C. R. GREEN.

PNEUMATIC HAMMER.

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905,692. Patented Dec. 1, 1908.

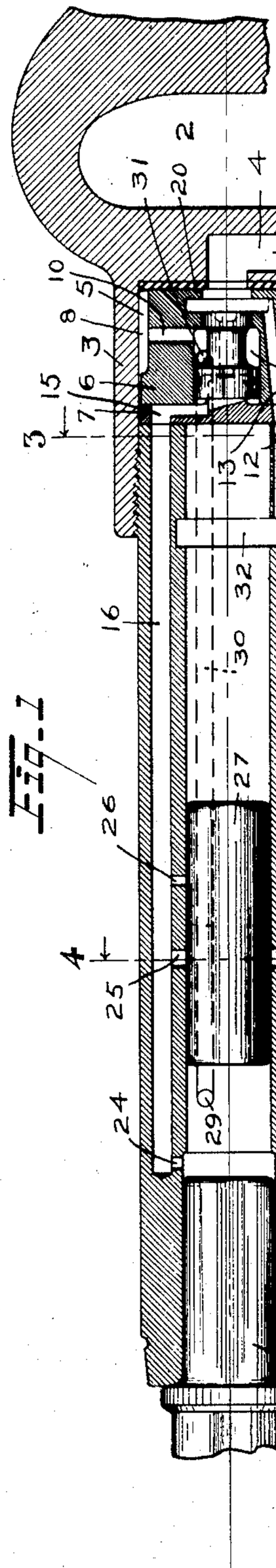

FIG. 1

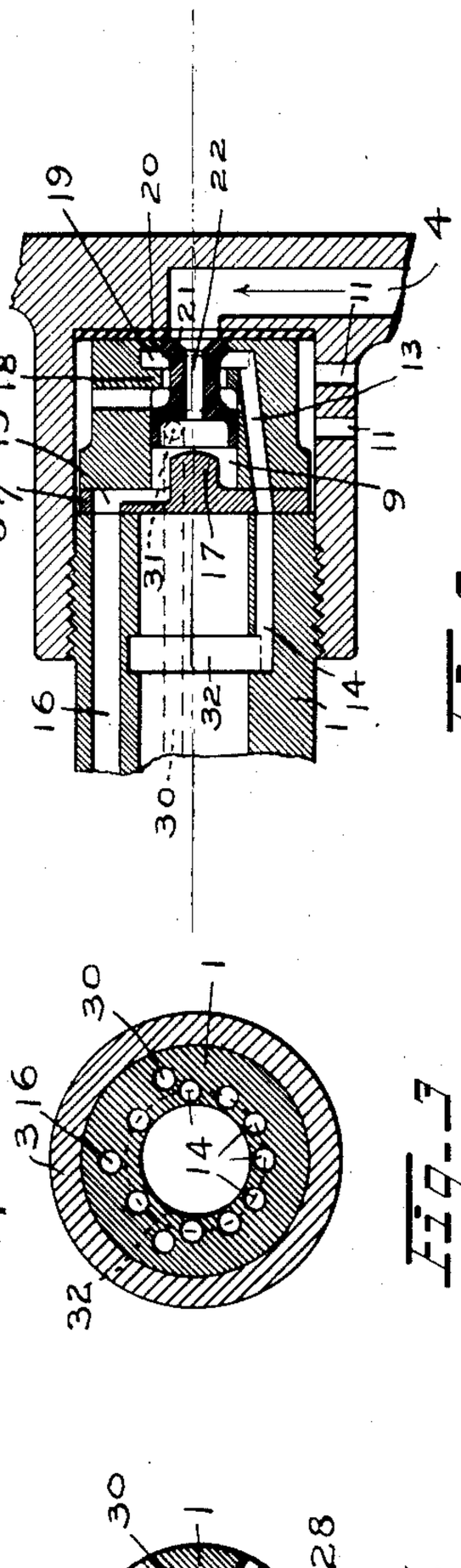

FIG. 2

FIG. 3

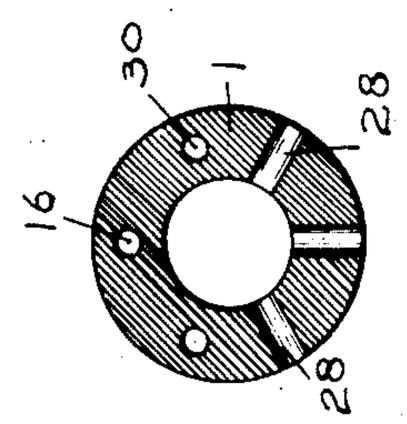

FIG. 4

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PNEUMATIC HAMMER.

