Feb. 1, 1927. **1,615,890**

E. W. STEVENS

PNEUMATIC HAMMER

Original Filed Feb. 28, 1921 2 Sheets-Sheet 1

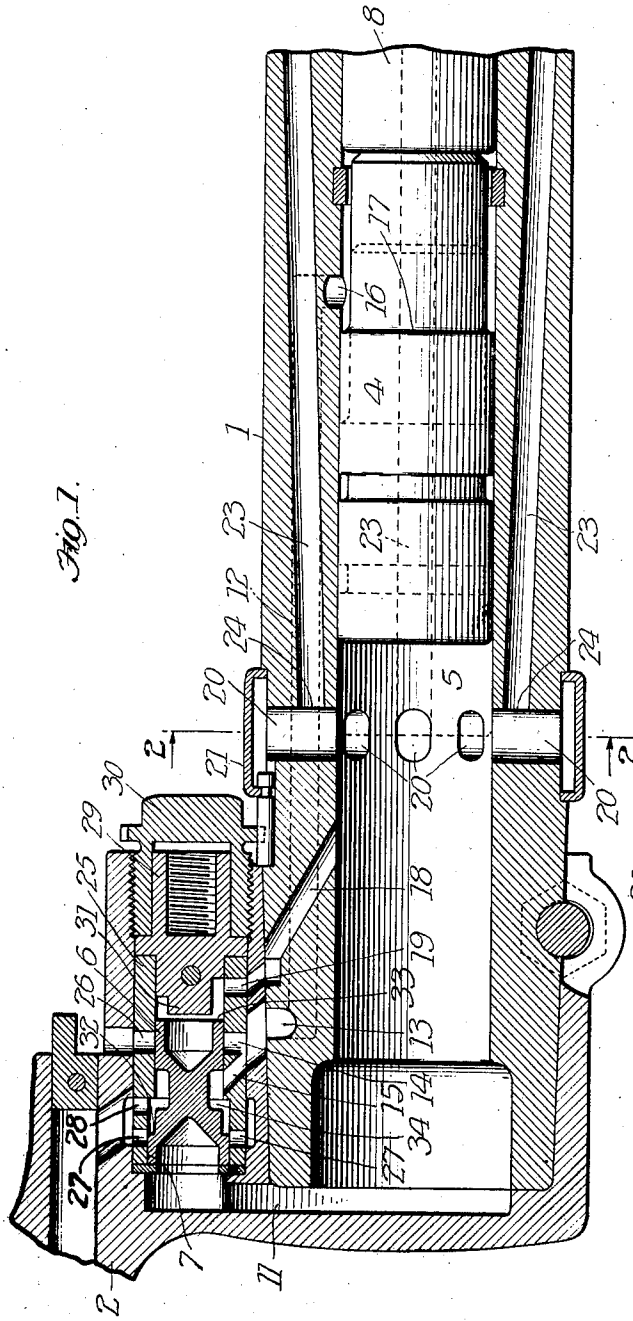


Fig. 1.

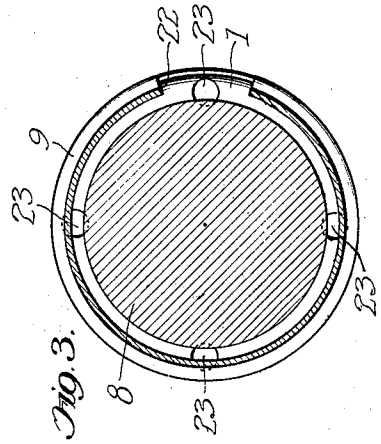


Fig. 3.

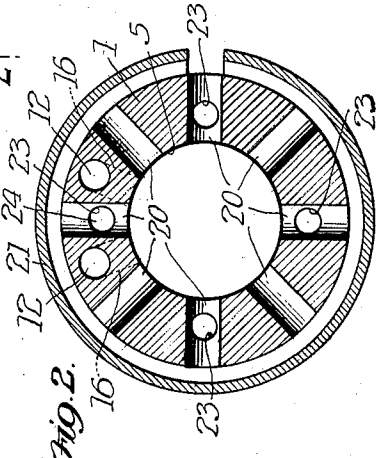


Fig. 2.

