No. 826,802. PATENTED JULY 24, 1906.

J. M. & E. W. RAIKES.

PNEUMATIC HAMMER.

APPLICATION FILED DEC. 19, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

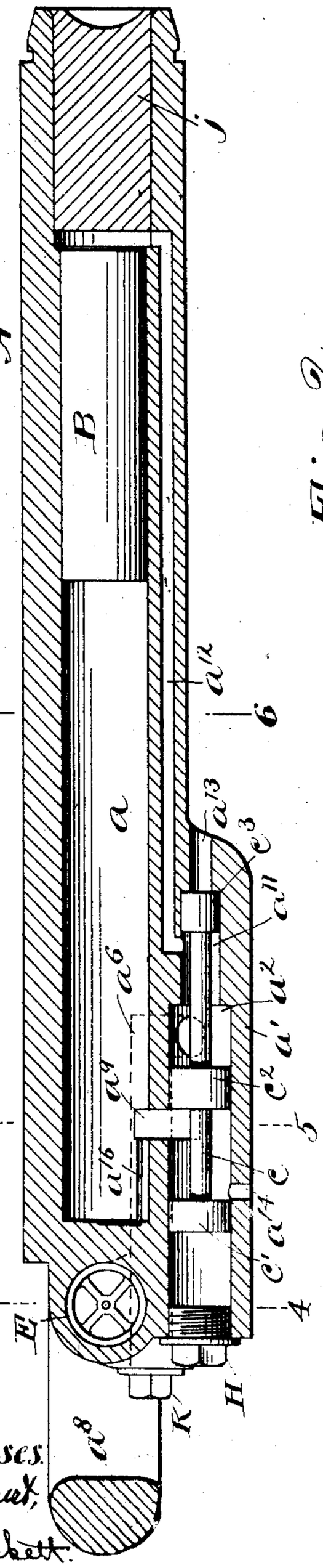


Fig. 2.

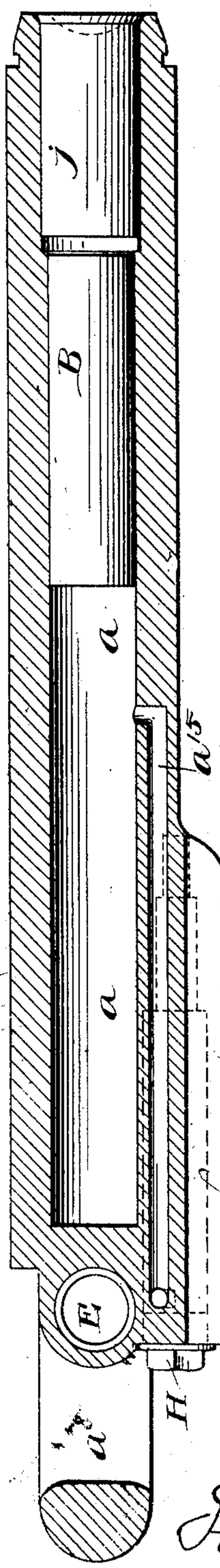
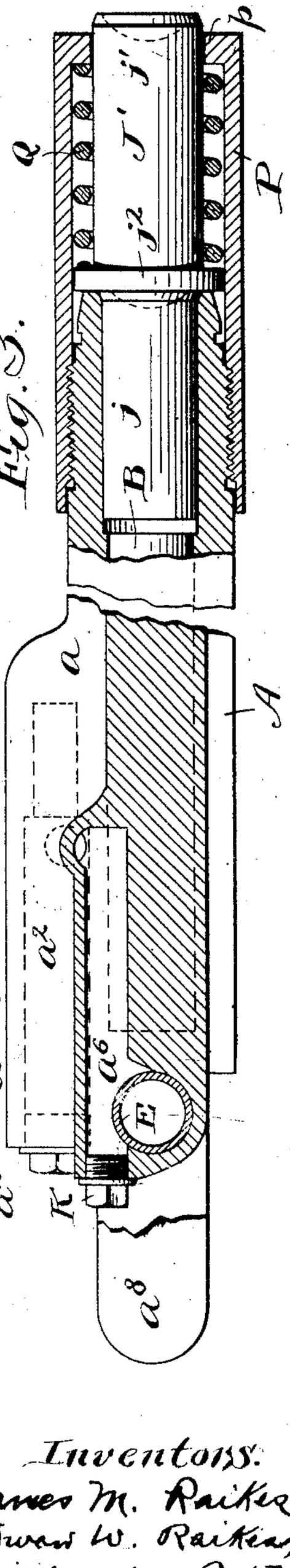


