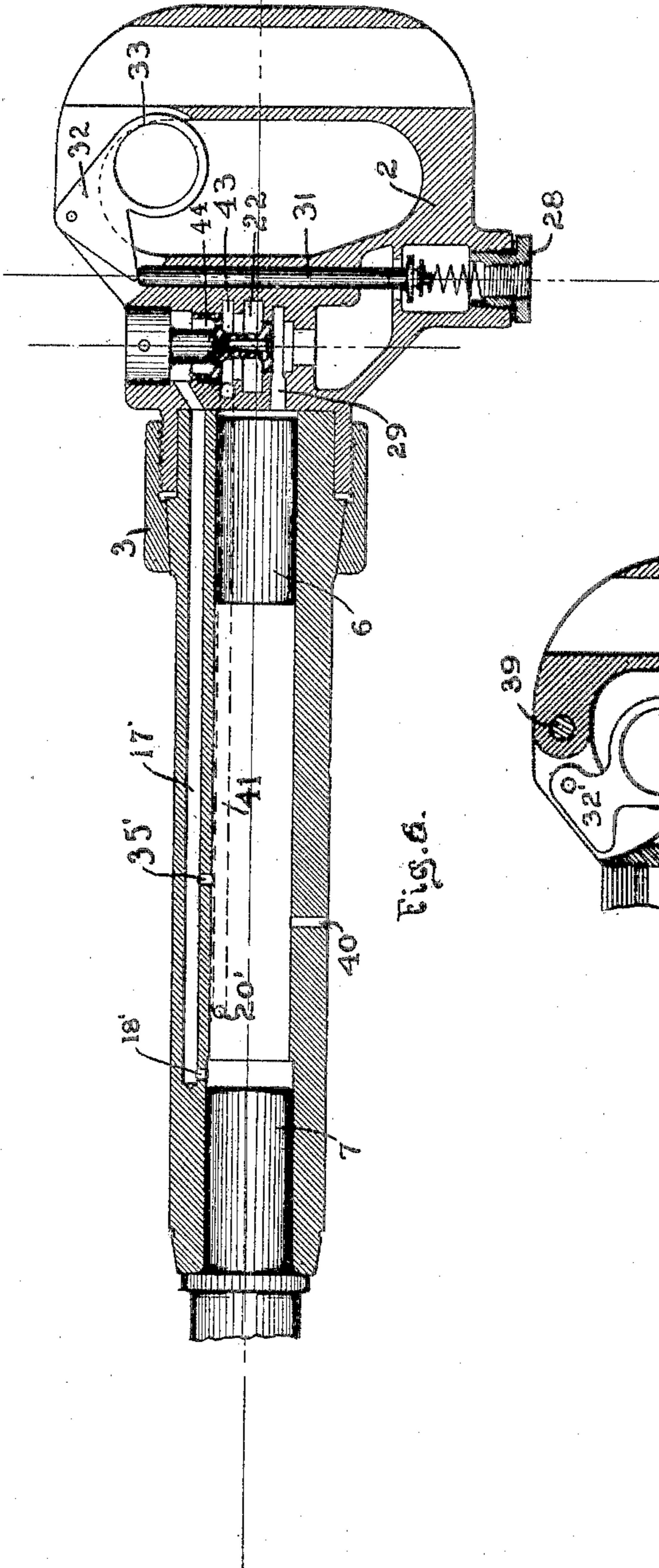


Fig. 6.

