

No. 669,599.

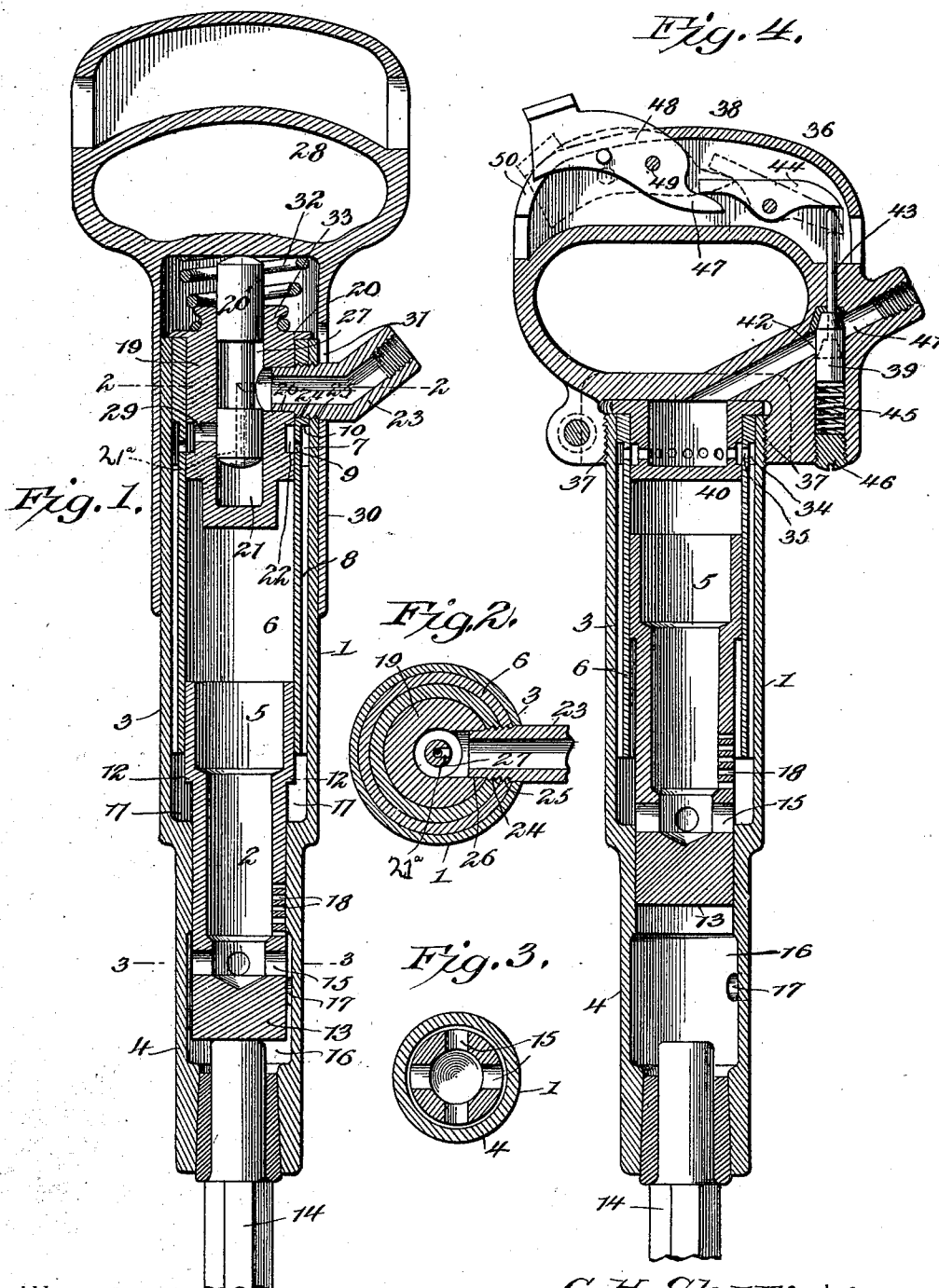
Patented Mar. 12, 1901.

C. H. SHAW.
PNEUMATIC HAMMER.

(Application filed Sept. 29, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
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2 Sheets—Sheet 2.

Fig. 5.

