No. 814,597. PATENTED MAR. 6, 1906.

C. A. FAESSLER.

RECIPROCATING TOOL OR ENGINE.

APPLICATION FILED NOV. 21, 1903.

2 SHEETS—SHEET 1.

Fig. 2.

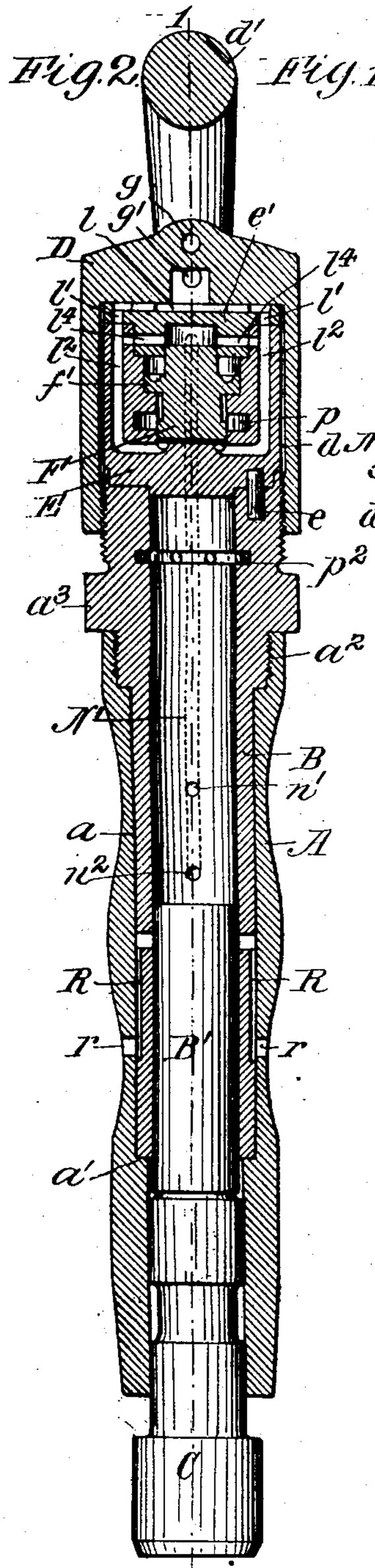


Fig. 1.

