No. 850,592. PATENTED APR. 16, 1907

W. LEWIS.

PNEUMATIC VIBRATOR OR HAMMER.

APPLICATION FILED OCT. 5, 1906.

Fig. 1.

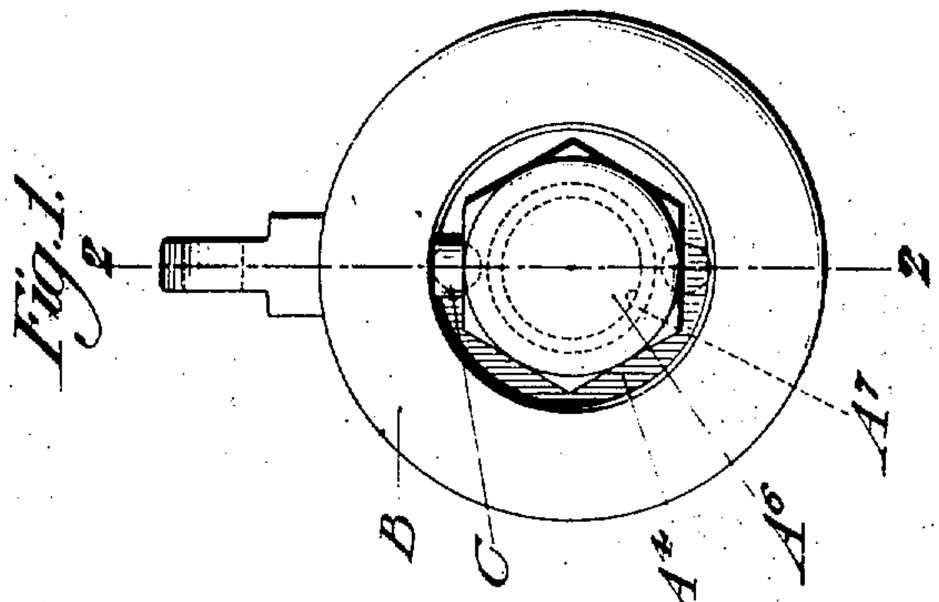


Fig. 3.

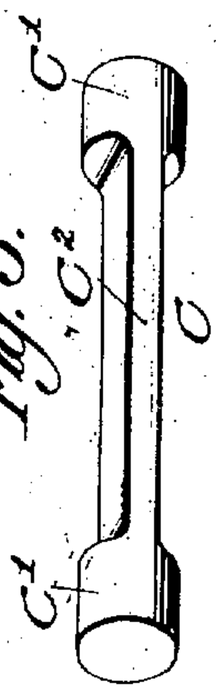


Fig. 2.