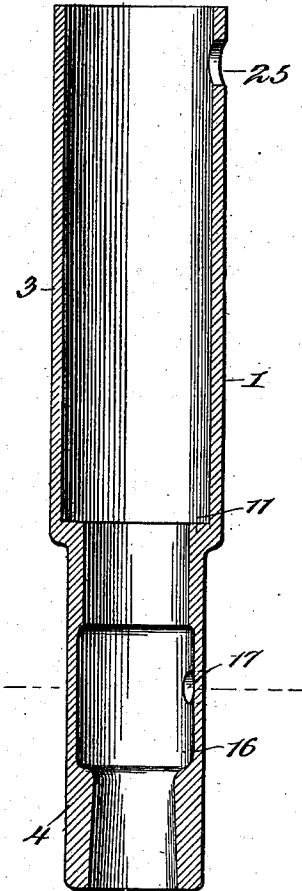


Fig. 6.

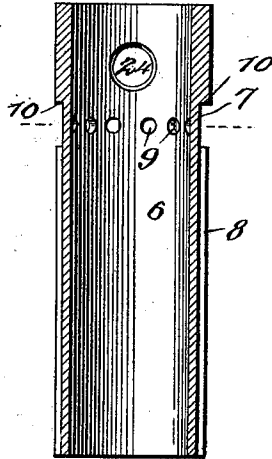


Fig. 9.

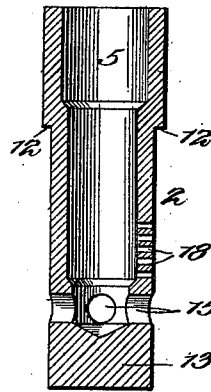


Fig. 7.

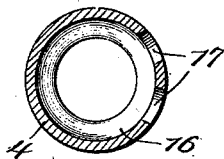


Fig. 8.

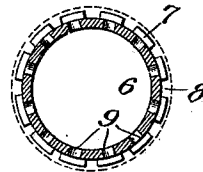


Fig. 10.

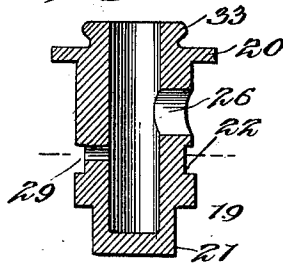


Fig. 12.

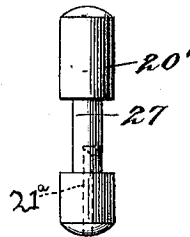
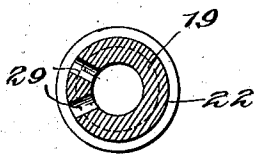


Fig. 11.



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UNITED STATES PATENT OFFICE.

CHARLES H. SHAW, OF DENVER, COLORADO.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 669,599, dated March 12, 1901.

Application filed September 29, 1900. Serial No. 31,527. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. SHAW, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented a new and useful Pneumatic Hammer, of which the following is a specification.

The invention relates to improvements in pneumatic hammers.

One object of the present invention is to improve the construction of pneumatic hammers and to provide a simple and comparatively inexpensive one having a hollow plunger or hammer adapted to contain a sufficient quantity of air, gas, steam, or other fluid under pressure to produce the necessary expansion after the supply is cut off to cause the hammer to complete its outward movement with the required force.

A further object of the invention is to enable the stroke of the plunger or hammer to be controlled to cause the same to strike light or heavy blows.

Another object of the invention is to cushion the handle to relieve the hand of the operator of the vibration or kick and to reduce the latter to a minimum.

The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

In the drawings, Figure 1 is a longitudinal sectional view of a pneumatic hammer constructed in accordance with this invention. Fig. 2 is a transverse sectional view on the line 2 2 of Fig. 1. Fig. 3 is a similar view on line 3 3 of Fig. 1. Fig. 4 is a longitudinal sectional view of a pneumatic hammer, illustrating a modification of the invention. Fig. 5 is a detail view of the outer shell of the cylinder. Fig. 6 is a similar view of the inner shell. Fig. 7 is a transverse sectional view of the outer shell of the cylinder. Fig. 8 is a similar view of the inner shell. Fig. 9 is a longitudinal sectional view of the plunger or hammer. Fig. 10 is a longitudinal sectional view of the valve-casing. Fig. 11 is a transverse sectional view of the same. Fig. 12 is a detail view of the valve.

Like numerals of reference designate corre-

sponding parts in all the figures of the drawings.

