No. 658,542. Patented Sept. 25, 1900.

E. A. FORDYCE.

PNEUMATIC HAMMER.

(Application filed June 3, 1898.)

(No Model.)

Fig. 1.

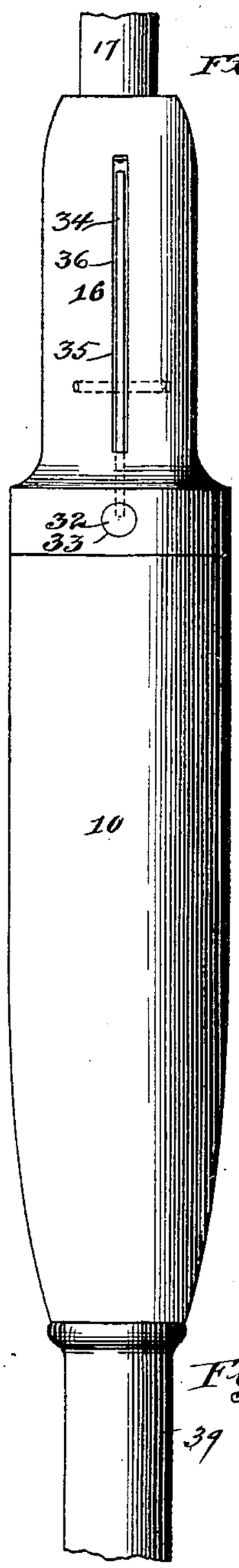


Fig. 2.

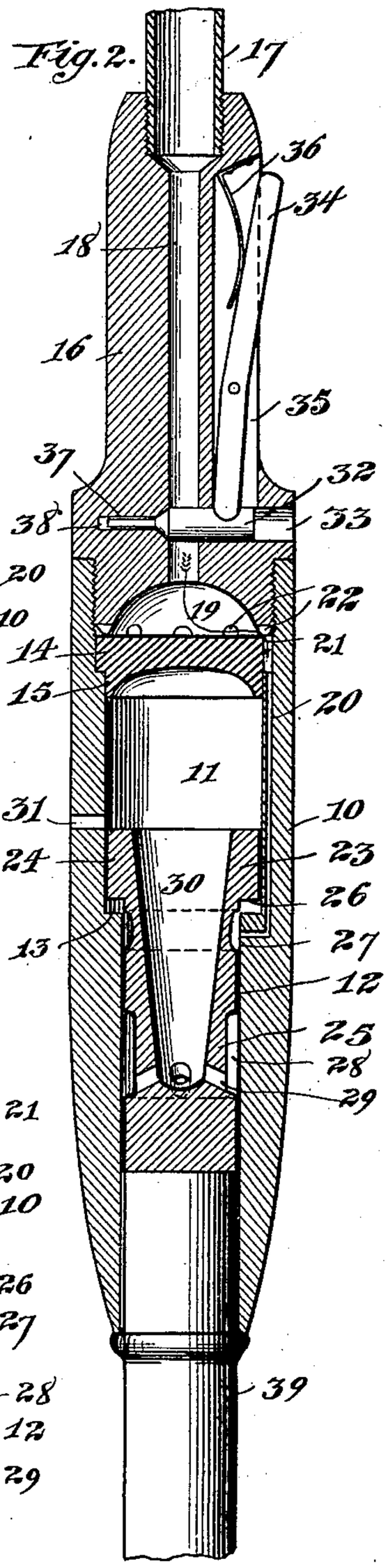


Fig. 3.

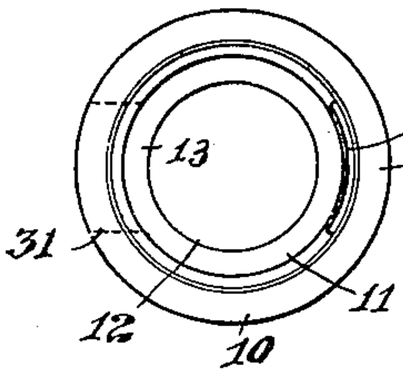


Fig. 4.