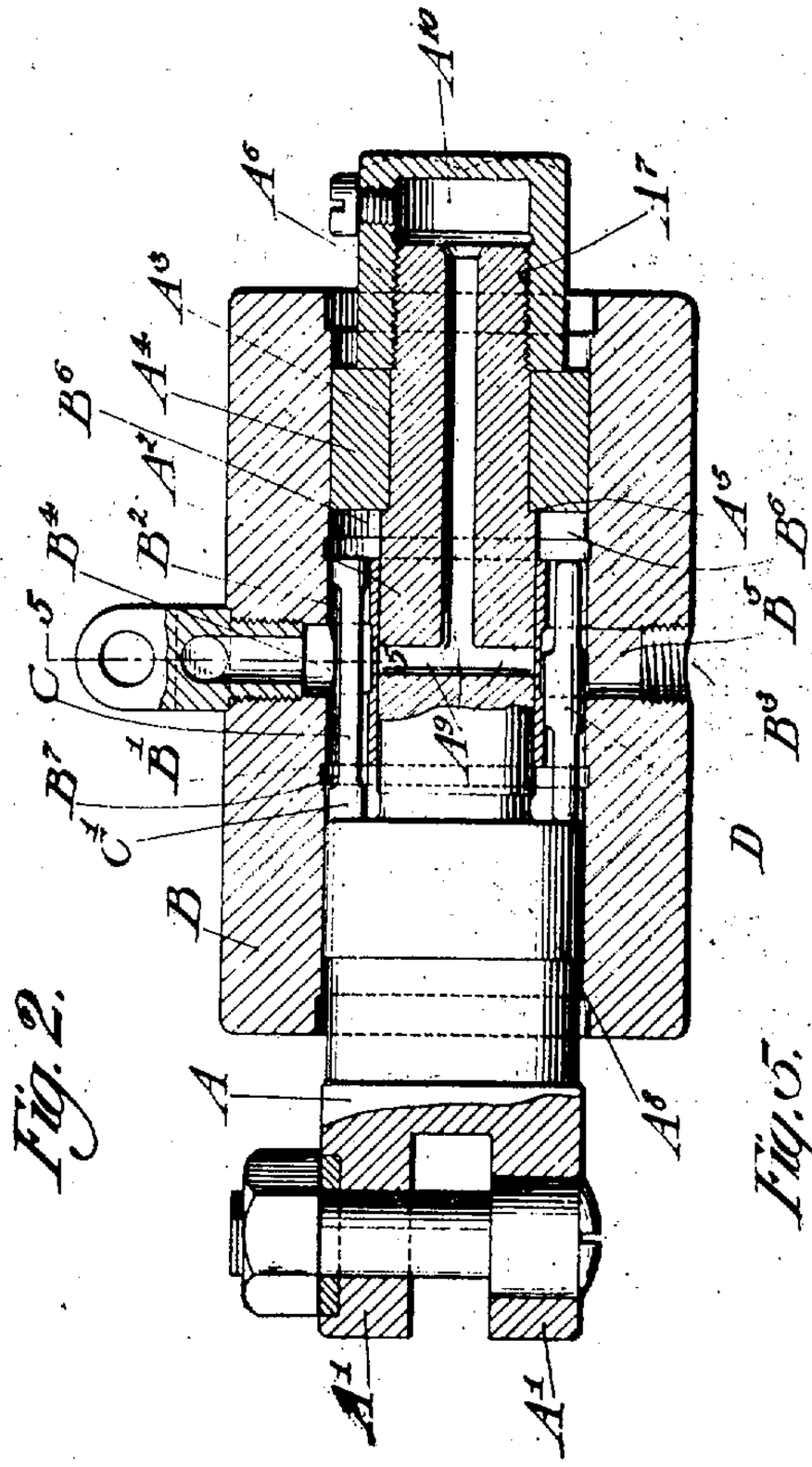


Fig. 4.

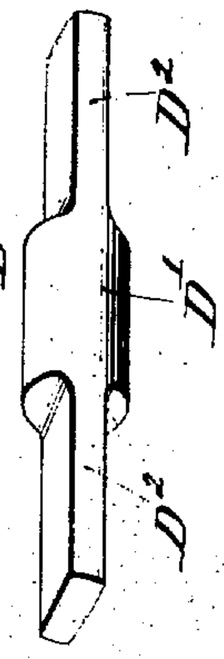
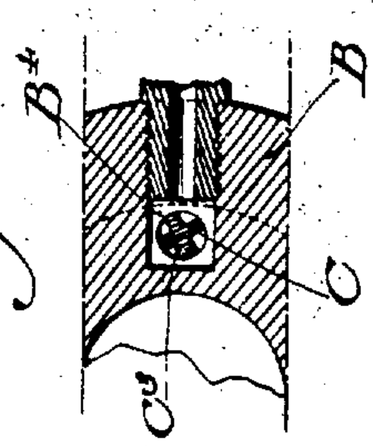


Fig. 5.



WITNESSES:

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PNEUMATIC VIBRATOR OR HAMMER.

No. 850,592. Specification of Letters Patent. Patented April 16, 1907.

Application filed October 5, 1906. Serial No. 337,502.

To all whom it may concern:

Be it known that I, WILFRED LEWIS, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Pneumatic Vibrators or Hammers, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My present invention relates to pneumatic instruments, such as vibrators or hammers, and particularly to such of these instruments as are designed for relatively heavy service, and has for its main purpose the production of a vibrator or hammer which is simple in construction and reliable in operation.

One of the objects of my invention is the construction and arrangement of the valves whereby they are made simple and reliable in operation and are arranged relatively to the ports or passages controlled by them, so that but little cushioning of the blow is had, and therefore a powerful jarring blow may be struck.

Another object of my invention is the arrangement of the device so that the striking member of the instrument is a movable cylinder member surrounding a relatively stationary piston. This permits the weight of the striking member to be made as heavy as desired, while at the same time permitting the instrument as a whole to be materially smaller than would be the case if the piston were the movable member.

The various novel features of construction and arrangement which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of my invention, however, and the advantages possessed by it reference may be had to the accompanying drawings and descriptive matter, in which I have illustrated and described one of the forms in which my invention may be embodied.