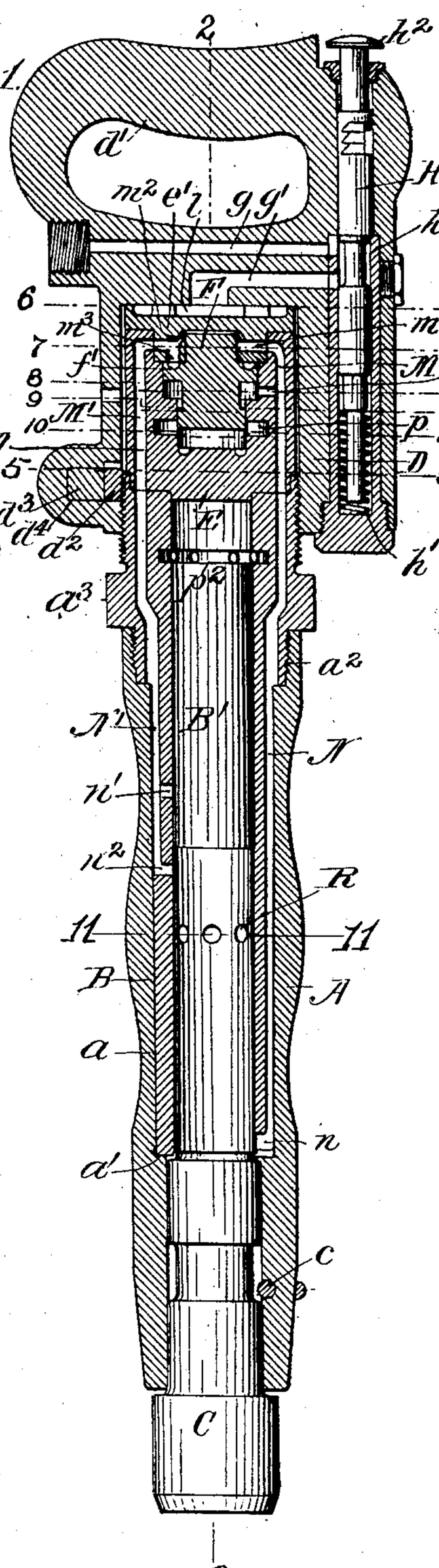
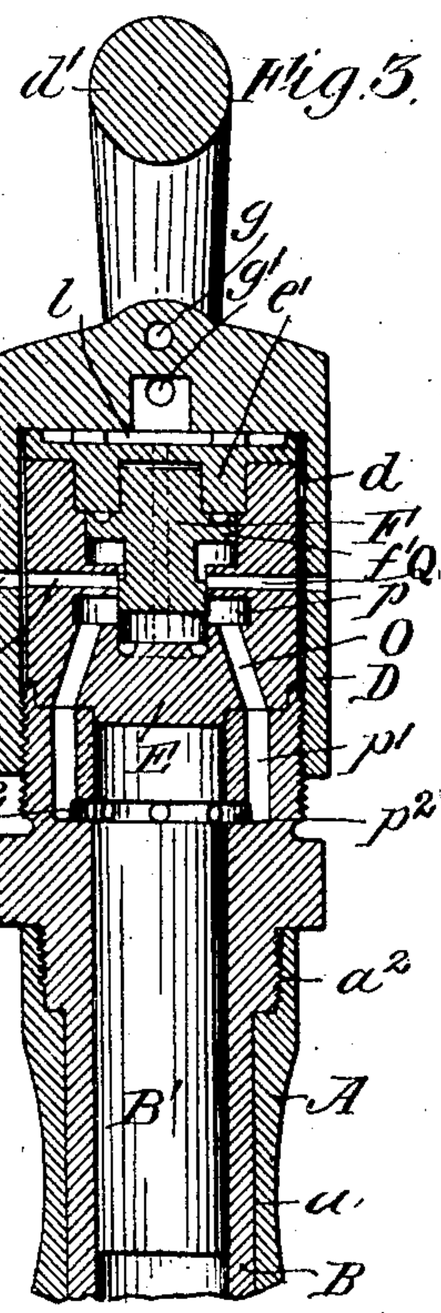


Fig. 3.



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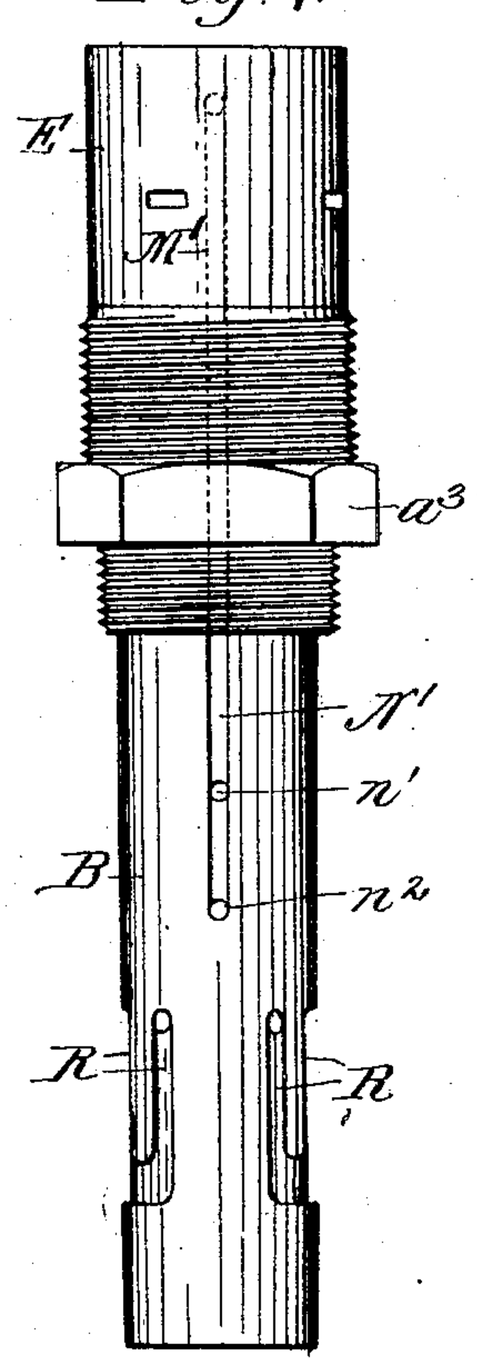
2 SHEETS—SHEET 2.