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

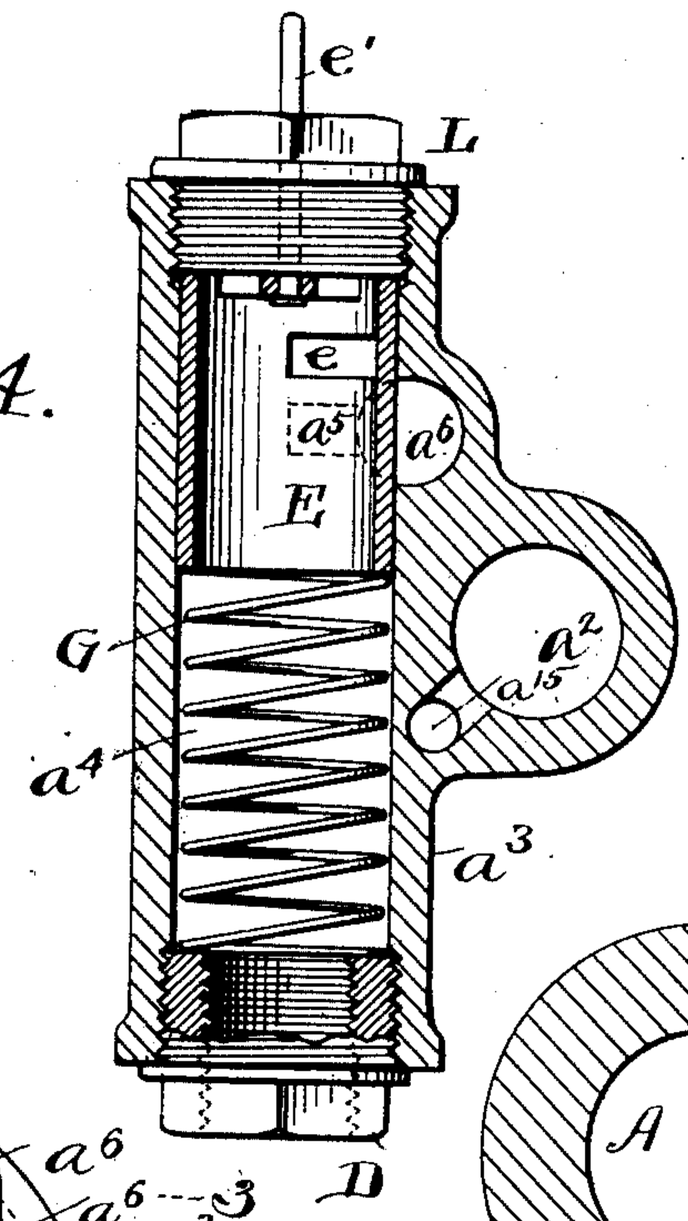


Fig. 5.

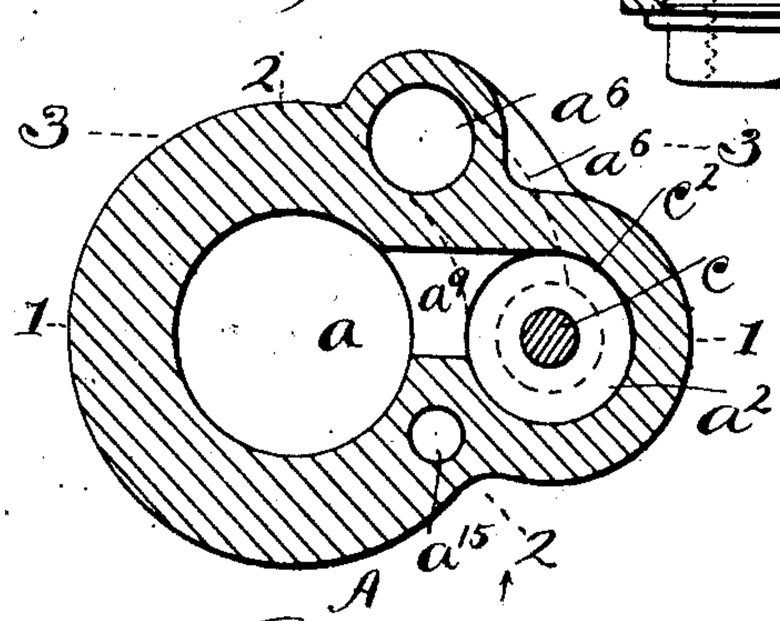


Fig. 6.

