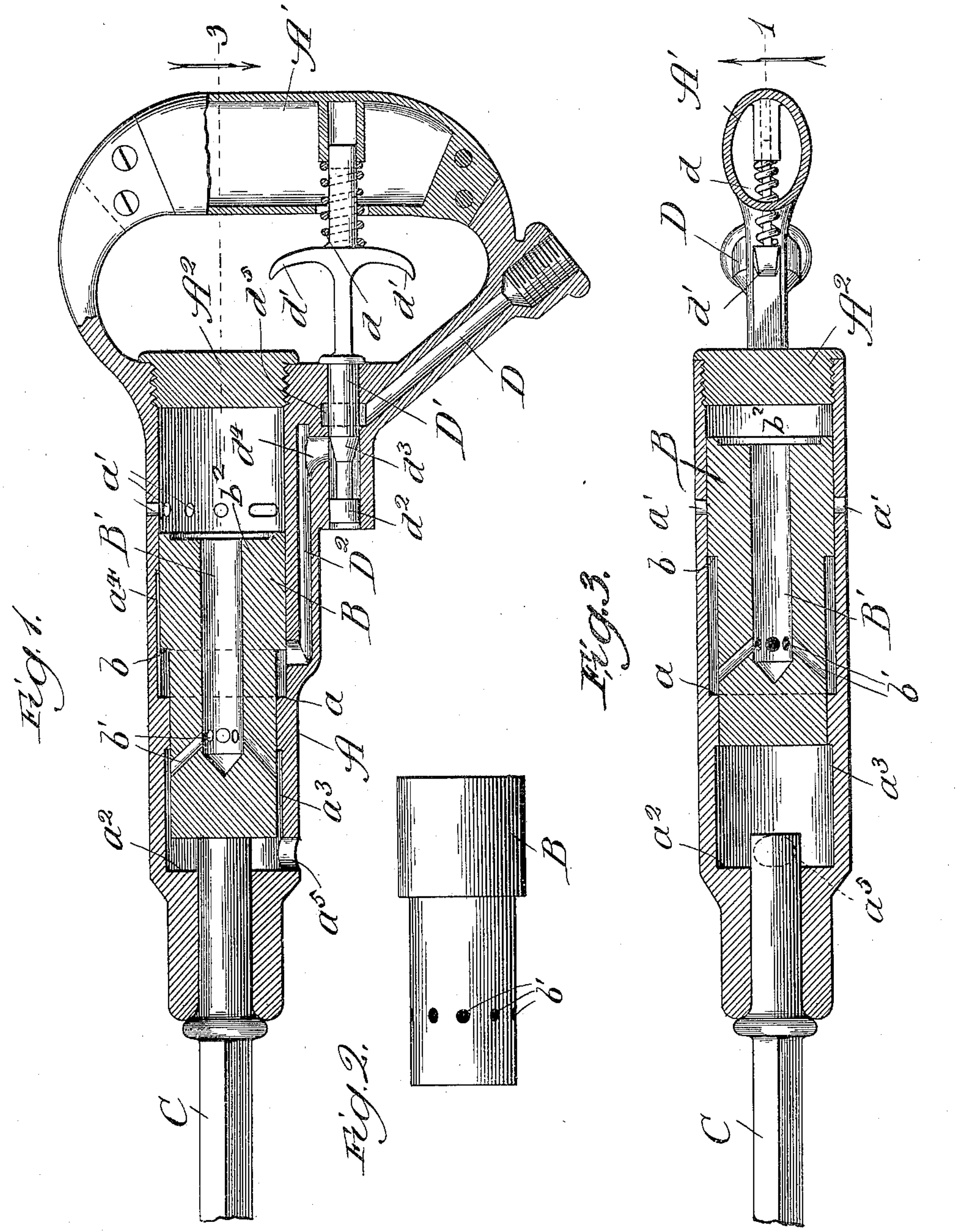
(No Model.)

2 Sheets—Sheet 1.

A. PARFITT.

PNEUMATIC HAMMER.

No. 604,633. Patented May 24, 1898.