No. 905,692. Specification of Letters Patent. Patented Dec. 1, 1908.

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To all whom it may concern:

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

My invention relates to power hammers which are operated by air or other fluid under pressure and especially to that class of such implements wherein the flow of the operating fluid to and from the cylinder is controlled by a reciprocating valve.

One of the objects of the invention is the production of a hammer of this character in which the valve will be moved positively at certain points of travel of the hammer piston and will be held in its position by direct pressure of the motive fluid on the ends thereof.

A further object of the invention is the provision of a hammer in which rapidity and positiveness of operation of the piston are secured, together with the provision of a cushion for the piston at each end of the stroke thereof.

A further object of the invention is to simplify and improve the valve construction.

A still further object is the provision of a hammer which will accomplish these results with a minimum number of parts, combining extreme simplicity of construction with efficiency of operation.

Generally speaking, the invention may be defined as consisting of the combinations of elements illustrated in the drawing, described in the specification, and embodied in the claims hereto annexed.

The accompanying drawings, forming part of this application, illustrate a form of my invention showing the same applied to a pneumatic hammer, the principles thereof being equally applicable to long and short stroke hammers.

Figure 1 represents a longitudinal sectional view through the center of a hammer embodying my invention, only so much of the handle being shown as is necessary to illustrate the manner of supplying pressure fluid therethrough and the adaptation of the same for the reception of the valve mechanism; Fig. 2 represents a slightly enlarged sectional detail of the valve mechanism and adjacent parts. the valve being shown in position to permit the exhaust of the motive fluid from the cylinder and the supply of motive fluid therethrough to return the piston to the rear of the cylinder; Fig. 3 represents a sectional view on the line 3—3 of Fig. 1; Fig. 4 represents a similar view on the line 4—4 of Fig. 1.

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

1 represents the barrel or cylinder of the hammer to the rear end of which is secured the handle piece 2. The handle piece comprises a head block 3, the front end of which is provided with an internal thread engaging a corresponding external thread on the rear portion of the cylinder or barrel, by means of which these two parts are secured together. In front of the grip proper of the handle, there is provided a port or passageway 4, for the supply of motive fluid to the cylinder. This passageway extends upwardly to a point opposite the axis of the cylinder and there opens into an enlarged chamber 5 formed in the head block. Within this chamber and occupying the space from end to end thereof, are the two metallic blocks 6 and 7. The latter block extends from the rear end of cylinder 1 and the block 6 occupies the remaining space. An annular passageway 8 is provided around the rear end of block 6, said passageway communicating at the upper portion thereof with an internal valve chamber 9 formed in said block through a passageway or port 10 and at the lower portion with the atmosphere through ports 11 formed preferably in the lower surface of the head block.

The block 7 occupies the space between the front of block 6 and the rear of cylinder 1 and is provided with a plurality of ports 12 extending therethrough and communicating with ports 13 in block 6 and ports 14 provided preferably in the rear end of cylinder 1. 15 denotes another port in the block 7, said port being formed in the upper portion of said block and communicating at one end with passageway 16 in the upper portion of the cylinder and at its lower end with the valve chamber 9. The block 7 is provided with a projection 17 extending forwardly into the valve chamber 9. This valve chamber has an enlarged cylindrical front portion extending from the front end thereof as far as the inwardly directed flange or shoulder 18, beyond which the chamber is enlarged at

19 and this enlarged portion communicates at its lower portion with the port 13. The rear or inlet end of the valve chamber proper communicates with the front end of passageway 4, such rear end being provided with a flange 20 of the same diameter as flange 18 and of somewhat greater diameter than the rear end of passageway 4.