1 designates a cylinder receiving a plunger or hammer 2 and provided with an enlarged upper portion 3 and a reduced lower portion 4, forming a bore of two different diameters, and the piston, which is hollow, as clearly shown in Fig. 9 of the accompanying drawings, has an enlarged upper portion 5, which is arranged within the enlarged portion of the bore of the cylinder. The main casing or cylinder consists of an outer shell or body portion and an inner shell 6, arranged within the enlarged portion of the outer shell or body portion and secured at its upper end to the same. The inner shell is provided near its upper end with an annular groove or channel 7, located at its outer face and communicating with an annular series of longitudinal grooves 8, and the said inner shell is also provided at the grooved portion with an annular series of perforations 9. The inner shell forms interior longitudinal passages in the cylinder, and it terminates short of the shoulder 10, formed by the enlargement of the upper portion of the cylinder, to provide an annular recess surrounding the hammer or plunger 2. The compressed air, gas, or other fluid under pressure is admitted through the perforations 9 by the means hereinafter described to the longitudinal passages formed by the grooves 8 of the outer face of the inner shell of the cylinder, and the said air passes through the longitudinal passages to the annular chamber or recess 11, where it is adapted to engage an exterior shoulder 12, formed by the enlargement of the upper portion of the hammer or plunger, whereby the said hammer or plunger is moved inward from the position illustrated in Fig. 1 of the accompanying drawings. When the plunger or hammer moves inward or rearward, the air within it and within that portion of the cylinder in rear of the hammer or plunger is compressed, whereby the plunger or hammer is stopped slowly, and the compressed air resulting from the backward stroke of the hammer or plunger assists in reversing the motion of the same.

The outer end of the hammer or plunger is solid at 13 to engage a suitable tool 14, and

large ports 15 are provided immediately in rear of the solid front portion of the plunger or hammer to admit air from the annular chamber or recess 11 into the interior of the plunger or hammer to force the latter outward and drive it against the tool, and the interior of the hollow plunger or hammer is adapted to contain a sufficient volume of air to preserve substantially the initial pressure when the plunger or hammer has moved outward and the supply of compressed air is cut off. When the plunger or hammer arrives at the end of its outward movement, it exhausts by means of the ports 15, which communicate with an annular chamber 16, located at the outer portion of the cylinder, which is provided with apertures 17, communicating with the atmosphere. At the completion of the stroke the plunger is moved inward or rearward by the compressed air engaging the shoulder 12, and this inward or rearward movement of the plunger or hammer compresses the air in rear of the said plunger or hammer, causing the latter to stop slowly and assisting the reversal of the movement of the same. By this construction the jar or kick of the pneumatic hammer is reduced to a minimum.

In order to enable the length of the stroke of the hammer or plunger and the force of the blow delivered by the same to be under the control of the operator, the hammer or plunger is provided in rear of the main ports 15 with a longitudinally-disposed series of small ports or perforations 18, adapted to admit the compressed air or other fluid into the hammer or plunger when they arrive at the annular recess 11. When the supply of compressed air is reduced, the plunger will not be moved inward or rearward its full stroke, and as soon as the small ports arrive at the annular recess 11 the movement of the plunger or hammer will be reversed. By this construction the stroke will be shortened and the power will be lessened, so that the blow may be varied in intensity, and when the full force of the compressed air is turned on the hammer or plunger will be carried backward the full length of its stroke and a maximum blow will be delivered. By turning the compressed air more or less off the force of the blows delivered by the plunger or hammer will be lessened, and the pneumatic hammer may be readily adjusted for different kinds of work.

Within the inner or upper enlarged portion of the cylinder is arranged a valve-casing 19, provided at its outer end with a flange 20 to fit against the adjacent end of the cylinder, and it bears against both the inner and outer shells, as clearly illustrated in Fig. 1 of the accompanying drawings. The valve-casing 19, which receives the valve 20', is provided at its inner end with a reduced projecting portion 21, and it has an annular recess 22, arranged between its ends and located adjacent to the annular series of perforations of

the inner shell of the cylinder. The reduced projecting portion 21 forms an annular space to receive the inner enlarged portion of the plunger or hammer when the latter is moved inward or rearward the full length of the stroke. Air is admitted into the valve-chamber through a nipple 23, designed to be connected with a supply-pipe and extending through registering openings 24, 25, and 26 of the inner and outer shells and the valve-casing, and the openings 24 and 25 of the inner and outer shells are threaded to receive a threaded portion of the nipple, as clearly illustrated in Fig. 1.