Witnesses:
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Inventor:
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Att'ys.

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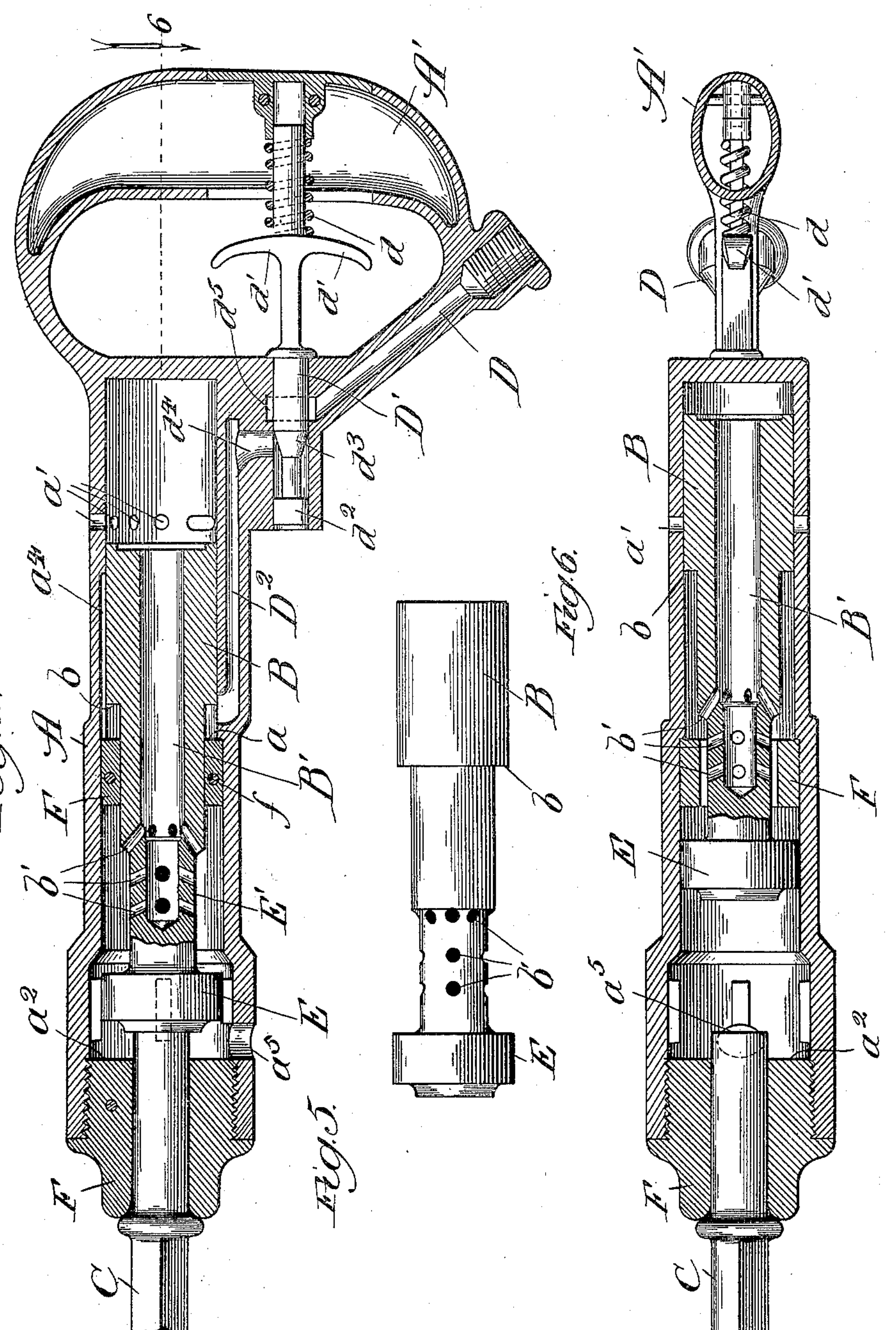

Fig. 4. Fig. 5. Fig. 6.

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UNITED STATES PATENT OFFICE.