Fig. 4.



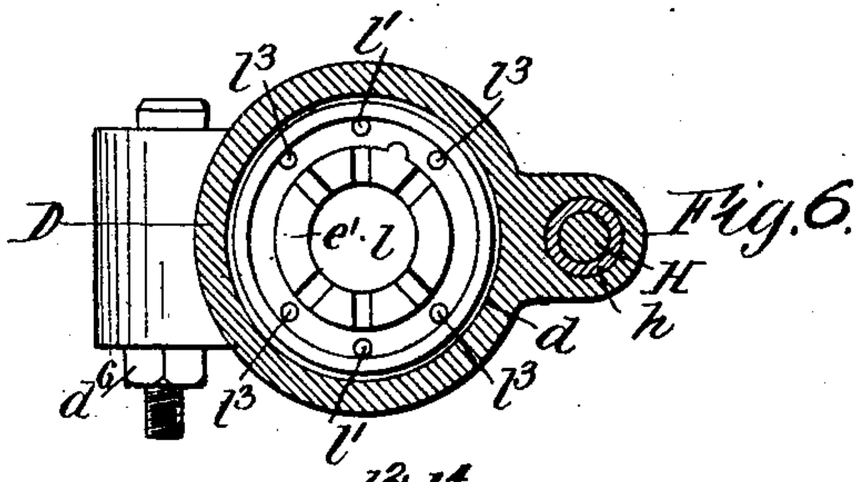


Fig. 6.