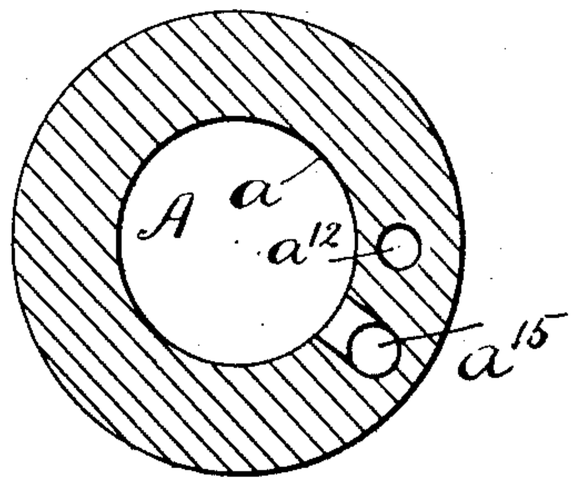
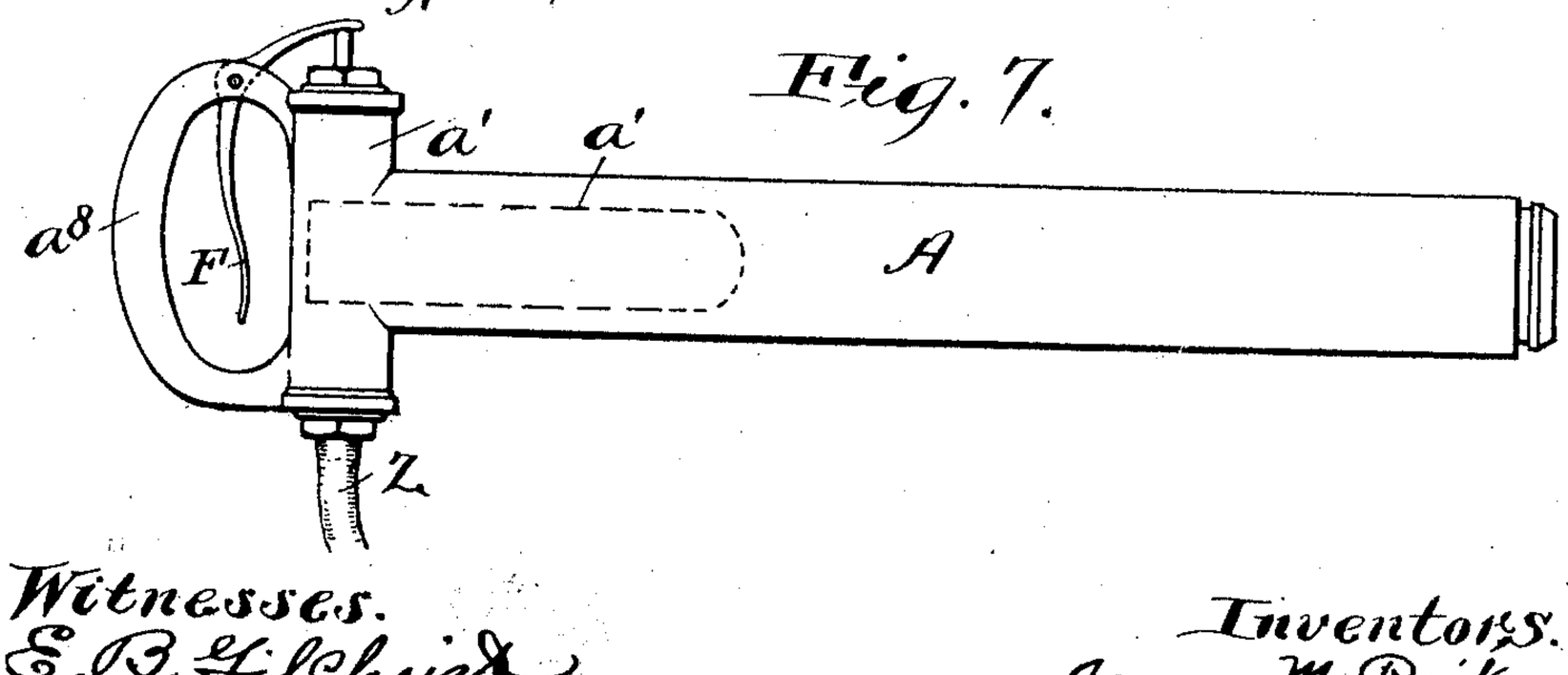


Fig. 7.



Witnesses.
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UNITED STATES PATENT OFFICE

JAMES M. RAIKES AND EDWARD W. RAIKES, OF CLEVELAND, OHIO.

PNEUMATIC HAMMER.