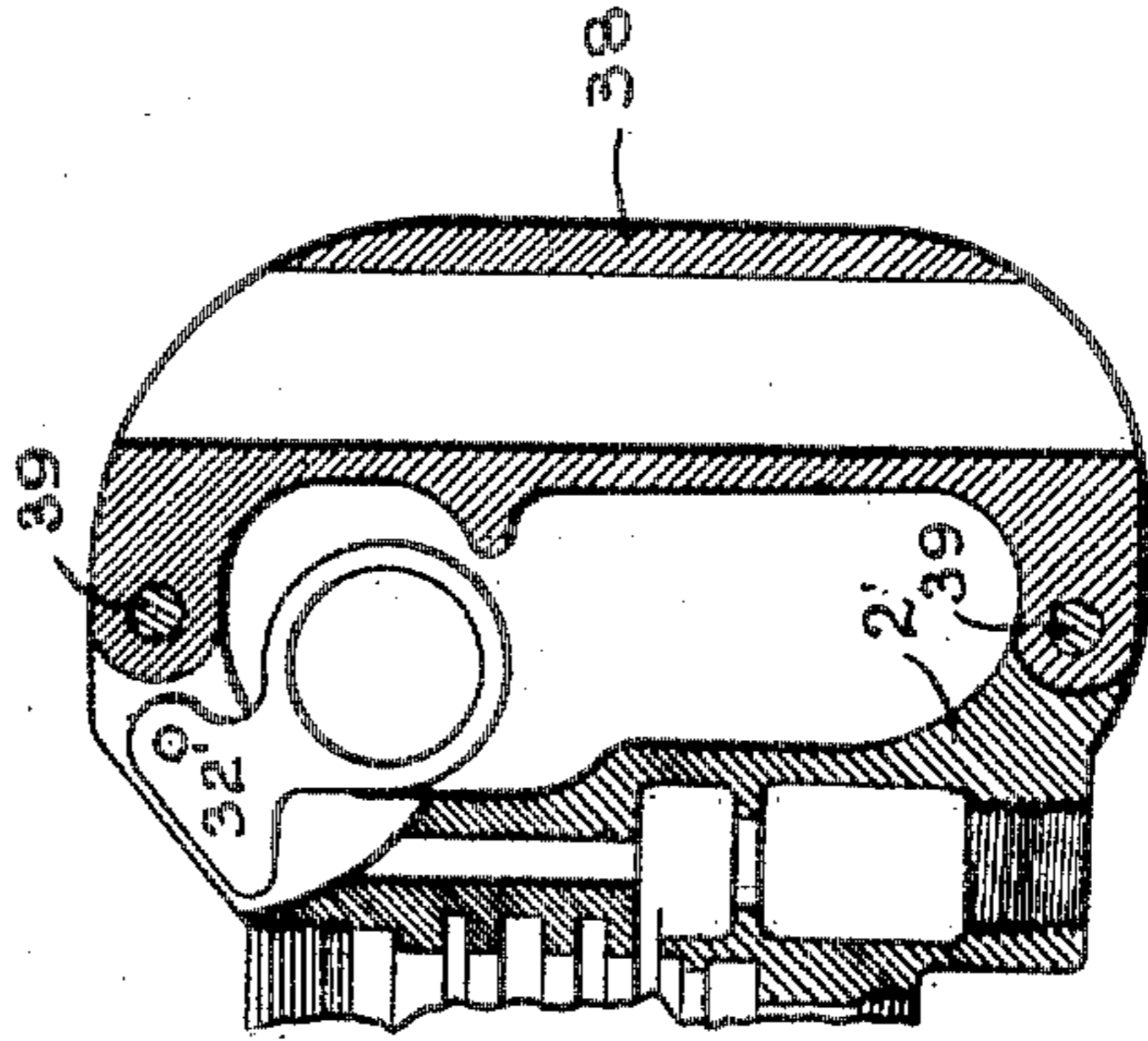


Fig. 7.

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UNITED STATES PATENT OFFICE.

CARL R. GREEN, OF CHICAGO, ILLINOIS.

FLUID-PRESSURE HAMMER.

SPECIFICATION forming part of Letters Patent No. 793,876, dated July 4, 1905.

Application filed April 13, 1904. Serial No. 202,967.

To all whom it may concern:

Be it known that I, CARL R. GREEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Fluid-Pressure Hammers, of which the following is a specification.

This invention relates to 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 cylinder is controlled by a reciprocating valve, one object of the invention being the production of a hammer of this character in which the valve will be moved positively at certain definite points of travel of the hammer-piston and will be held in its positions by the direct pressure of the motive fluid on the ends thereof.

Another object of the invention is to provide a throttle-valve close to the main valve, thereby giving a more direct passage for the air from the hose to the main valve, also to provide a trigger which is protected from being accidentally pulled, thereby opening the throttle and operating the hammer-piston when it is not desired to do so.

A further object of the invention is the simplification of devices of this character, which is attained by rendering the same economical and strong in construction and by using the fewest possible parts, such parts as are subjected to wear being readily replaceable.