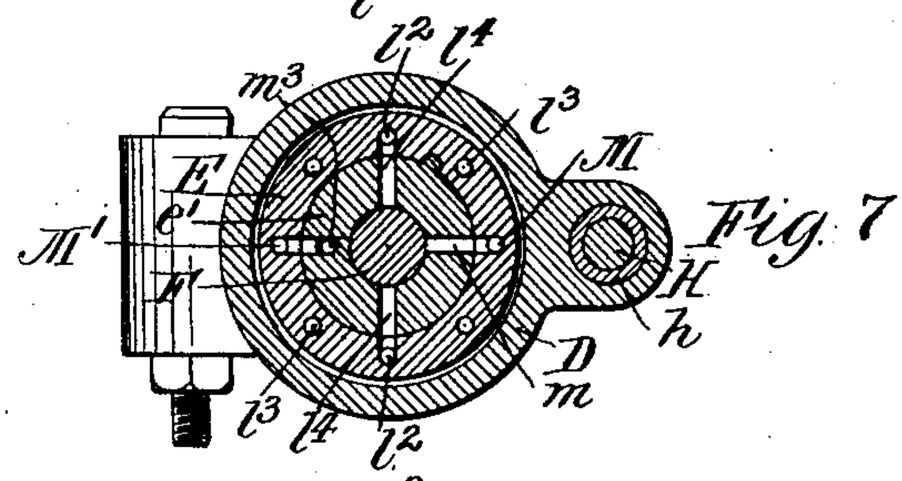


Fig. 7

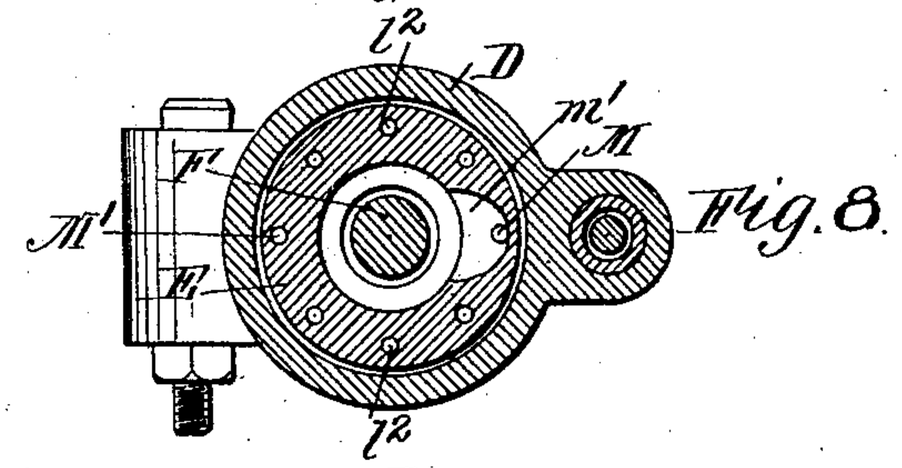


Fig. 8.

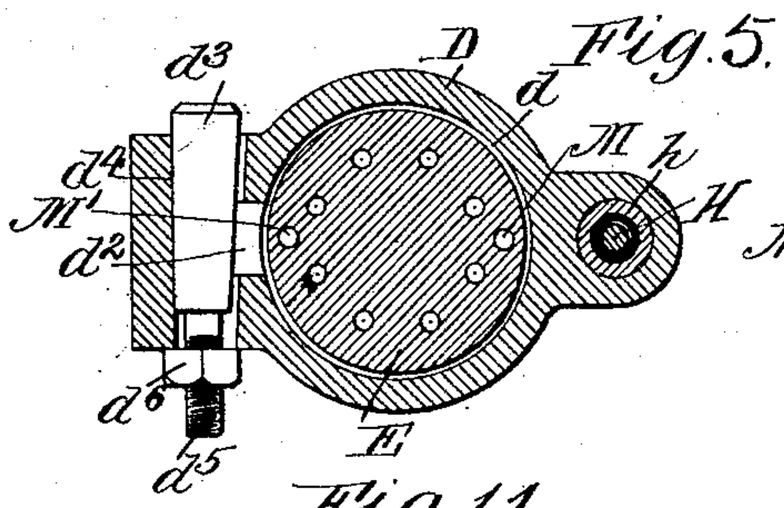


Fig. 5.

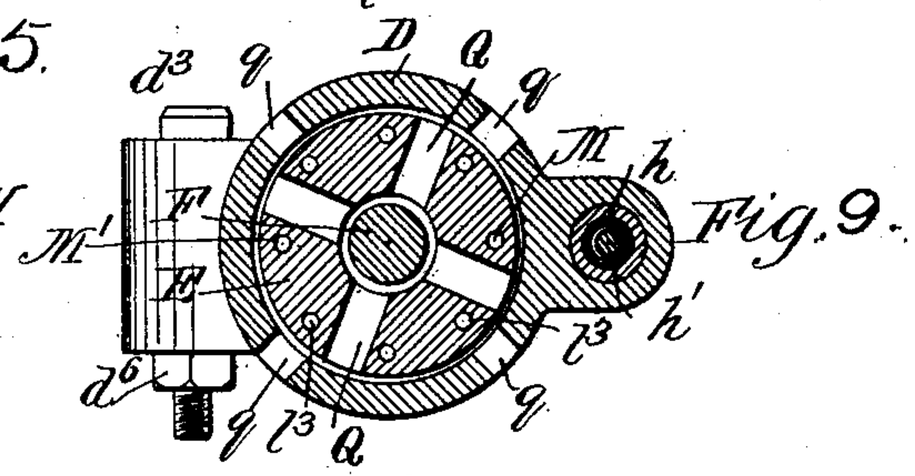
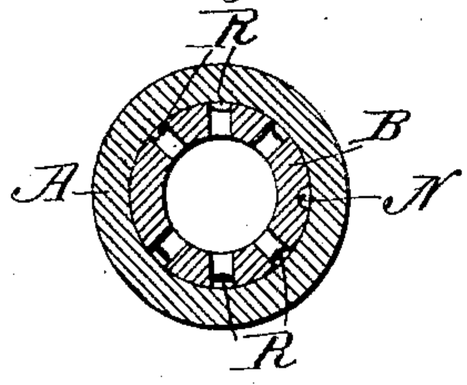