ALFRED PARFITT, OF TOPEKA, KANSAS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE JOHNSON-PARFITT TOOL COMPANY, OF SPRINGFIELD, ILLINOIS.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 604,633, dated May 24, 1898.

Application filed August 25, 1896. Serial No. 603,828. (No model.)

To all whom it may concern:

Be it known that I, ALFRED PARFITT, a citizen of the United States, residing at Topeka, Shawnee county, Kansas, have invented certain new and useful Improvements in Pneumatic Hammers and Drills, of which the following is a specification.

In the drawings, Figure 1 is a longitudinal sectional elevation of my improved pneumatic hammer and drill; Fig. 2, a side elevation of the plunger; Fig. 3, a longitudinal sectional plan view of my improved hammer and drill, taken in line 3 of Fig. 1, showing the plunger in a different position; Fig. 4, a longitudinal sectional elevation of a modified form of my hammer and drill; Fig. 5, a side elevation of the plunger used in such modified form, and Fig. 6 a longitudinal sectional plan taken in line 6 of Fig. 4.

In making my improved pneumatic hammer or drill—the one or the other, dependent upon the kind of tool employed—I make a metallic cylinder A, provided with a handle A' to enable the operator to hold it in position for work. The cylinder is provided with a plug A^2 to close the end next to the handle, or the "outer" end, as I will for convenience term it. It is also provided with an internal annular shoulder a, exhaust-ports a', arranged at a desired distance from the outer end, and with an annular stop a^2, where the bore of the cylinder is diminished in size to receive and hold the tool. A plunger B is arranged in the bore of the cylinder and provided with a longitudinal hole or bore B', extending from the "outer end," as it may be termed, of the plunger down a convenient distance into the plunger. The plunger is also provided with an annular shoulder b and with annular inclining holes or ports b', which extend into the central hole or bore B'. The ends of these ports b' open into an annular space a^3. The cylinder is also provided with an emergency groove or recess a^4, extending from the shoulder a along the side of the cylinder a distance a little in excess of the distance between the shoulder b of the plunger and its outer end. The outer end of the plunger is also provided with a recess b^2, so that should the plunger be moved entirely out until its end was against the plug A^2 no joint will be formed, inasmuch as the recess permits the ingress of air between the plug and the end of the plunger, so that it may be returned into working position again. A tool C, which may terminate in a hammer or drill, is arranged in what for convenience may be termed the "inner end" of the cylinder A. This tool extends far enough up into the cylinder so that its end may be struck by the plunger and forced out the distance of the stroke, either to drill a hole, to head a rivet, or for other purposes. The cylinder A is also provided with an exhaust-port a^5 to assist in the escape of the air after a stroke of the plunger has been made. It also operates as a breathing-hole, so that the atmospheric air may come in as the plunger is retracted.

Near the handle of the hammer is arranged a duct D for the introduction of air, gas, steam, or other fluid under pressure, which is furnished from any convenient storage-receptacle. At the inner end of this duct is arranged, transverse to it, a throttle D', which is held in its forward position by a spring d, and which may be drawn back by the fingers of the operator pulling against the finger-holds d'. This throttle is provided with a head d^2 and a beveled inclined portion d^3, with a diminished stem or portion between them. When it is in its in position, it closes the duct D; but as it is drawn back by the fingers of the operator the beveled portion d^3 is drawn back past the end of the duct, so that the air can enter and pass around the diminished portion and on through an opening d^4 into the duct D^2 into the cylinder below the shoulder b of the plunger. The beveled portion of the throttle serves to graduate the entrance of the motive fluid instead of permitting its full force to enter at once, as would be the case were such beveling not employed.

An annular groove d^5 is arranged around the throttle D', so that the air or other fluid used, which is under pressure, will bear against the throttle equally from all sides, so as to balance or equalize the pressure.