The accompanying drawings, forming part of this invention, illustrate two forms of my invention, the one form showing the invention applied to a long-stroke power-hammer and the second showing the same applied to a power-hammer having a shorter stroke. My invention may still be employed in other forms which I have not illustrated, and I therefore desire it to be understood that the invention is not limited to the specific structures shown and described.

Figure 1 is a longitudinal sectional view through the center of a long-stroke power-hammer to which my invention is applied. Fig. 2 is a similar view of the rear end of the hammer, showing the valve in its second position. Fig. 3 is a transverse sectional view

taken on the line 3 3 of Fig. 1 or 2 with the valve removed, said view looking in the direction of the barrel of the hammer. Fig. 4 is a transverse sectional view through the barrel, taken on the line 4 4 of Fig. 1. Fig. 5 is a similar view taken on the line 5 5 of Fig. 1. Fig. 6 is a longitudinal sectional view through the center of a short-stroke power-hammer to which my invention is applied, and Fig. 7 is a sectional view showing a modified form of handle.

Similar reference characters designate corresponding parts throughout the several views of the drawings, in which—

1 represents the barrel of the hammer, to the rear end of which is secured a handle-piece 2, said barrel and handle-piece being held together by any suitable means, as by the shouldered collar 3, which engages the barrel and is screw-threaded upon the flange 4 of the handle-piece. I have constructed this collar and the associated part of the barrel as a clamp to prevent it from being jarred loose while the hammer is in operation. This clamp consists of a tapered shoulder 36 on the barrel, which is engaged by a corresponding tapered portion 37 on the inside of the collar. It will be seen that when the collar is screwed tight on the handle the tapered parts act as a wedge, preventing the collar from jarring loose by the operation of the handle. The barrel is provided with a central bore 5, within which reciprocates the hammer-piston 6, said piston being adapted to operate upon the tool-holder 7 in the forward end of the barrel.

In the head-block of the handle-piece just to the rear of the barrel I form a valve chest or chamber 8, within which reciprocates a double-piston valve 9, the upper piston being of greater diameter than the lower piston for a purpose hereinafter made to appear. The stem connecting the pistons of the valve is made hollow at 10 to form an air passage or port, and the lower end of this hollow portion communicates with the periphery of the lower piston through ducts 11. The upper end of the valve-chest is closed by means of a screw-threaded plug 12, the lower end of which projects into the valve-chest and is

formed of two parts 13 and 14, said parts being of different diameters, the part 14 being adapted to fit into the hollow 10 in the valve.

That part of the valve-chamber immediately below the plug 12 comprises an air-chamber 15, said chamber communicating through a port 16 (shown in dotted lines in Fig. 3) with a port 17 in the lower part of the barrel, said latter port extending forwardly and communicating with the bore 5 of the barrel at 18, which is just at the rear of the tool-holder. In the upper part of the barrel I provide a series of ports 19, said ports communicating with the bore of the barrel at a point 20 and with a chamber 21 of the valve-chest. The point 20 is a slight distance to the rear of the point 18 heretofore referred to, and the chamber 21 is below the chamber 15 of the valve-chest. Below the chamber 21 is an exhaust-port 22, said port leading through the side of the handle-piece to the outside air. Below the exhaust-port there is a chamber 23, which communicates with ports 24 on the side of the barrel, said ports opening into the barrel at points 24 toward the front end of the latter. Below the chamber 23 there is an inlet-port 26, said port communicating with the passage 27 for the compressed air or other motive fluid, said motive fluid being conducted to the hammer through any suitable pipe which is attached to the handle-piece by means of the screw-threaded thimble 28. The inlet-port 26 also communicates through the lower part of the valve-chest with the admission-port 29, which enters the bore 5 at its rear end.

In order to control the admission of the fluid to the hammer, I provide a throttle-valve 30, having a stem 31, which is mounted in the head-block of the handle-piece and projects inwardly therein, so as to be acted upon by the trigger 32, said trigger having a ring portion 33 for the finger of the operator. By grasping the handle and pulling back with the finger on this ring portion the valve is depressed and the motive fluid is admitted to the hammer. Normally the valve is maintained in a closed position by means of a coiled spring 34. One end of said spring engages the head of the throttle-valve, and the other end is engaged by the thimble 28. By this construction the spring is easily inserted into and removed from its port, and the thimble forms a convenient means for adjusting the tension of said spring. The large size of said port, compared with that of the spring, permits the fluid to pass without obstruction to the main valve.