No. 826,802. Specification of Letters Patent. Patented July 24, 1906.

Application filed December 19, 1904. Serial No. 237,418.

To all whom it may concern:

Be it known that we, JAMES M. RAIKES and EDWARD W. RAIKES, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Pneumatic Hammers, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide a pneumatic hammer in a form which shall be very simple in construction, effective in service, and not liable to get out of order. To this end we have devised a hammer having very few parts, and those so arranged that they may be cheaply constructed.

The invention may be best summarized as consisting of the combination of the parts hereinafter explained, and definitely set out in the claims.

In the drawings, Figures 1, 2, and 3 are longitudinal sections through the hammer, the sections being taken on different planes through the various passage-ways, as indicated by the correspondingly-numbered lines in Fig. 5. Figs. 4, 5, and 6 are cross-sections on the correspondingly-numbered lines of Fig. 1. Fig. 7 is a side elevation of the hammer complete.

Referring to the parts by letters, A represents a barrel having a smooth cylindrical bore a, in which a piston B is adapted to reciprocate. Made integral with the barrel A is a valve-casing a', in which a valve C is placed which is operated by the air itself to change the direction of the stroke of the piston, as hereinafter explained. Integral also with the barrel and valve-casing a' is a tubular casing a^3, providing an admission-chamber a^4, into which the air is continuously admitted and which has a hand-operated valve to admit the air to the valve-chamber a^2.

Screwing into one end of the admission-casing a^3 is a tubular plug D, which is adapted to receive the air-pipe Z. Sliding within the bore of this casing a^3 is a tubular valve E, which has an opening e, adapted to aline or be out of alinement with the port a^5 of the passage-way a^6, leading to the valve-chamber a^2. When the valve E covers the port a^5, air is shut off from the automatic valve C. When, however, the port e alines with the port a^5, air is admitted to the automatic valve.

The valve E is controlled by a hand-lever F, bearing on the stem e' of the valve and pivoted to the handle a^8, which is made integrally with the barrel of the tool. A spring G, between the valve E and the plug D, tends to hold the valve E in closed position. When, however, the finger-lever F is drawn toward the handle a^8, the valve E is forced inward toward the spring, the opening e registering with the port a^5, and thereupon air is admitted through the passage-way a^6 to the valve-chamber a^2.

Leading from the valve-chamber a^2 into the bore a of the barrel is a passage-way a^9. The chamber a^2 has a cylindrical extension a^{11}, and from this extension a passage-way a^{12} leads along in the wall of the barrel to a point beyond the outer end of the piston. The valve C consists of three solid pistons c', c^2, and c^3, mounted on a common stem c. The pistons c' c^2 occupy the larger portion of the bore a^2 of the valve-chamber, and the piston c^3 occupies the extension a^{11}. Leading from the extension-chamber a^{11} beyond the piston c^3 is an exhaust-port a^{13}, and leading from the chamber a^2 between the valve-heads c' c^2 is an exhaust-port a^{14}. The end of the chamber a^2 is closed, as by means of a plug H, and the space between this plug and the valve-head c' is connected by a passage-way a^{15} with the main bore a intermediate of the entrance of the passage-ways a^9 and a^{12}.

The purpose of the passage-ways and the valve-heads will be best understood from a description of the operation. Assuming that the piston is near the outer end of its stroke, as shown in Figs. 1 and 2, and that the valve E is forced inward to constantly admit air to the passage-way a^6, the valve C being in the position shown in Fig. 1, the air from the passage-way a^6 into the chamber a^2 passes through the passage-way a^{12} to force the piston inward, and at the same time, acting on the larger area of the head c^2, it starts the valve toward the left. Before the valve has moved far, however, the piston has covered the entrance to the passage-way a^{15}, and this blocks the exit from the space between the plug H and the head c' and retards the movement of the valve. When the outer end of the piston uncovers the passage-way a^{15}, the air at the left of the head c' is relieved, and the air-pressure on the right side of the head c^2 forces the valve to the left, so that by the time the piston has reached the inner end of its stroke and is bounding back by means of the air-cushion therein the passage-way a^9 is coupled with the passage-way a^6. Live air is

thus admitted from the passage-way a^6 through the passage-way a^9 onto the inner end of the piston, which is thus driven outward, forcing the air beyond it out through the passage-way a^{12} and the exhaust a^{13}. When the inner end of the piston uncloses the passage-way a^{15} on its outward stroke, the compressed air in the barrel enters through the passage-way a^{15} onto the left side of the head c' and, acting on greater area than the head c^2, forces the valve to the right. This closes the exhaust a^{13} at substantially the same time that the piston strikes its blow on the die J, and thus, as the piston is rebounding into the position shown in Figs. 1 and 2, the live air is again admitted through the passage-way a^{12} beyond the piston, causing the continuance of the inward movement thereof, and before the valve has time to shut off the passage-way a^{12} the piston has covered the passage-way a^{15}, blocking the movement of the valve. It will thus be seen that the piston B reciprocates rapidly backward and forward, and the valve C is automatically shifted by the air itself to control the piston. A small groove a^{16} in the bore a leads from the port a^9 to the inner end of the bore to start the piston from its innermost position, should it be there at the beginning of the operation.