Fig. 9.

Fig. 11.



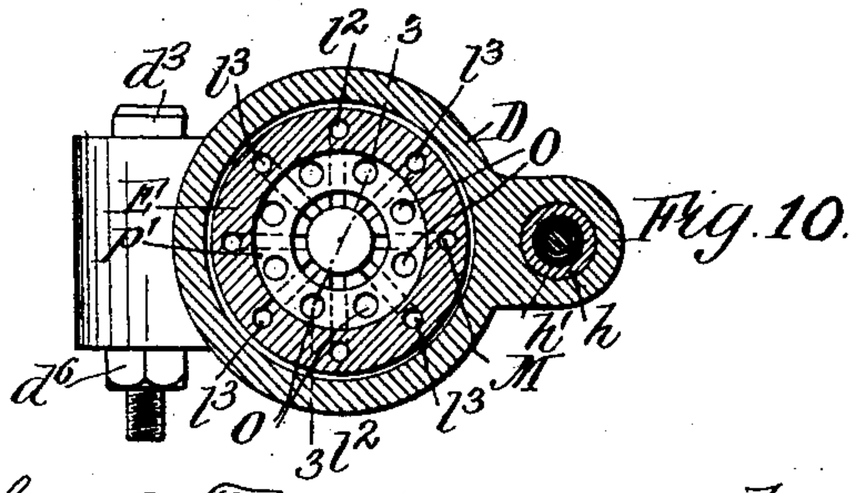


Fig. 10.

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UNITED STATES PATENT OFFICE.

CHARLES A. FAESSLER, OF BUFFALO, NEW YORK.

RECIPROCATING TOOL OR ENGINE.

No. 814,597. Specification of Letters Patent. Patented March 6, 1906.

Application filed November 21, 1903. Serial No. 182,049.

To all whom it may concern:

Be it known that I, CHARLES A. FAESSLER, a citizen of the United States, and a resident of Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Reciprocating Tools or Engines, of which the following is a specification.

This invention relates to reciprocating engines, and more particularly to pneumatic tools or hammers which are used for riveting, calking, chipping, and other purposes and involve a rapidly-reciprocating hammer or piston which strikes the riveting or other tool.

One object of the invention is to produce a machine of this character composed of the minimum number of parts, which are all of strong and simple construction.

Another object of the invention is to so form the parts that the motive fluid will be rapidly admitted and exhausted to and from the cylinder, thereby permitting the piston to reciprocate very rapidly and deliver blows of great force.

Another object of the invention is to provide a simple and efficient device for securely holding the body from working loose in the head under the influence of the vibrations of the machine when in operation.

Other objects of the invention will appear from the following description.

In the accompanying drawings, consisting of two sheets, Figure 1 is a longitudinal sectional elevation of a pneumatic riveter embodying the invention in line 1 1, Fig. 2. Fig. 2 is a longitudinal sectional elevation thereof in line 2 2, Fig. 1, showing the piston and automatic valve in another position. Fig. 3 is a fragmentary longitudinal sectional elevation thereof in line 3 3, Fig. 13. Fig. 4 is an elevation of the cylinder and valve-casing removed from the barrel and head. Figs. 5, 6, 7, 8, 9, and 10 are transverse sections, partly in plan, in lines 5 5, 6 6, 7 7, 8 8, 9 9, and 10 10, respectively, Fig. 1. Fig. 11 is a transverse section in line 11 11, Fig. 1.