The valve 21 is of the double piston type, the inner or front piston being of larger diameter than the outer or rear piston, for a purpose to be hereinafter explained. The stem connecting the pistons is provided with an axial port or passageway 22 extending therethrough and adapted to communicate at one end with passageway 4 and at the other end with the port 15. The inner or front piston is cupped, as will appear more particularly from an inspection of Fig. 2, and the internal diameter of the cup is greater than the external diameter of projection 17. Moreover, the rear end of such projection is rounded to form an accurate closure for the port 22 when the valve is in the position shown in Fig. 1.

The passageway 16 extends from the rear end of piston 1 to the front end thereof, immediately to the rear of the tool holder 23, where it communicates with the front end of the cylinder, through port 24. Passageway 16 is also provided with ports 25 and 26 communicating with the interior of the cylinder, the former being of relatively large area and at a shorter distance from port 24 than the length of the piston 27 and the latter being of relatively small area and at somewhat greater distance from port 24 than the length of said piston. A plurality of exhaust ports 28 are provided in the wall of the cylinder in substantially the same transverse plane as port 25. At a short distance to the rear of port 24, cylinder 1 is provided with a port 29 communicating with the passageway 30, the rear or inner end of which communicates with a corresponding passageway formed in blocks 6 and 7, the rear end of said passageway communicating with the valve chamber 9 through a port 31. This port is so located as to communicate with said chamber when the valve is in the position shown in Fig. 1 and to be closed by the cup of the larger piston when said valve is in the position shown in Fig. 2. The front end of passageway 14 communicates freely with the annular recess 32 formed within the rear portion of the cylinder at a sufficient distance from the rear end thereof to provide a cushioning chamber therebetween. Passageways 12, 13 and 14 constitute continuous ports or passageways of large aggregate area communicating at one end with the interior of the cylinder and at the other end with the enlarged space 19.

It will be observed that the small piston of valve 21 is of greater diameter than the inlet end of passageway 4. To provide a removable seat for said piston, an annular disk 33 is inserted between the rear end of block 6 and the adjacent face of the head block. The bore of the disk is of the same diameter as the bore of passageway 4 and forms an extension thereof. The rear face of the smaller piston seats against the disk when the valve is in the position shown in Fig. 2.

It will be observed that the rear end of the valve chamber opens directly into the passageway 4 and forms in effect a continuation thereof. This enables the live air to act directly and without the development of any friction on the rear end of valve 21 and to pass, with a minimum of friction, to the ports 13.

With the arrangement of parts as above described, the operation is as follows: Assuming that the rear end of the piston has traveled a sufficient distance from the rear end of the cylinder to permit the escape of pressure fluid through passageways 14 and that valve 21 is in the position shown in Fig. 1, motive fluid will enter the rear portion of cylinder through 13, 12 and 14 and will drive the piston forward. Any air that is in the front portion of the cylinder will escape freely through ports 28 and 29, passageway 30, valve chamber 9, port 10, passageway 5 and ports 11 until such time as the front end of the piston closes ports 28 and 29. Air will then be compressed through port 24, passageway 16 and port 15 and such compressed air will act on the front face of the large piston of valve 21. When the rear end of the piston has uncovered port 26, live air will flow through said port, passageway 16 and port 15 and will help to build up the pressure on the front face of large piston of valve 21, insuring the shifting of the valve in time to admit motive fluid therethrough in front of said piston and return the latter to the rear of the cylinder. This is rendered possible by the compression of the air and the relatively large surface on which the same has to act, the rounding or beveling of the rear end of projection 17 enabling this pressure to act on substantially the whole area of said piston, insuring a quick and positive movement of the same to the position shown in Fig. 2. When the valve has been moved to the position shown in Fig. 2, the motive fluid passes through the port or passageway 22, valve chamber 9, port 15, passageway 16 and port 24 to the front end of the cylinder and drives the piston rearwardly. At the same time, the small piston on the rear end of the valve has cut off communication between passageway 4 and port 13 and the large piston has cut off communication between passageway 30 and the exhaust ports 11. The piston travels rearwardly under the full pressure of the live air until the front end thereof uncovers ports 28, whereupon the motive fluid is exhausted