For a purpose hereinafter made to appear I provide an opening 35 between the bore 5 and the port 17, the distance between the openings 18 and 35 of this port being slightly greater than the length of the hammer-piston.

In Fig. 7 I have shown a modified form of handle which I may use with either form of

hammer heretofore described. In this case I make the rear or grip portion 38 of the handle removable from the head-block 2' thereof, the parts being suitably secured together, as by bolts 39 extending therethrough. The trigger 32' is pivoted to the main portion of the handle and, like the trigger of the other modifications, is entirely within the exterior casing of the same, whereby it is protected from being accidentally operated to turn on or cut off the supply of pressure fluid at an inopportune time.

By making the rear or grip portion of the handle removable and by locating the pressure-fluid connection, throttle-valve, and trigger in the front or permanent portion or head-block of said handle it follows that should the grip become broken or otherwise injured it may be readily replaced at a trifling expense and without interfering with the operation of the hammer other than to make the necessary substitution.

The operation of the hammer may be stated to be as follows: With the valve 9 in the position shown in Fig. 1 and the throttle-valve open the motive fluid passes through the ports 26 and 29 to the rear end of the cylinder, and thus drives the hammer-piston 6 forward. During the travel of the hammer in this direction the port 19 is in open communication with the exhaust-port 22, so that the hammer meets with no appreciable resistance from the air in front of it, the multiplicity of the ports 19 affording a ready escape for the air. With the valve 9 in the position shown in Fig. 1 the portion 14 of the plug 12 closes the hollow 10 of the valve, and thus the ports 24 are closed by the lower piston of the valve. After the hammer-piston passes the point 20 the ports 19 are cut off and the motive fluid is compressed in the forward end of the cylinder and also in the ports 17 and 16 and in the chamber 15 above the valve. After the hammer-piston passes the opening 35 the live air at the rear of the piston enters through this opening into the ports 17 and 16 and bears upon the upper end of the valve. At this time, therefore, the valve is subject at each of its ends to live-air pressure, and as the upper end of the valve is larger than the lower end the valve will be shifted downwardly into the position shown in Fig. 2. When in this position, the air enters through the ports 11, the hollow 10, the valve-chamber 15, and the ports 16 and 17 to the front end of the barrel and drives the hammer-piston rearwardly. With the valve in the position shown in Fig. 2 the ports 24 are in communication with the exhaust-port 22, so that the air escapes from the rear of the hammer until the latter reaches the opening 25, when the exhaust is cut off and the air is compressed at the rear end of the cylinder. Owing to the fact that the ports 16, 17, and 18 are able to carry a great deal more air than the ports 11 and the hollow 10

in the valve, the pressure above the valve is comparatively low, so that the pressure on the lower end of the valve, caused by the return movement of the hammer-piston, is sufficient to shift the valve back into the position shown in Fig. 1.

In Fig. 6 I have shown my invention as applied to a short-stroke power-hammer in which the valve is operated in one direction by a constant pressure of live air on one of its pistons and in the other direction by the air compressed in the forward end of the cylinder, said air acting on the larger piston of the valve and being assisted by live air admitted to the rear of the hammer-piston. In this figure the port 17' communicates with the bore of the hammer at the two points 18' and 35', the latter point being so located as to be at the rear of the hammer-piston when it is in its extreme forward position. The air is exhausted from the front of the hammer-piston through a port 40 and also through ports 19', which communicate each at one of its ends with the bore of the hammer at 20' and at the other end with the chamber 21' in the valve-chest, said chamber being in communication with the exhaust-port 22' when the valve is in the position shown. This valve 44 also differs slightly from the valve 9, heretofore described, in that the hollow extends straight through the valve from one end to the other, the ports 11 being omitted. With the valve in the position shown the air will enter at the rear of the hammer-piston through the port 29' and will drive the hammer-piston forward, the air in the meanwhile holding the valve 44 in its upper position. As the hammer-piston moves forwardly the air escapes from the front of the same through the ports 40, 19', and 22 until the piston passes the opening 20', at which time the air is confined and compressed in the front end of the barrel and is caused to act backwardly through the port 17' upon the top of the valve 44. After the hammer-piston passes the opening 35' the live air acts backwardly through the ports 17 on the top of the valve and pushes it downwardly, thus opening the hollow through the valve and permitting the air to enter through the opening 18 in the front of the piston, thus driving the latter rearwardly. When the hammer-piston passes the exhaust 40, the pressure in the front of the piston in the ports 17' and above the valve drops and the pressure of the live air on the smaller piston of the valve is sufficient to lift the latter again. Before the valve is thus moved, however, the hammer-piston is moved rearwardly, through its own momentum, to a point which depends upon the location of the port 40, and said port is so placed that the hammer-piston will travel to substantially the rear end of the barrel.