Like letters of reference refer to like parts in the several figures.

The body of the engine consists of a barrel or shell A, which is preferably of an external shape, affording a comfortable easy grip for the hand of the operator and a cylinder secured in said barrel. The barrel is provided with a longitudinal bore or cavity *a*, which preferably tapers slightly from its upper to its lower end, terminating in an annular shoulder *a'*. The bore of the barrel from the shoulder *a'* to the end of the barrel is cylindrical. The barrel is provided at its upper end with an internal screw-thread a^2.

B represents the engine-cylinder, the lower portion of which is slightly conical or tapering and fits snugly in the conical bore of the barrel, with its lower end resting upon the shoulder *a'* of the barrel. The cylinder is provided near its upper end with a threaded portion which screws into the internal thread a^2 of the barrel and above said threaded portion is provided with a part a^3, fashioned to receive a wrench or other tool to turn the cylinder. By screwing the cylinder firmly down into the barrel its conical portion is wedged tightly into the conical bore of the barrel, effecting a fluid-tight joint between the parts. The cylinder can be readily unscrewed and removed from the barrel whenever this is necessary for renewing broken or worn parts or for any other reason.

B' represents the piston or hammer, which reciprocates in the cylinder, and C the riveting-tool or other tool or device, the shank of which fits loosely in the lower cylindrical portion of the bore of the barrel.

D represents a hollow head or hood which is provided with a cylindrical cavity *d*, the lower end of which is screw-threaded and screwed on the threaded upper end of the cylinder B. This head is provided with the handle or grip *d'*, which is grasped in one hand of the operator in using the machine. The head is locked on the cylinder and prevented from working loose or unscrewing in the operation of the machine by the following means: d^2, Figs. 1 and 4, represents a locking-block which is movably confined in a socket in the head which opens into the cylindrical cavity thereof. The inner face of the locking-block is concaved and provided with threads or teeth adapted to interlock with the threaded portion of the cylinder. d^3 is a wedge block or key which is arranged to move transversely relative to the locking-block in a hole d^4 in the head and having an inclined face which bears against the outer inclined face of the locking-block. The small end of the wedge-block is provided with a projecting screw-threaded stem d^5, on which is screwed a nut d^6, which bears against a flat face on the

head. After the head or hood has been screwed tightly down on the cylinder, the nut d^6 is turned on the threaded stem of the wedge-block to draw the latter into its hole in the head and force the locking-block inwardly against the threaded portion of the cylinder, thereby holding the latter positively from turning in the head.

F and E represent, respectively, the automatic valve which controls the operation of the piston and the casing for said valve. The valve-casing E is of cylindrical form and is of smaller diameter than that of the cavity in the head in which the casing is located, thus leaving an annular space around the valve-casing. The lower end of the body of the valve-casing is reduced and seated in a depression in the upper end of the cylinder and is held from turning on the cylinder by a pin e or other device. The upper end of the valve-casing is closed by a removable cap e', which is provided with a cylindrical portion which extends down into a cylindrical cavity in the upper end of the valve-casing body. The cap is held from turning relative to the casing-body by suitable means. (Not shown.) The valve-casing is clamped tightly between the upper end of the cylinder and the end of the cavity in the head.