The valve 20', which is round, is adapted to reciprocate, and it is provided between its ends with an annular recess 27, communicating with the inner end of the nipple and presenting inner and outer shoulders. The inner portion of the valve is provided with a longitudinal passage 21^a, extending from the annular recess 27 to the inner end of the valve, to enable compressed air to act upon the inner end of the valve to force the latter outward and to assist in cushioning the handle, hereinafter described. The valve is operated by a handle 28, and when it is moved inward its recess 27 communicates with ports or openings 29 of the valve-casing. The valve is pierced at the annular recess 22 to form the ports or openings 29. Communication is thus established from the supply-pipe to the longitudinal passages of the cylinder, the compressed air passing from the valve-casing through the perforations 9 into the annular chamber or channel 7. The valve will be moved outward by the compressed air in the inner end of the valve-casing as soon as the valve is free to return.

The handle 28 is provided with a sleeve 30, arranged to slide on the exterior of the cylinder and provided with a longitudinal slot 31, receiving the nipple, which limits the movement of the sleeve and the handle and detachably secures the same to the cylinder. The air-cushion at the inner end of the valve resists the inward movement of the handle, and this resistance is supplemented by a helical spring 32, interposed between the handle and the valve-casing and having its inner coil disposed around an annular boss or extension 33 of the said valve-casing. The annular boss or extension 33 is provided with an exterior groove, and it serves to support the spring. The spring is compressed when the handle is moved inward and the handle is quickly returned to its initial position, and it is capable of rapidly operating the pneumatic hammer, so that a series of blows may be rapidly delivered.

In Fig. 4 of the drawings is illustrated a modification of the invention, or rather of that portion of the invention relating to the means for controlling the admission of air to the cylinder, the latter and the plunger or hammer being constructed the same as the parts heretofore described, with the excep-

tion that the annular channel 34 and the perforations 35 are located nearer the upper or inner end of the cylinder. The handle 36 is provided with a threaded socket 37 to receive the upper or rear end of the casing or cylinder, and it is provided with a hollow grip portion 38, receiving the operating mechanism for actuating a valve 39. Within the cylinder is arranged a head 40, consisting of a hollow cylindrical body provided at its outer end with a flange and having apertures communicating with the annular channel of the inner shell and the longitudinal passages of the same. The handle is provided with a duct 41 for the introduction of air, gas, or other fluid under pressure, and disposed transversely of the duct is a valve 42, arranged to close the duct and provided with a stem 43, extending into the hollow grip of the handle and located at one end thereof in position to be engaged by an inner lever 44. The lever 44 is fulcrumed between its ends on a suitable pivot, and its outer arm engages the stem, which projects into the hollow grip and which is held in such position by a coiled spring 45, arranged in the bore or opening for the valve and retained therein by a screw-plug 46. The inner end of the lever 44 is engaged by a projection 47 of an operating-lever 48, fulcrumed at 49 in the hollow grip and extending outward through a slot 50 thereof, whereby it is adapted to be readily depressed by the operator without removing the hand from the grip of the handle. The operating-lever is adapted to be moved inward to the position illustrated in Fig. 4 of the accompanying drawings in dotted lines, and the valve is moved outward by this operation to permit the compressed air to flow into the device.

In the construction illustrated in Fig. 4 the hammer is adapted to be operated by simply depressing the lever 48, and the spring beneath the valve will return the parts to the position shown in full lines in Fig. 4. In the construction shown in Fig. 1 the pneumatic hammer is operated by depressing the handle and reciprocating the sleeve on the cylinder.

It will be seen that the pneumatic hammer is simple and comparatively inexpensive in construction, that it is adapted to reduce the jar or kick to a minimum, and that when the plunger or hammer is moved inward or rearward the air within it and at the back of the cylinder is compressed to stop the hammer slowly, and such compressed air will expand and assist in reversing the plunger. It will also be apparent that as the interior of the main casing or cylinder presents an imperforate surface in rear of the annular chamber 11, and as the rear portion of the plunger is imperforate, and also as the ports at the outer end of the plunger are closed after passing the chamber 16 and remain closed until they arrive at the chamber 11, the air within the plunger and within the upper or rear portion of the main casing or cylinder will be compressed and will retard the rearward move-

ment of the plunger toward the end of the stroke, so that the plunger will be stopped slowly, and this compressed volume of air will expand and assist the said reversal of the plunger. Also the hollow plunger is adapted to contain a sufficient quantity of compressed air to produce an expansion after the supply has been cut off that will maintain substantially the initial pressure until the end of the stroke and that the series of small ports will enable the length of the stroke and the force of the blow to be regulated.