From the above description it will be seen that I have invented a fluid-pressure power-

hammer that is very compact, the throttle-valve being located in the head-block of the handle-piece directly behind the main distributing-valve 9. I wish it to be understood, however, that my invention is not limited to the precise structure shown, as many details may be varied without departing from the spirit of my invention.

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

1. In a fluid-pressure power-hammer having a cylinder and a reciprocating hammer therein, a valve, said valve controlling the flow of motive fluid into the cylinder, a hollow or port extending through the valve, and a port leading from the end of the valve to the cylinder near its front end, the said hollow and port conducting the motive fluid to the front of the hammer-piston to move the same rearwardly.

2. In a fluid-pressure power-hammer having a cylinder and a reciprocating hammer therein, a valve located at one end mounted to reciprocate at substantially a right angle to the direction of the motion of the hammer, said valve controlling the flow of motive fluid into the cylinder, a hollow or port extending through the valve, and a port leading from the end of the valve to the cylinder near its front end, the said hollow and port conducting the motive fluid to the front of the hammer-piston to move the same rearwardly.

3. In a fluid-pressure power-hammer having a cylinder and a reciprocating hammer therein, a double-piston valve for controlling the flow of the motive fluid to the cylinder, one piston of the valve being of larger diameter than the other, a port leading from the large end of the valve to the cylinder near its front end, whereby the air that is compressed in the said front end is used to shift the valve in one direction by pressure on the large piston, and the air compressed in the rear end of the cylinder is used to return the valve to its original position, and the port extending through the valve through which air is admitted to the front end of the cylinder to return the hammer-piston.

4. In a fluid-pressure power-hammer having a cylinder and a reciprocating hammer therein, a valve-chest, a valve movable in said chest, a port through which air is admitted to said chest, said port being normally open to the rear end of the cylinder, a hollow or port extending through the valve, a port extending from the valve to the cylinder near its front end and through which the air that is compressed at the front end of the cylinder is caused to act on the valve to shift the latter, said valve, when shifted, having the port therethrough brought into communication with the main inlet-port so that the live air is admitted through the valve to the front of the cylinder to return the piston.

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5. In a fluid-pressure power-hammer having a cylinder and a reciprocating hammer therein, a valve-chest, a plug for closing one end of the chest, said plug having a portion
5 extending into the said chest, a valve reciprocating in said chest, said valve having a port extending therethrough, said port being closed by the said plug when the valve is in one of its positions.
- 10 6. In a fluid-pressure power-hammer, the combination of a cylinder, a handle-piece carried by the rear end of said cylinder, said handle-piece consisting of a head-block secured to the cylinder and a lower grip portion, a main
15 distributing-valve in the head-block of the handle, adjacent to said cylinder and mounted to reciprocate transversely of the axis of said cylinder, a throttle-valve in the head-block of said handle adjacent to said main valve, a short port connecting said valves, an operating-stem for said throttle-valve, a thimble for pressure fluid threaded into said head-block opposite the head of the throttle-valve, an enlarged port connecting said thimble and the head of said throttle-valve, and a spring having one end in engagement with the head of the throttle-valve and the other end engaged by the thimble, substantially as specified.
- In testimony whereof I affix my signature in the presence of two witnesses.
- CARL R. GREEN.
- Witnesses:
J. G. HALE,
A. H. ZIMMERMANN.