Witness
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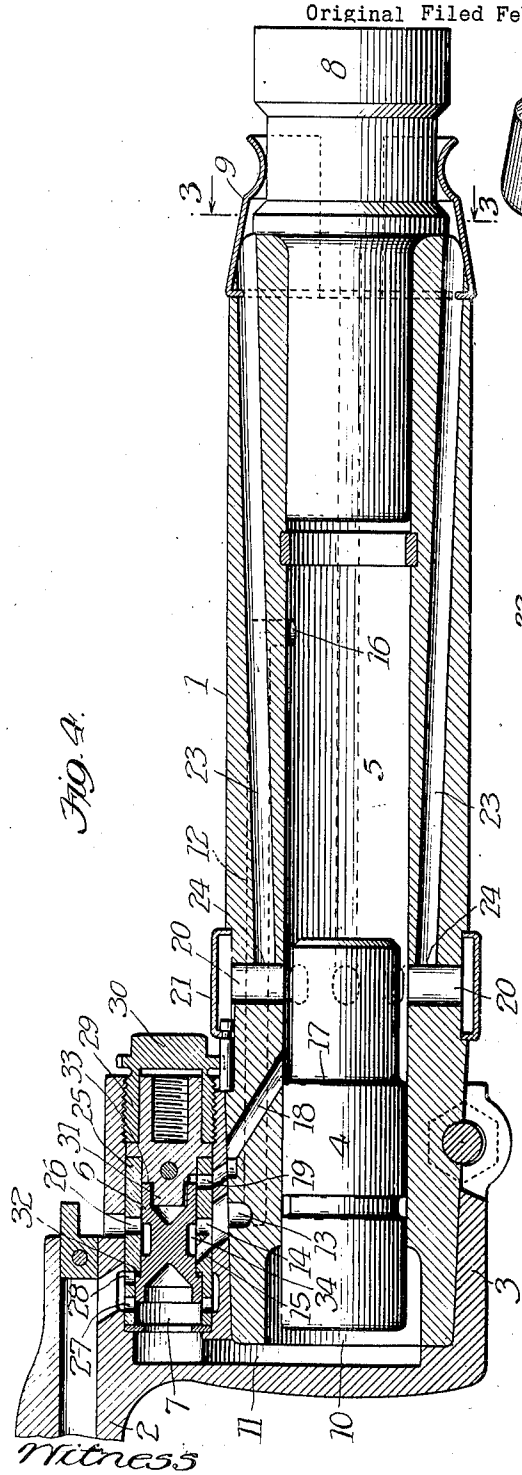


Fig. 4.

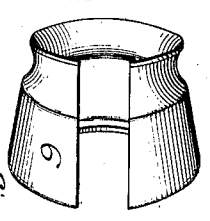


Fig. 7.

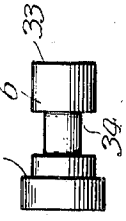


Fig. 6.

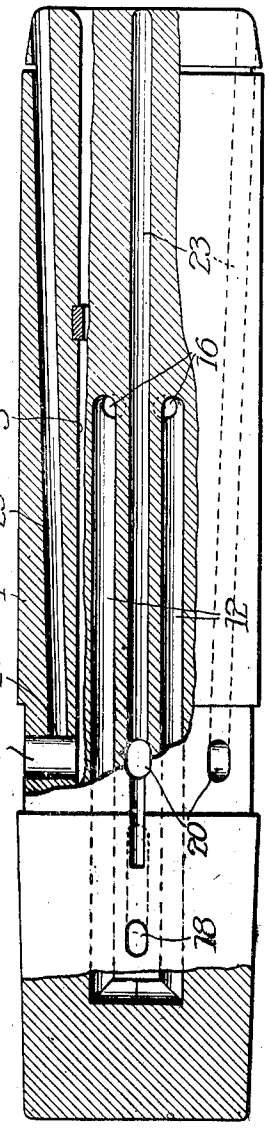


Fig. 5.

Witness

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Patented Feb. 1, 1927. 1,615,890

UNITED STATES PATENT OFFICE.

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PNEUMATIC HAMMER.

Original application filed February 28, 1921, Serial No. 448,293. Divided and this application filed June 5, 1922. Serial No. 565,897.

My invention relates to pneumatic hammers and one of the main objects of my invention is to provide simple and efficient valve mechanism for controlling the reciprocations of the hammer piston, such valve being characterized by a movement in one direction by air compressed by the piston on its return stroke and in the opposite direction by constantly applied live air against one pressure area and also by a variable pressure intermittently supplied from the piston chamber and controlled by the piston in its reciprocation.

In the drawings Fig. 1 is a section of a portion of a hammer embodying my invention; Fig. 2 a cross section on the line 2—2 of Fig. 1; Fig. 3 a cross section on the line 3—3 of Fig. 4; Fig. 4 a longitudinal section of the hammer complete with the exception of a portion of the handle and showing the valve in a position opposite to that shown in Fig. 1; Fig. 5 a plan view of the hammer with portions thereof broken away to expose the ports and passages; Fig. 6 an elevation of the valve alone and Fig. 7 a perspective of the rivet set clip.