Changes in the form, proportion, size, and the minor details of construction within the scope of the appended claims may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention, such as varying the form of the inner end of the valve-casing and extending the same entirely across the cylinder or main casing to present a flat unbroken inner face similar to the face of the head of the casing or cylinder shown in Fig. 4, as the reduction of the inner end of the valve-casing is not essential and is employed only to increase the stroke of the plunger without lengthening the cylinder or casing.

What is claimed is—

1. In a device of the class described, the combination of a casing having exhaust and supply ports, and a hollow reciprocating plunger, provided near its outer end with large ports adapted to register alternately with the supply and exhaust ports of the casing, said plunger being also provided with a longitudinally-disposed series of small ports adapted to register with the supply-port of the casing before the large ports of the hammer, whereby the length of the stroke of the hammer and the force of the blow may be controlled by regulating the admission of the compressed air, substantially as described.

2. In a device of the class described, the combination of a casing provided between its ends with means for supplying compressed air or other fluid to its interior, and presenting an imperforate inner face in rear of such point, a hollow reciprocating plunger having an imperforate rear portion and provided at its outer end with a large port and having a longitudinally-disposed series of small ports or openings adapted to register with the means for supplying the compressed air or other fluid in advance of the large port and capable of enabling the length of the stroke and the force of the blow to be controlled, and means for regulating the admission of air to the casing, substantially as described.

3. In a device of the class described, the combination of a casing having a supply-passage terminating at its inner end at a point between the ends of the casing, said casing being provided at its outer end with an exhaust-port and presenting an imperforate interior in rear of the inner end of the supply-passage, a reciprocating hollow plunger provided near its outer end with large ports and

- having a longitudinal series of small ports located in rear of the large ones, and adapted to register with the supply-passage before the large ports, said plunger being impermeable in rear of said ports, and being capable of compressing the air within it and within the rear portion of the casing, and means for controlling the admission of air to the device, substantially as described.
- 10 4. In a device of the class described, the combination of a casing having a longitudinal air-passage, a valve-casing mounted within the said casing and provided with an opening or socket and having ports communicating respectively with the air-supply and with the said passage, a sliding valve operating in the longitudinal opening or socket, an exterior handle connected with the valve, and a reciprocating plunger, substantially as described.
- 20 5. In a device of the class described, the combination of a main casing having a longitudinal air-passage and provided with an exhaust-port, a reciprocating plunger, a valve-casing communicating with the air-passage, a valve arranged within the valve-casing, a nipple extending into the main casing and communicating with the valve-casing, a handle having a sleeve arranged on the main casing and provided with a slot receiving the nipple, and a spring for cushioning the handle, substantially as described.
- 30 6. In a device of the class described, the combination of a casing consisting of an outer body or shell, and an inner shell provided with longitudinal grooves to form air-passages and having an annular channel at the inner ends of the grooves and perforated at the annular channel, a valve-casing arranged within the upper or rear end of the said casing and provided with a channel or groove and having a perforation communicating with the same, a valve mounted in the valve-casing, a plunger, and means for operating the valve, substantially as described.
- 45 7. In a device of the class described, the combination of the outer shell or body having an enlarged inner portion forming a shoulder, the inner shell terminating short of the shoulder and provided with longitudinal passages, a valve-casing arranged at the inner end of the inner shell and provided with a port communicating with the said passages, a valve mounted in the valve-casing, and a plunger, substantially as described.
8. In a device of the class described, the combination of an outer shell having an enlarged inner or rear portion forming a shoulder, an inner shell arranged within the enlarged portion of the outer shell and terminating short of the shoulder, one of the shells being provided with a longitudinal passage, a head or casing closing the outer end of the inner shell and communicating with the said passage, a valve, means for operating the valve, and a plunger, substantially as described.
9. In a device of the class described, the combination of the inner and outer shell, one of the shells being grooved to form passages, a valve-casing mounted within the inner shell and forming a head and communicating with the said passages, a reciprocating valve mounted in the valve-casing and provided with a recess, adapted to communicate with the said passages, means for supplying air to the valve-casing, a plunger, and operating mechanism for actuating the valve, substantially as described.
10. In a device of the class described, the combination of a casing having a longitudinal passage, a plunger, a valve-casing provided between its ends with a port communicating with the said passage, a valve mounted within the valve-casing and provided with a passage extending to its inner end from the port to cause the compressed air to act against the inner end of the said valve, and means for actuating the valve, substantially as described.
- In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.
- CHARLES H. SHAW.
- Witnesses:
CHARLES F. SCHOFIELD,
M. T. GOSS.