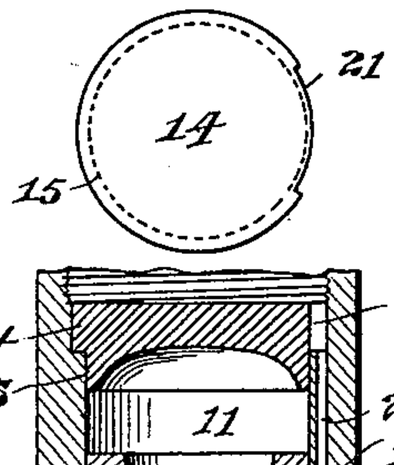
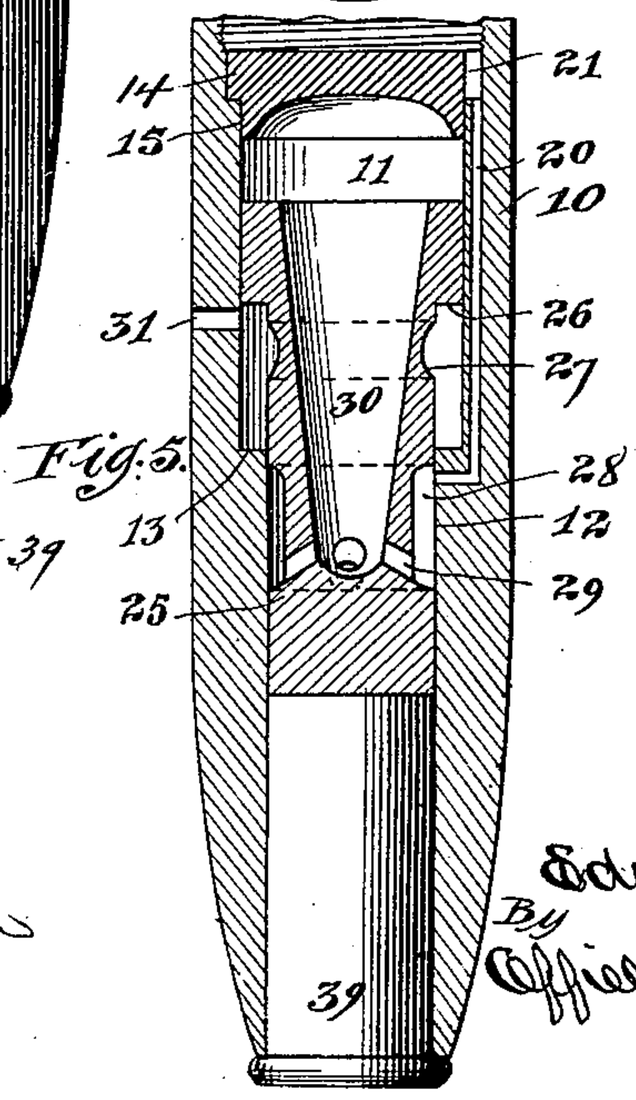


Fig. 5.



Witnesses,
D. F. Mann,
Frederick f. Goodwin

Inventor,
Edmund A. Fordyce,
By Offield, Towle & Linthicum,
Atty's.

UNITED STATES PATENT OFFICE.

EDMOND A. FORDYCE, OF CHICAGO, ILLINOIS.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 658,542, dated September 25, 1900.

Application filed June 3, 1898. Serial No. 682,424. (No model.)

To all whom it may concern:

Be it known that I, EDMOND A. FORDYCE, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Pneumatic Hammers, of which the following is a specification.

This invention relates to pneumatic hammers, and more particularly to that class of portable hammers which are known as "valveless," in which the striking piston or hammer proper constitutes in itself the controlling-valve, by means of which its motion is reversed.

My present invention has for its object to provide a hammer which shall be simple and efficient and at the same time inexpensive in cost of construction and maintenance, not liable to get out of order through complication of parts, and in which the shock or vibration shall be reduced to a minimum.

To these ends my invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the appended claims.

In the accompanying drawings, Figure 1 is an elevation of a pneumatic hammer embodying my invention. Fig. 2 is a central longitudinal sectional view of the same. Fig. 3 is a detail plan view of the upper end of the cylinder, the cylinder-head and piston or hammer being removed. Fig. 4 is a detail plan view of the cylinder-head detached; and Fig. 5 is a detail sectional view taken on the same plane as Fig. 2, but showing the piston or hammer in its uppermost position.

