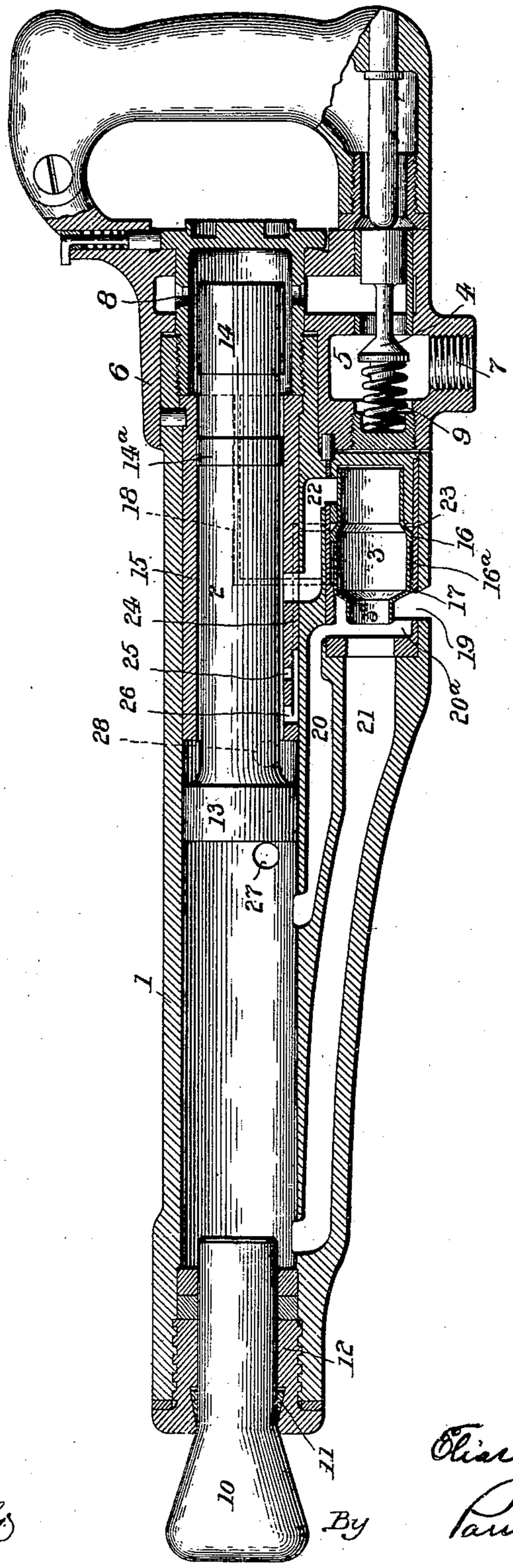
No. 751,072. PATENTED FEB. 2, 1904.

E. GUNNELL.

PNEUMATIC HAMMER.

APPLICATION FILED AUG. 5, 1901.

NO MODEL.



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No. 751,072. Patented February 2, 1904.

UNITED STATES PATENT OFFICE.

ELIAS GUNNELL, OF CHICAGO, ILLINOIS.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 751,072, dated February 2, 1904.

Application filed August 5, 1901. Serial No. 70,973. (No model.)

To all whom it may concern:

Be it known that I, ELIAS GUNNELL, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Pneumatic Hammers, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention has reference to the provision of a pneumatic hammer in which a constant pressure is employed in driving the hammer in a direction to strike its blow, while pressure is intermittently admitted and exhausted from the cylinder in advance of the hammer to procure the reciprocation thereof.

One of the objects of this invention is the provision of an arrangement of valve mechanism, and port openings controlled thereby, whereby the passage of fluid into and out of the forward end of the cylinder will take place with the greatest possible facility, and procure a maximum efficiency of operation of the hammer on the impact stroke thereof as well as upon the return stroke. The above as well as such other objects as may hereinafter appear, I attain by means of a construction which I have illustrated in preferred form in the accompanying drawing.

The reference figure "1" represents a hammer cylinder or barrel; 2, a reciprocating piston operating therein; 3, a valve located in the chamber, and 4, a throttle valve mounted in a chamber 5, formed within the hub of a handle 6.

An inlet 7 is provided for the admission of the fluid pressure, which passing through the chamber 5 and past the valve 4, enters the piston cylinder through the radial ports 8 at the back of the piston 2, when the valve 4 is pushed open against the pressure of a spring 9, in the manner which will be clear from an examination of the drawings.

At the extreme left hand end of the piston cylinder or barrel 1, is mounted a rivet set, or other operating tool 10, which is provided with a retaining ring 11, carried in a screw threaded bushing 12, the said ring 11 being constructed to latch or catch upon the rivet set 10 and prevent the same from being inadvertently driven out of the cylinder.

The piston 2 has one end, or head 13, larger than the other, the smaller head 14 having a bushing 15 within which it operates, and having between its extreme ends at 14^a an intermediate head, which, together with the head 14, is a snug fit in the bushing 15, while the other portions are of smaller diameter.

The valve 3 is of hollow or shell-like construction, and has also one portion 16 which is of larger diameter than the part 17, the chamber 16^a between the parts 16 and 17 being supplied with live fluid pressure through a passage 18, shown in dotted lines. The valve 3 is open at both its ends, thus forming a tubular shell, and controls a number of port openings, one of which, 19, leads to the external atmosphere from both the passage 20 and the passage 21, and another of which, 22, leads from the interior of the cylinder to the interior of the valve, when the valve is in its extreme left hand position, being closed when the valve is in the position shown in the drawings.