In operation the duct D is connected with a source of fluid under pressure. The plunger B is in the position shown in Fig. 1. The throttle is drawn back by the fingers of the operator and the air or other fluid rushes in through the opening d^4 and through the duct D^2 and enters the cylinder below the shoulder b on the plunger. This causes the plunger to move outward until the ports b' pass beyond the edge of the shoulder a, when the fluid motive power enters through such ports and up through the hole or bore B' into the space in the cylinder between the plug A^2 and the outer end of the plunger. This causes the pressure to immediately give the plunger an impulse in, so that its end or shank strikes against the end of the tool. As the plunger moves forward for its stroke its outer end passes the exhaust-ports a' and the ports b' come to open into the annular space or channel a^3. This enables the air to exhaust into the atmosphere through the exhaust-ports a' and a^5. As this is done the parts are brought into position for the air to again enter beneath the shoulder of the plunger b and throw the plunger out, when the operation above described will be repeated and the plunger continue to strike the tool as long as the throttle is held out by the fingers of the operator and the tool is in position to be struck by the plunger. As soon as the tool is removed by the operator, however, the plunger moves in until its end or shank rests against the shoulder a^2. This excessive inward movement will have brought the shoulder b past the edge of the opening of the duct D^2, so that air or other motive fluid no longer can enter below the shoulder b to throw the plunger out. The plunger is therefore in what may be termed a "locked" position, so that it ceases its operation even though the throttle B be open. When this has happened, the channel a^4 opens into the space above the outer end of the plunger, so that any air that may possibly leak in beneath the shoulder b will have a way of escaping without forcing the plunger out. When the tool, however, is returned to position, the plunger will be pushed out, so that it again becomes operative.

In Figs. 4, 5, and 6 I have shown a modification of my pneumatic hammer or drill. In describing these figures I will employ the same letters where they indicate the same parts, as in Figs. 1, 2, and 3, but different letters to indicate modifications.

In the form shown in Figs. 4, 5, and 6 the plunger is made with a head E and a diminished portion E′. The plunger is inserted at the tool end of the cylinder instead of at the handle end. A plug F, which may be screwed in and out, permits the insertion or removal of the plunger. The shoulder a is formed by a ring F′, that is inserted with the plunger before the plug F is screwed into place. This ring is what is usually termed a "split" ring, formed in two parts, and after it is inserted in place with the plunger it is attached or fastened to the cylinder by pins f, which pass through the cylinder and through the edge of the ring. Instead of having a single set of ports b', as shown in the first three figures, I have shown three sets; but of course it is immaterial whether one or more sets be used, as the operation is the same. The head E of the plunger presents a bearing-surface, against which the pressure of the motive fluid is exerted—the same as against its outer end—when the plunger is moved out far enough to permit the diminished portion E′ of the plunger to pass beyond the edge of the shoulder a. At the commencement of the instroke of the plunger the air or motive fluid coming through the duct D^2 has a direct communication with the outer side of the head E, so that direct pressure is exerted on such head, as well as upon the outer end of the plunger. As the plunger moves in, however, so that the direct pressure of the fluid on the head E is cut off by the shoulder a, there is still exerted the pressure of the motive fluid which is in the space between the ring F′ and the head E of the plunger and the air that passes into such space through the ducts b'. In this modified form of arrangement, therefore, I consider that I get an increased fluid-pressure and increased rapidity and strength of blow of the plunger against the tool. If desired, also, the plunger may be made with several heads E to present additional bearing-surfaces for the air to bear against in giving the stroke or blow. In other respects the operation of the device shown in Figs. 4, 5, and 6 is similar to the operation of the form shown in Figs. 1, 2, and 3.

While I have described the construction and operation of my improved pneumatic hammer or drill with considerable minuteness and detail, I do not wish it to be understood that I propose to limit myself to specific features and details of construction further than as specified in the claims.

I claim—

1. In a machine of the class described, the combination of a shouldered piston, a port adapted to give constant supply of motive agent beneath the shoulder, an exhaust-port, and a passage in the piston leading to its larger end adapted to communicate alternately with the supply and exhaust ports at opposite ends of its stroke, substantially as described.

2. In a machine of the class described, the combination of a cylinder having an enlarged bore at one end, and a correspondingly-shaped piston, a supply-port leading into the inner end of the enlarged bore adapted to give a constant supply of motive agent, and a passage in the piston leading to the large end having a port adapted to connect alternately with the supply and an exhaust port at the opposite ends of the stroke and to be closed intermediate thereof, substantially as described.