In the said drawings, 10 indicates the cylinder or casing. This cylinder is provided with an internal chamber or bore 11 in its upper part and a similar chamber or bore 12 in its lower part of less diameter than the chamber 11, there being thus formed between the two chambers a shoulder 13, which is annular in form. The chamber 12 is open at its lower end to receive the shank of the tool upon which the hammer is to operate, while the chamber 11 is closed at its upper end by means of a head 14. This head is shouldered or rabbeted at its lower portion, as shown at 15, to fit within the chamber 11 and is held in place on the seat thus formed by means of the handle 16, which screws into the upper end of the cylinder or casing 12 and bears against the cylinder-head 14 to hold the same in place on its seat. The handle 16 has screwed into it the nipple 17, to which the hose by means of which the compressed air is supplied to the hammer is attached. There is formed through the body of the handle 16 a passage 18, leading from the nipple 17 to an air-chamber 19, located above the cylinder-head and formed in the present instance in the lower end of the handle.

20 represents a port or passage extending from the chamber 19 to the chamber 12 and opening into this latter a short distance below the shoulder 13. The upper end of the port or passage 20 may be conveniently formed by cutting a portion of the upper part of the cylinder-head 14, as indicated at 21 in Fig. 4, and communication is established between said port 20 and the chamber 19 by means of suitable notches or openings 22, formed in the lower edge of the handle 16, said notches being formed at all parts of the periphery of said handles, so that some one or more of said notches will register with the upper end of the port 20 when the handle is screwed home into proper position to clamp the head 14 in place.

23 indicates the piston or hammer proper, which is provided with an enlarged head or upper portion 24, which fits within the chamber 11, and with a reduced lower portion 25, which fits within the chamber 12, there being thus formed upon the body of said piston a shoulder 26 annular in form and corresponding with the shoulder 13, against which it is adapted to abut. A short distance below the shoulder 26 there is formed in the body of the reduced portion 25 of the piston a circumferential groove 27, which forms a port or passage for the compressed air at certain periods of the operation of the device. Some distance below this circumferential groove or port 27 there is formed in the body of the piston a second circumferential groove or port 28, which, by means of passages or apertures 29, is in communication with an opening or chamber 30, formed in the interior of the piston 23 and extending from the port or groove 28 to the upper end of the piston, where it is in open communication with the chamber 11.

It will be observed that the chamber 30 is tapering in form so as to conform to the avail-

able space within the body of the piston and give a relatively-large cubical capacity to said chamber, thereby increasing the volume of confined air which forms the air-cushion. I have found by experience that this provision has a material effect upon the cushioning action and greatly increases the smoothness of action of the hammer.

31 indicates a port or passage formed through the wall of the cylinder 10 and communicating at its inner end with the chamber 11 at a point a distance above the shoulder 26 of the piston 23 about equal to the distance between the ports 20 and 28 when the parts are in the position shown in Fig. 2 of the drawings. The outer end of the port 31 opens into or communicates with the atmosphere.

The admission of compressed air to the instrument is controlled by a suitable valve, the form which I have devised being that shown in the drawings, the same being mounted in the handle 16 and comprising a cylindrical valve 32, mounted to move transversely with respect to the inlet-passage 18 in a suitable chamber or way 33 and adapted to be projected across the inlet-passage 18 so as to close or partially close the same, as desired. This movement of the valve 32 is effected by means of a lever 34, pivoted in a slot 35, formed in the handle, one end of said lever engaging the valve 32 so as to move the same, while the other end of the said lever rests upon a spring 36, by means of which the valve 32 is normally held in a closed position. The valve 32 is provided with a stem 37, which engages with a suitable way 38 to guide the movement of said valve.