It will be seen that our hammer may be very cheaply constructed. The body of the hammer is made of a single forged piece. The bore a and the chamber a^2 and the chamber a^4 are all easily bored out and the various ports conveniently machined to make them the right size. The simple screw-plug H closes the chamber a^2, a screw-plug K closes the passage-way a^6, and the screw-plugs D and L form the ends of the admission-chamber a^4. The construction is extremely simple and is thoroughly accessible. The removal of the various screw-plugs allows the removal of the parts and the cleaning of the passage-ways.

It not infrequently happens that the admission-valve of a pneumatic hammer is accidentally opened before the die is against its work, and the air thus forces the hammer against the die and shoots them both out of the barrel. In doing structural work on buildings this is dangerous, for these parts sometimes pass to the sidewalk below. It also entails much loss of time. To obviate this, we provide mechanism for holding the die to the tool without interfering with its operation. Such mechanism consists of a sleeve P, screw-threaded onto the outer surface of the barrel near its free end. At its outer end this sleeve has an inwardly-extended flange p. The die J' has the usual cylindrical portion j occupying the barrel and has an outer portion j', which occupies a circular hole in the flange p. The die also has intermediately a projecting collar j^2 sliding freely in the sleeve P. Between the collar j^2 and the flange p is a coiled spring Q. This spring is sufficient to maintain the die normally in its innermost position; but it has play enough to allow the die to be freely forced outward to deliver its blow under the stroke of the hammer B.

On the outer side of the barrel, between the screw-thread and the proximate end of the barrel, is a groove which is adapted to receive the inturned ends of a wire or other member to temporarily hold the die in place when the hammer is used in work not requiring the permanent-holding means above described.

We claim—

1. In a pneumatic tool, a barrel, a valve-casing on the outer side thereof parallel therewith and bored out tubularly from the head end of the tool, a screw-plug for closing said casing accessible from the head end of the tool, an automatic piston-valve in said casing, three passage-ways from said casing to the main bore of the barrel, combined with a second casing formed transversely at the head of the barrel, an admission-valve in such second casing, a looped handle for the tool formed beyond the second casing, means conveniently accessible at said handle for operating the admission-valve, and a passage-way formed along the wall of the barrel between said two casings, substantially as described.

2. In a pneumatic tool, a cylinder, a piston adapted to reciprocate therein, a valve-chamber, a piston-valve occupying said chamber and having three heads, two of the heads being of different area and the third head having an area greater than such difference, and passage-ways from the valve-chamber to the cylinder, leading as follows when the valve is at the outer end of its stroke, a passage-way to one end of the cylinder leading from a point between the heads of different area, a passage-way to the other end of the cylinder leading from a point between the other two heads, and a passage-way to an intermediate part of the cylinder from a point beyond the large-headed end of the valve, combined with an admission-valve chamber carried by the cylinder at its head end crosswise of the cylinder, an admission-valve in such chamber, manual means for operating the admission-valve, and a passage-way between the admission-valve chamber and the valve-chamber first mentioned.

3. In a pneumatic tool, the combination of a barrel open at one end and closed at the other, a piston adapted to reciprocate therein, an admission-valve chamber formed at the head of the cylinder crosswise thereof, a handle beyond the admission-valve chamber, a chamber for an automatic valve alongside of the barrel, a pair of passage-ways leading from the automatic-valve chamber to the cylinder, a piston-valve occupying said auto-

matic-valve chamber and having three heads, one of which is smaller than the other two, said piston-valve being adapted to stand with one of said passage-ways between such small head and the next head, and the other passage-way between the other two heads, an admission passage-way leading from the admission-valve chamber and discharging between the heads when the valve is in said position, an exhaust passage-way controlled by the small head, and an additional passage-way from the cylinder to the automatic-valve chamber beyond the large end of the valve when so positioned.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

JAMES M. RAIKES.
EDWARD W. RAIKES.

Witnesses:
E. L. THURSTON,
ALBERT H. BATES.