In the drawings, Figure 1 is an end elevation of a pneumatic vibrator or hammer. Fig. 2 is a sectional elevation on the line 2 2 of Fig. 1. Fig. 3 is a perspective view of the exhaust-valve. Fig. 4 is a similar view of the inlet-valve, and Fig. 5 is a partial section on the line 5 5 of Fig. 2 and illustrating a modified valve construction.

The instrument shown is primarily designed for jarring castings to clean them, though it is obviously capable of use in many different relations. It comprises the cylindrical piston member A, provided at one end with apertured ears A′, by means of which the piston may be secured to the work to be jarred. The piston member is reduced at A^2 and is further reduced at A^3 to receive an annular member A^4. The member A^4 is secured against the shoulder A^5 by a hollow nut A^6, screwed on the threaded end A^7 of the piston.

A cylindrical hammer member B, the body of which closely surrounds the portion A^8 of the piston and the member A^4, is provided with an internally-projecting circumferential rib B′, which is slidingly fitted on the reduced portion A^2 of the piston. The axial length of the rib B′ is shorter than the corresponding dimension of the reduced portion A^2. Axial passages B^2 and B^3 are formed in the flange B′. An exhaust-passage B^4 communicates with the passage B^2 between its ends, and an inlet-passage B^5 communicates with the passage B^3 between its ends. A valve member C is located in the passage B^2 and a valve member D in the passage B^3. The valve C comprises cylindrical portions C′, adapted to close the ends of the passage B^2 and a connecting-body portion C² of reduced cross-section. The valve D comprises a cylindrical central portion D′, fitting the passage B^3 and having reduced end or stem portions D^2. Each of these valves may be formed by cutting away portions of a cylindrical bar, as shown best in Figs. 3 and 4. Instead of being flattened the stem portions of both valves may have axial grooves formed in their periphery, as the grooves C^3 in the stem of the valve C. (Shown in Fig. 5.)

As shown, the two valve members are of the same length. The distance between the cylindrical portions C′ of the valve C is substantially equal to the axial length of the flange B′, and the axial length of the cylindrical portion D′ of the valve D is just sufficient for it to close the portions of the passage B^3 at each side of the port B^5 when in the proper position. Passages A^9, leading from

a reservoir A^{10}, formed in the nut A^6 and containing lubricating material are provided for lubricating the surfaces of contact between the rib B′ and portion A^2. The passages B^2 and B^3 preferably lead from enlarged portions of the passages B^4 B^5. In the form shown, these passages are cylindrical and the passages B^4 and B^5, which are of greater diameter than the passages B^2 and B^3, extend through the latter, as shown best in Fig. 5.

The operation of the device may be readily understood from Fig. 2. In the position shown the valves are arranged to permit air to pass from the port B^5 to the cylinder-space B^6 at the right-hand end of the rib B′, while at the same time air may exhaust from the cylinder-space B^7 at the left-hand end of the rib B′ through the port B^4. This tends to move the cylinder B to the left, as seen in Fig. 2. It will be observed that both valves are held in the position shown in which they engage the left-hand end of the wall of the recess in which the rib B′ is axially movable by the pressure in the portion of this recess at the right of the rib. As the hammer member approaches the limit of its movement to the left the valve member D first closes the communication between the right-hand end of the valve-passage B^3 and the inlet-port B^5 and then opens communication between the port B^5 and the left-hand end of the valve-passage B^3. During the same period a relative movement between the hammer member and the valve C is produced, which closes the communication between the space B^7 and the exhaust-port B^4 and opens communication between the exhaust-space B^6 and the exhaust-port B^4. After the left-hand end portion C′ has entered the corresponding end of the valve-passage B^2 there is a cushioning, due to the compression of the working fluid then in the space B^7. This cushioning can be reduced to a minimum by cutting away the outer ends of the end portions C′. In this case if it is desired to preserve the same relation between the inlet and exhaust valves the ends of the inlet-valve D should be correspondingly cut away. By varying the relative lengths of the two end portions C′ the blow due to the movement of the movable member may, if desired, be cushioned in one direction more than that due to the movement in the opposite direction.

As soon as the space B^6 is connected to exhaust the fluid-pressure in the space B^7 causes the valve members to be moved into engagement with the member A^4, where they are held by the fluid-pressure until the hammer member approaches the limit of its movement toward the right.