At the right side of the enlargement 16 of the valve there is a chamber 23, which has communication through a passage 24, with two port openings 25 and 26, that open into the interior of the piston cylinder. Supplemental exhaust ports to the atmosphere are provided at 27 and 28, the purpose of these being to facilitate the operation of the device as will appear from the description which I will now give.

Air being admitted past the throttle valve 4, enters through the radial ports 8, and drives the piston 2 to the left, which is its impact stroke, during which it cuts off the exhaust port 27 to the atmosphere, and then the opening leading to the passage 20, and, continuing its travel, until the head 14 uncovers the port 25, when live pressure enters the passage 24, and acting in the chamber 23 upon an area of the valve larger than the area exposed in the chamber 16^a, shifts it to the left, cutting off the exhaust port 19, from both the passages 20 and 21, and opening the passage 22 where-

by live pressure is admitted through the passage 22, the tubular valve 3, and the passage 21, to the lower end of the cylinder in advance of the piston, and the piston having delivered its blow to the tool shank 10, it begins its return stroke, the valve for a time remaining in its position at the left, while the piston moves back. During such return movement the part 14 passes the port 26, when the air in the chamber 23 escapes through the exhaust port 28, but without at this time shifting the valve, because the projecting stem 3ª has entered the passage 21 and created a chamber 20ª, covering a still larger area of the valve than the chamber 23, which has at such time by communication with the exhaust 27, less pressure than the pressure within and on the right hand end of the valve. When the head 13 passes the cylinder end of the passage 20, the air in front of the piston acts in the chamber 20ª to shift the valve to the right to the position shown, the port 22 having been previously cut off from live pressure by the head 14 in its backward travel. If the inertia of the moving piston still causes it to continue its return stroke, it is then finally checked on the opening of the supplemental exhaust port 27, before it strikes the rear end of the piston casing. The cycle of movements described is then repeated.

From the above it will be evident that I have provided an improved and novel construction of hammer, in which a piston driven on its impact stroke by constant pressure, is constructed to be returned by intermittent pressure at the forward end of the same, and which is provided at the extreme end, or near the extreme end, of its return stroke with a supplemental exhaust port, through which the pressure employed to return the piston, can finally and efficiently be exhausted, in order to more freely permit escape of the air and to check the backward stroke, and prevent its striking the cylinder head. It is further evident that in connection with my piston mechanism, I have shown a valve, which, although light and of small dimension, still at the same time controls ports of very large capacity, and effects the control thereof by but a limited range of movement. I have also provided a valve which has its actuation from three different areas, operating in rotation. Thus the area of the valve exposed to the pressure in chamber 23, is greater than the area exposed to the pressure in chamber 16ª, and the area of the valve exposed to the pressure in chamber 20ª, is greater than the area of the valve exposed to the pressure of the chamber 23. The pressure in the smaller of the three chambers is utilized in holding the valve in position during the impact stroke of the piston, and to prevent any trembling or chattering, or other uncertain or fluttering action of the device. The pressure in the intermediate chamber 23, serves to throw the valve to the left, reversing it at the end of the impact stroke, while the pressure in the chamber 20ª, serves to return the valve to the position shown at the end of the return stroke. Thus by the use of the three valve chambers, with the different areas shown in them, I am enabled to govern the operation of my valve with the greatest certainty, as well as nicety.

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

1. A fluid pressure impact tool, having a cylinder, a piston, means for exerting constant pressure upon said piston in the impact strokes thereof, and a tubular valve, controlled by the piston, for exerting intermittent pressure upon the forward end of said piston, to procure the reciprocation thereof, and supplemental exhaust ports checking the return stroke of the piston, substantially as described.

2. A fluid pressure impact tool, having a cylinder, a piston, means for exerting constant pressure upon said piston in the impact strokes thereof, and means for exerting intermittent pressure upon the forward end of said piston, to procure the reciprocation thereof, said means comprising a valve mounted in a chamber at the side of the piston chamber, substantially as described.

3. In a fluid pressure impact tool, the combination with a piston chamber and appropriate passages, of a valve chamber located at the side of the piston chamber, and a tubular valve in said valve chamber controlling the inlet and exhaust from in front of said piston and provided with a small central pressure area to maintain it in normal position, a larger area communicating with large pressure fluid to push the valve forward to introduce said fluid in front of the hammer, and a still larger pressure area at the front of said valve to push it backward to exhaust the front of the piston chamber, substantially as described.

4. The combination with a main piston cylinder and a casing having a passage leading from the live steam and to the front of the piston and another passage to exhaust the space in front of the piston, of a valve comprising a tubular shell open at both ends and having a large front area exposed to the exhaust passage, an intermediate area at rear to move valve to introduce live pressure, and between these two areas a smaller area communicating with the large steam passage to maintain the valve in normal position.

5. In a pneumatic tool, the combination with a valve, of a chamber surrounding the same, provided with pressure for holding the valve during the impact stroke of the piston, a chamber containing pressure acting upon an area of the valve greater than the last men-

tioned chamber, for shifting the valve at the end of the impact stroke, and a third chamber containing pressure acting upon an area of the valve greater than the last mentioned area, for returning the valve after the end of the return stroke, substantially as described.

6. A valve for a fluid pressure impact tool, consisting of a tubular shell mounted in a casing at the side of the piston cylinder, and provided with three differential pressure areas, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ELIAS GUNNELL.

In presence of—

PAUL SYNNESTVEDT,

H. W. SMALLEY.