Referring to the particular embodiment of my invention as herein shown, the same comprises as its main parts the cylinder 1, handle 2, provided with the clip 3, the piston 4 adapted to reciprocate in the piston chamber 5, the valve 6 operating in the chamber 7, the working tool which is here a rivet set 8 and the tool retainer which is here a rivet set clip 9.

Describing the construction of the cylinder, the same is provided with the piston chamber 5 having ports and passages controlled by the valve and by the piston for admitting and exhausting the pressure fluid from opposite sides of the piston for causing the reciprocations of the latter. The piston chamber is open at its rearward end at 10 and the same communicates through the space 11 with the rear end of the valve chamber 7. The cylinder is further provided with one or more longitudinal passages 12 communicating through the ports 13, 14 and 15 with the valve chamber and through port 16 with the piston chamber intermediate the length thereof. These ports and passages are for the purpose of admitting and exhausting pressure fluid to and from the front pressure area 17 of the piston as hereinafter explained. The cylinder is further provided with a short inclined passage 18 communicating with the piston chamber toward the rear end thereof, and also communicating with the valve chamber through the port 19.

The cylinder is further provided at a point toward the rear end thereof with one or more, but preferably numerous, exhaust ports 20 extending transversely through the cylinder walls. Some of this exhaust is released directly to the atmosphere and a part thereof is directed to the front end of the cylinder as hereinafter explained. I prefer to employ a clip 21 nearly surrounding all of the exhaust ports as shown in Fig. 3 but cut away as shown at 22, in order to deflect the exhaust close along the side of the cylinder and away from the operator.

One or more, but preferably the numerous longitudinal passages 23 are provided within the cylinder walls, the same extending longitudinally thereof and of considerable carrying capacity as shown in Figs. 1 and 4. These passages communicate at their rearward ends at 24 with the exhaust ports and passages 20 and the same lead preferably diagonally in the cylinder walls to the front end of the cylinder and to the outer corner thereof as shown in Figs. 4 and 5. By the provision of a suitable number of these exhaust ports 23 and by making them of the proper diameter the amount of exhaust air thus carried to the front end of the cylinder and to the working tool and its retainer may be varied in order to suit conditions.

The working tool which is here a rivet set is inserted in the front end of the piston chamber and the same is held in working relationship with the cylinder by means of the clip 9 which, as usual, is connected with the set. These clips are of tempered sheet metal and it is desirable that they shall not be overheated. Therefore, in order to keep them as cool as possible the exhaust passages 23 are arranged to discharge the exhaust directly against the inner walls of the clip from whence such exhaust air is deflected by these walls into the rivet set which is thereby kept cool.

Referring to the valve mechanism, the valve is a differential one adapted to reciprocate in a block 25 having an exhaust port or ports 26 and two inlet or live air ports 27 and 28. This block also contains the ports

14, 15 and 19 hereinbefore referred to. The valve chamber is open at its rearward end to the piston chamber and is closed at its forward end by means of the plug 29 held in place by the screw plug 30. This plug is provided with a reduced rearward extension 31 over which fits the hollow forward end of the valve.

The valve has its largest pressure area at its rearward end, the pressure against which tends to shift it forwardly. The valve is provided with two pressure areas tending to shift the valve in the opposite direction, that is rearwardly. One of these two pressure areas is indicated at 32, the same being constantly exposed to live air through the port 28. The other pressure area is indicated at 33 at the forward end of the valve and the same is exposed to intermittent pressure through the port 19. It will be understood that the forward end of the valve fits loosely upon the extension 31 of the plug 29 so that the entire forward end of the valve constitutes a pressure area. The valve is provided with a central groove 34 which controls the admission and exhaust of pressure fluid to and from the passages 12.

Describing a cycle of operation of the piston and valve and starting with the parts in their position shown in Fig. 1, the valve is now in its rearward position admitting live air to the front end of the piston chamber and against the pressure area 17 of the piston through the ports and passages 27, 34, 15, 13, 12 and 16. The piston is now on its rearward stroke and after it has traversed and covered the exhaust ports 20 and the passage 18 it will compress the air in the rear end of the piston chamber which air so compressed acts on the rearward end of the valve and forces the same forwardly to the position shown in Fig. 4. When the piston reaches the position shown in Fig. 4 the pressure at the front end of the valve is released through the passage 18, piston chamber 5 and exhaust ports 20 with the result that the valve was free to be moved forwardly by the air compressed by the returning piston as described. The live air is now admitted to the rear end of the piston chamber through the ports 27, valve chamber 7 and space 11, thereby driving the piston forwardly to deliver its blow upon the shank of the rivet set. At this time the forward end of the piston chamber is open to exhaust through the ports and passages 16, 12, 13, 14, 15, 34 and 26 and thence to atmosphere, it being understood that when this piston is in its extreme rearward position, as shown in Fig. 4, the free end of the piston chamber is fully open to exhaust through the exhaust ports 20.