In the particular form of my invention disclosed the cylindrical member B is the hammer member, and with this construction I am able to increase the weight of the striking member without increasing the bulk of the instrument, as would be necessary if the member A were the hammer member. It is obvious, however, that the novel valve arrangement disclosed is not necessarily limited to this form of hammer.

The construction shown and described has been found in actual practice to be highly effective and reliable. It will be obvious, however, to those skilled in the art that changes may be made in the form of my invention without departing from its spirit, and I do not wish the claims hereinafter made to be limited to the particular embodiment disclosed more than is made necessary by the state of the art.

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

1. In a fluid-actuated hammering device, a relatively stationary member having a recess formed in its outer surface, a tubular hammer surrounding said stationary member and provided with an inwardly-projecting portion entering said recess and axially movable therein, and means for alternately admitting fluid under pressure to said recess at one side of said projection and exhausting the fluid so admitted.

2. In a fluid-actuated hammering device, a relatively stationary cylindrical member, having a circumferentially-extending recess formed in its periphery, a tubular hammer member surrounding the first-mentioned member and provided with an inwardly-extending circumferential rib entering and axially movable in said recess and means for alternately connecting the portions of the recess at opposite sides of the projection to a source of fluid under pressure and while one of said portions is so connected exhausting the fluid from the other portion.

3. In a fluid-actuated hammering device, a member having a recess formed in its outer surface, a tubular member surrounding the first-mentioned member and provided with an inwardly-projecting portion entering said recess and relatively movable therein in an axial direction, means for alternately admitting fluid under pressure to said recess at one side of said projection and exhausting the fluid so admitted, said projection having valve-passages formed in it and valve members located in said passages and actuated jointly by the fluid-pressure in the recess and movement of one member relative to the other to control the admission and exhaust.

4. In combination, a cylindrical member having a circumferential recess formed in its periphery, a tubular member surrounding said cylindrical member and provided with an inwardly-projecting rib or flange entering said recess and axially movable therein, said rib having a valve-passage formed in it extending axially from end to end of the rib and communicating with an inlet-port formed in

the wall of the tubular member and a valve member located in said passage and provided with a cylindrical body portion fitting said passage and reduced end portions, said body and end portions being so arranged that the movement of one member to the limit of its movement relative to the other in either direction causes the valve member to engage said cylindrical member and be moved to admit fluid from the inlet-port to the proper end of the recess, to produce the return movement of the hammer member.

5. In combination, a tubular member provided with an inner circumferential flange or rib, a member surrounded by said tubular member and provided with a recess in which said rib is received and is axially movable, said rib having an axially-extending valve-passage formed in it, an exhaust-valve in said passage, said exhaust-valve comprising end portions adapted to close the corresponding ends of the valve-passage, and a reduced body portion of a length substantially equal to the thickness of the rib.

6. In combination, a tubular hammer member provided with an inner circumferential flange or rib, a relatively stationary member surrounded by said hammer member and provided with a recess in which said rib is received and between the end walls of which said rib is axially movable, said rib having an axial valve-passage formed in it communicating between its ends with an exhaust-port, and an exhaust-valve in said passage, said exhaust-valve comprising end portions adapted to close the corresponding ends of the valve-passage and a connecting stem portion of a length substantially equal to the thickness of the rib.

7. In combination, a tubular member provided with an inner circumferential flange or rib, a member surrounded by said tubular member and provided with a recess in which said rib is received and between the end walls of which said rib is movable, said tubular member having a valve-passage formed in it extending between opposite sides of said rib and having an inlet-port communicating with said valve-passage between its ends, and an inlet-valve in said valve-passage provided with a body portion filling the passage and of a length sufficient to close the inlet-port, and end stem portions, said end portions being of such a length that they project beyond the sides of the rib when the body portion is in a position to close the inlet-port.

8. In combination, a tubular hammer member provided with an inner circumferential flange or rib and a relatively stationary member surrounded by said hammer member and provided with a recess in which said rib is received and between the end walls of which the rib is axially movable, said rib having axially-extending inlet and outlet valve passages formed in it, valve members in said valve-passages controlling the admission of a working fluid to and its exhaust from the portion of the recess at each side of the rib, said valves being so arranged that the movement of the hammer member to the limit of its movement in one direction causes the valves to be actuated to produce the return movement of the hammer and so that the fluid acting on the valves tends to hold them in the position into which they have moved until the hammer approaches the limit of its movement in the opposite direction.

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Witnesses:
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D. STEWART.