The device thus constructed operates in the following manner: When the parts are in the position shown in Fig. 2 of the drawings, pressure upon the lever 34 will open the valve 32 and air under pressure will be admitted through the passage 18 into the chamber 19 and thence to the port or passage 20. From this latter the air under pressure passes into the groove or port 27, and since the piston has been moved a sufficient distance upward by its contact with the shank of the tool 39 to cause the upper end of the groove 27 to clear or pass upward beyond the shoulder 13 the air under pressure is admitted into the space between the shoulder 13 of the casing and the shoulder 26 of the piston. The piston is thereby caused to move upward, the air above said piston escaping through the port 31 during such upward movement until the enlarged head or upper portion 24 of the piston closes said port 31. This occurs before the piston has reached the upper end of the cylinder, and the remaining air in said cylinder forms a cushion to prevent the piston from striking the head of the cylinder and also to gradually arrest the upward movement of the piston and minimize the jar or shock. At this time the parts have assumed the position shown in Fig. 5 and the groove 28 comes opposite the port 20, the air thus passing through said groove and through the passages 29 and 30 to the space between the piston-head and the upper end of the cylinder. The piston is thereby caused to move downward and deliver its blow upon the tool. The downward movement of the piston again uncovers the port 31, placing the same in communication with the upper port of the cylinder 10, and the air is thereby exhausted therefrom and the downward movement of the piston is arrested. During the latter portion of the downward movement of the piston the air is compressed between the shoulder 26 of the piston and the shoulder 13 of the cylinder, thereby cushioning the closing portion of the downward blow of the piston. The rate of speed of the piston is very great, reaching as high as two thousand strokes per minute. As soon as the tool is withdrawn from the open lower end of the cylinder the piston seats itself with its shoulder 26 in contact with the shoulder 13 of the cylinder, at the same time cutting off communication between the port 20 and the enlarged chamber or bore 11 in the upper end of the cylinder, so that the reciprocation of the piston automatically stops as soon as the shank of the tool is removed and is again started by the insertion thereof, which raises the piston until the groove or port 27 reëstablishes communication between the port 20 and the upper chamber or bore 11 of the cylinder.

The pneumatic hammer thus constructed is, as is well known, capable of a widely-extended range of applications, both as a metal-worker's device and as a stone-worker's device for chipping, calking, riveting, and all other purposes to which a continuously-operating hammer is adapted.

The machine constructed as described is exceedingly simple and durable, being composed of but very few parts and not liable to get out of order, while at the same time it is easy to examine and repair, if necessary. The piston is cushioned at each end of its stroke and the shock, jar, or vibration is thereby reduced to a minimum.

Although I have described the device as a pneumatic hammer, it is obvious that fluid-pressure of any suitable description may be employed to actuate the hammer.

I claim—

1. A valveless pneumatic hammer comprising a cylinder having a bore of large diameter at its upper end and of small diameter at its lower end, each section of said bore being of equal diameter throughout, and a piston having an enlarged head and reduced body to fit said bore, the cylinder having an inlet-port opening into the reduced portion slightly below its top and an outlet-port opening from the enlarged portion above the normal downward position of the piston, and the piston having an external groove or port slightly below its shoulder, a second external groove or port below said first-mentioned groove or port,

and a passage extending from the upper end of the piston to said lower groove or port, the lower end of the cylinder being closed by the piston throughout its range of movement, substantially as described.

2. A pneumatic hammer, comprising a cylinder or casing having a bore or chamber of unequal diameter in its upper and lower portions, an air port or passage opening into the reduced lower portion a short distance below the shoulder between the two portions, and an exhaust-port opening into the larger upper portion above said shoulder, and a piston or hammer proper having an enlarged head to fit the upper portion of the cylinder, a smaller body to fit and close the lower portion of the cylinder, an external groove a short distance below the shoulder thus formed, a passage or chamber of tapering or diminishing diameter extending from the upper end of said piston downward to the lower portion thereof, and an external groove in the lower portion of the piston below the first-mentioned groove and communicating with the internal passage or chamber thereof, substantially as described.

3. In a pneumatic hammer of the class described, the combination, with a cylinder and its piston, said cylinder being open and threaded at its upper end and provided with a seat below said threaded portion, of a cylinder-head shouldered to fit said seat, and a handle threaded to fit the cylinder above the head thereof and hold the latter in position, said handle being recessed at its lower end to form an air-chamber and notched at its extremity to form air-passages between it and the cylinder-head, whereby said air-chamber communicates with the interior of the cylinder, substantially as described.

EDMOND A. FORDYCE.

Witnesses:
FREDERICK C. GOODWIN,
IRVINE MILLER.