through said ports and the piston travels the remainder of its rearward stroke mainly by momentum. Locating the large port 25 in substantially the same transverse plane as ports 28 makes a free direct path for motive fluid between the former port and the latter port and further reduces the pressure in passageway 16 and port 15. After passing port 26, another short path is provided for the escape of motive fluid through exhaust ports 28, with corresponding reduction of pressure in passageway 16 and port 15. Piston 27 continues to travel rearwardly, exhausting through ports 14, 12, 13 and 11 until the rear end of the piston crosses the annular passageway 32. The air is cushioned between the rear end of piston and the rear end of the cylinder, relieving the same of any direct impact of the piston. Meanwhile, the free escape of motive fluid through the three ports 24, 25 and 26 and through the large ports 28, coupled with the small area of port 22, has so reduced the pressure on the front of the large piston as to enable the superior pressure of the live air acting directly on the smaller piston to shift the valve to the position shown in Fig. 1. After the piston has rebounded so that the rear end thereof permits the entrance of motive fluid through port 14, the piston will travel to the front of the cylinder, and the cycle of operations above set forth will be repeated.

It will be apparent from the above description, taken with the drawings, that I have produced a fluid pressure power hammer that is very compact and that has a minimum number of parts, with consequent freedom from liability to derangement, and that, owing to the valve construction and arrangement of parts, I am able to obtain a quick and effective stroke of the hammer. I wish it to be understood however, that my invention is not to be limited to the precise structure shown, as numerous details thereof may be varied without departing from the spirit of my invention.

Having thus described my invention, I claim:

1. In a fluid pressure power hammer, the combination of a cylinder, a hammer piston therein, and a valve controlling the supply of motive fluid to said cylinder, said cylinder having a passageway extending from the valve to the front end of the cylinder and communicating therewith, said passageway having a pair of ports communicating with the cylinder in the rear of the first mentioned port and said cylinder being provided with an exhaust port communicating directly with the atmosphere and located in substantially the same transverse plane as one of the pair of ports, substantially as specified.

2. In a fluid pressure power hammer, the combination of a cylinder, a hammer piston therein, and a valve controlling the supply of motive fluid to said cylinder, said cylinder having a passageway extending from the valve to the front end of the cylinder, said passageway also having a pair of ports communicating with the cylinder to the rear of the first mentioned port, one of said pair of ports being at a less distance from the first mentioned port than the length of the piston and the other being at a greater distance therefrom than the length of the piston and said cylinder being provided with one or more exhaust ports communicating directly with the atmosphere and located in substantially the same transverse plane as the port of said pair that is at the shorter distance from the first-mentioned port, substantially as specified.

3. In a fluid pressure power hammer, the combination of a cylinder, a piston therein, a motive fluid supply passageway and valve mechanism interposed between said passageway and the rear portion of the cylinder, said mechanism comprising a chamber at the rear of the cylinder, a block in said chamber having a valve chamber therein, a reciprocating valve in said chamber, said valve having a port therethrough and a piston at the front end thereof, a second block interposed between the first mentioned block and the rear of the cylinder and having a rearwardly extending projection forming a seat for said valve and adapted to close the port therethrough, a port or passageway communicating with the front end of the cylinder, a port in the last mentioned block communicating with said passageway and the front end of the valve chamber, and ports extending through both of said blocks and forming a passageway communicating with the rear portion of the cylinder, the last mentioned ports being controlled by said valve, substantially as specified.

4. In a fluid pressure power hammer the combination of a cylinder having therein a passageway extending from the rear to the front portion thereof and having a port communicating with the front portion of the cylinder, a second passageway in said cylinder communicating with the rear portion thereof, means for supplying pressure fluid through said passageways to the cylinder, said means comprising a passageway for the supply of motive fluid, a block interposed between said passageway and the rear portion of the cylinder, said block having a valve chamber therein extending longitudinally with respect to the cylinder and communicating with the second passageway, and a reciprocating valve in said chamber, said valve having a piston at the rear end thereof and a cupped piston at the front end thereof and a passageway extending longitudinally through the central portion thereof, a block interposed between the former block

and the rear of the cylinder and abutting against and closing the rear of the cylinder, said block having a port therein extending from the first mentioned passageway into the rear portion of the valve chamber and having a rearwardly extending projection adapted to fit within the cup of the piston at the rear of the valve and close the passageway through said valve, substantially as specified.

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

CARL R. GREEN.

Witnesses:
S. E. FOUTS,
J. B. HULL.