3. In a pneumatic hammer or drill, the combination of a cylinder provided with a duct for the inlet of the motive fluid and with an annular shoulder between the opening of

the duct and the tool end and with an emergency groove or duct arranged along its inner surface, a plunger provided with an annular shoulder arranged at such a distance from its outer end as to enable the outer end of the emergency groove or duct to open into the cylinder beyond the end of the plunger when the tool is out and the plunger fully in, and means for admitting the motive fluid into the cylinder between the shoulder on the cylinder and the annular shoulder on the plunger.

4. In a pneumatic hammer or drill, the combination of a cylinder provided with a duct for the inlet of the motive fluid and with an annular shoulder between the opening of the duct and the tool end, a plunger provided with an annular shoulder and with a head E at its tool end so that as the plunger is moved out the motive fluid is admitted to the outer side of the head, and means for admitting the motive fluid into the cylinder between the annular shoulder on the cylinder and the annular shoulder on the plunger.

5. In a pneumatic hammer or drill, the combination of a cylinder provided with a duct for the inlet of the motive fluid and with an annular shoulder between the opening of the duct and the tool end, a plunger provided with an annular shoulder and with a head E at its tool end and with a diminished portion between the annular shoulder and its head E, so that as the plunger is moved out its diminished portion will come opposite the inner end of the duct for the inlet of the motive fluid, and means for admitting the motive fluid into the cylinder between the annular shoulder on the cylinder and the annular shoulder on the plunger.

6. In a pneumatic hammer or drill, the combination of a cylinder provided with a duct for the inlet of the motive fluid and with an annular ring between the opening of the duct and the tool end, a plunger provided with an annular shoulder and with a head E at its tool end, both of larger diameter than the bore of the ring, and means for admitting the motive fluid into the cylinder between the annular ring and the annular shoulder on the plunger.

7. A valveless portable pneumatic hammer in which there is combined a casing provided with a fluid-pressure chamber and inlet and exhaust openings, an operating-tool in one end thereof, a reciprocating piston-hammer in the casing arranged to contact the operating-tool at one limit of its stroke and divide the pressure-chamber into two chambers, and means whereby fluid-pressure is admitted constantly to one end of the piston and through the piston is alternately admitted to and exhausted from the other end of the piston to reciprocate the same and operate the parts, substantially as described.

8. In a machine of the class described, a casing provided with fluid pressure and exhaust chambers, an operating-tool in one end of the casing, a reciprocating piston-hammer in the chambers of the casing arranged to contact the operating-tool at one limit of its stroke and divide the exhaust from the pressure chamber, a head portion on such piston-hammer dividing the pressure-chamber into two chambers, one a constant-pressure chamber and the other a main intermittent-pressure chamber, so as to present a larger superficial area of the piston in the main chamber over the surface presented in the constant-pressure chamber, means whereby fluid-pressure is admitted constantly to the constant-pressure chamber, a passage in the piston for alternately connecting the main and constant-pressure chamber and the main pressure and exhaust chambers by the movements of the reciprocating piston to supply to and exhaust fluid-pressure from the same, substantially as described.

9. In a machine of the class described, the combination of a casing provided with a pressure and exhaust chamber, an operating-tool in one end thereof, a reciprocating piston-hammer in the casing arranged to contact the operating-tool at one limit of its stroke and divide the pressure from the exhaust chambers, a head portion on the piston dividing the pressure-chamber into two chambers, one an annular pressure-chamber between the body, the piston and the casing and the other a main pressure-chamber between the head and the end of the casing and presenting a larger superficial area of piston-surface than in the annular chamber, an inlet-passage connected with the annular chamber whereby fluid-pressure is admitted constantly thereto, and a passage in the piston whereby the main and constant-pressure chamber and the main and exhaust chambers are alternately connected to admit to and exhaust fluid-pressure from the main chamber during the movements of the piston, substantially as described.

ALFRED PARFITT.

Witnesses:
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THOMAS B. MCGREGOR.