After the rear end of the piston has cleared the passage 18 the pressure fluid in the rear end of the piston chamber will be admitted to the forward end of the valve through the ports and passages 18 and 19 which pressure fluid will put the valve in a state of balance. When the piston uncovers the exhaust ports 20 the pressure fluid acting on the opposite ends of the valve will be simultaneously exhausted and the live air constantly acting against the area 32 will shift the valve rearwardly to the position shown in Fig. 1. This completes the cycle of operation.

This application is a division of my application, Serial No. 448,293, filed February 28, 1921, the claims of which are drawn to the means for cooling the working tool, its retainer or clip and the front end of the hammer, while the claims of this divisional application are directed toward the valve mechanism.

I claim:

1. In a pneumatic hammer, the combination of a cylinder having a piston chamber, having admission and exhaust ports and passages, a piston reciprocable in such chamber, a valve controlling said ports and passages, said valve having a pressure area constantly exposed to live fluid pressure and tending to move the valve in one direction and having other areas intermittently subjected to pressure fluid, and means under control of said piston for admitting pressure fluid to certain of said other areas of the valve so that equal opposed areas are subjected to pressure and the valve placed in a state of balance prior to its shifting in the said direction.

2. In a pneumatic hammer, the combination of a cylinder having a piston chamber, having admission and exhaust ports and passages, a piston reciprocable in such chamber, a valve controlling said ports and passages, said valve having a pressure area constantly exposed to live fluid pressure and tending to move the valve in one direction and having other areas intermittently subjected to pressure fluid, and means under control of said piston for admitting pressure fluid to certain of said other areas of the valve so that opposed areas of equal extent are subjected to pressure and then subjecting all pressure areas of the valve to exhaust except said constant pressure area thereby to effect shifting of the valve by said constant pressure.

3. In a pnuematic hammer, the combination of a cylinder having a piston chamber, having admission and exhaust ports and passages, a piston reciprocable in such chamber, a valve controlling said ports and passages, said valve having a pressure area constantly exposed to live fluid pressure and tending to move the valve in one direction, a passage under control of said piston for admitting pressure fluid from the piston chamber to the valve on the outward or working

stroke of the piston to place the valve in state of balance, and an exhaust port subsequently uncovered by the piston simultaneously to reduce the fluid pressure on all pressure areas of the valve except the constant pressure area thereby to effect shifting of the valve by said constant pressure.

4. In a pneumatic hammer, the combination of a cylinder having a piston chamber, having admission and exhaust ports and passages, a piston reciprocable in such chamber, and a valve controlling said ports and passages, said cylinder having a side valve chamber in which such valve is located, the rear end of said valve chamber being constantly in communication with the rear end of the piston chamber and exposed intermittently to air compressed by the piston on its return stroke whereby the valve is moved in one direction, and said valve chamber having two live air inlet ports, one of which admits live air to the piston chamber when uncovered by the valve when moved in said direction, and the other of which constantly admits live air against the valve tending to move it in the opposite direction, and a passage extending between the piston and valve chambers for the passage of air to and from the valve, such latter air when admitted to the valve being adapted to place the valve in a state of balance prior to its movement in response to the said constant pressure.

5. In a pnuematic hammer, the combination of a cylinder having a piston chamber, having admission and exhaust ports and passages, a piston reciprocable in such chamber, and a valve controlling said ports and passages, said cylinder having a side valve chamber in which such valve is located, the rear end of said valve chamber being constantly in communication with the rear end of the piston chamber and exposed intermittently to air compressed by the piston on its return stroke whereby the valve is moved in one direction, and said valve chamber having two live air inlet ports, one of which admits live air to the piston chamber when uncovered by the valve when moved in said direction, and the other of which constantly admits live air against the valve tending to move it in the opposite direction, a passage extending between the piston and valve chambers for the passage of air to and from the valve, such latter air when admitted to the valve being adapted to place the valve in a state of balance, said latter passage being under the control of the piston in its reciprocations, and an exhaust port positioned beyond said passage also under control of said piston for simultaneously opening both ends of the valve to exhaust thereby to effect shifting of the valve by said constant pressure.

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