The automatic valve F, which is solid and of cylindrical form, is arranged in the valve-chamber and reciprocates longitudinally or in line with the hammer or piston B′. The valve has a reduced upper end having a sliding fit in a central cavity in the cap of the valve-casing and which forms the upper end of the valve-chamber, and its lower end reciprocates in the lower end of the valve-chamber, which corresponds in size to the lower end of the valve. The valve has a reduced waist forming an annular space around the same in the valve-chamber and is provided above said waist with an annular enlargement f', which works in the correspondingly enlarged intermediate portion of the valve-chamber.

g g' represent two transverse passages in the head, the former of which is connected in any suitable manner with the flexible supply pipe or hose (not shown) for the motive fluid, while the latter leads to the cavity in the head which contains the automatic valve-casing. The passages g g' are adapted to be placed in communication by a hand-operated throttle-valve H. The latter is preferably of cylindrical form and is arranged to move longitudinally in a chamber formed in the head and in a cylindrical bushing h, which is screwed into a hole in the head. The throttle-valve is pressed upwardly by a spring h', which surrounds the inner end of the throttle between the end of the bushing and a shoulder on the throttle-valve. The latter is provided at its outer end with a head or button h^2, which is located in a convenient position to be pressed inwardly by the thumb of the hand grasping the handle. The throttle-valve is reduced in diameter adjacent to the supply-passages g g' and is normally held by its spring, so that its body covers and closes the end of one of the supply-passages, thereby preventing the admission of the motive fluid to the engine. When the throttle-valve is depressed or pushed inwardly, its reduced portion is brought opposite to and connects the passages g g'.

The top of the casing of the automatic valve is recessed centrally at l, Figs. 1, 3, and 6, forming a distributing-chamber between the valve-casing and head which communicates with the supply-passage g', and the top of the casing is provided with two longitudinal holes l', which connect said distributing-chamber with correspondingly-arranged longitudinal fluid-passages l^2, Figs. 2, 7, 10, in the valve-casing leading to the lower end of the valve-chamber. The valve casing and cap are provided with a plurality (preferably four) of similarly-arranged passages l^3, Figs. 6 and 7, which also connect the recess of the cap with the bottom of the valve-chamber. The two passages l^2 also communicate near their upper ends by lateral passages l^4, Figs. 2 and 7, in the casing and its cap with the upper reduced portion of the valve-chamber which is formed in the cap. The valve-casing is also provided with longitudinal fluid-passages M M′, Figs. 1, 7, 10. The passage M connects at its upper end with the upper contracted portion of the valve-chamber by a lateral passage m in the cap and with the enlarged intermediate portion of the valve-chamber by a port m', which is controlled by the annular enlargement f' of the valve. The passage M′ connects at its upper end, respectively, by ports m^2 m^3 in the valve-casing cap with the extreme upper end of the valve-chamber and the enlarged portion of the valve-chamber above the valve enlargement f'. The lower ends of the passages M M′ register with the upper ends of longitudinal passages N N′, respectively, leading to the engine-cylinder. The upper portions of these passages pass through the enlarged upper end of the cylinder, while the greater part of their length is formed by grooves or channels in the external face of the cylinder. (See Figs. 1 and 4.) The lower end of the passage N connects by a port n with the lower end of the cylinder, and the lower end of the other passage N′ connects by two ports n' n^2 with the intermediate portion of the cylinder. The valve-casing is also provided with a plurality of passages O, Figs. 3 and 10, connecting at their upper ends with the lower portion of the valve-chamber

through an annular groove p and registering at their lower ends with corresponding longitudinal passages p' in the upper portion of the cylinder and communicating with the interior thereof below its top by an annular groove p^2. (See Fig. 3.)

Q, Figs. 3 and 9, represents exhaust-ports extending radially through the valve-casing and connecting the contracted lower portion of the valve-chamber with the annular space between the valve-casing and tool-head, and q indicates exhaust-ports in the tool-head connecting the annular space between the same and the valve-casing with the atmosphere. The cylinder is provided externally with grooves R, Figs. 2, 4, and 11, forming exhaust-passages which connect at their upper ends with the interior of the cylinder below the port n^2 and at their lower ends with exhaust-ports r, extending through the tool-barrel.

The operation of the engine is as follows: It being assumed that the piston and valve are in their lower position, as indicated in Fig. 2, when the riveting-tool or other tool is pressed against the work the piston is lifted so that its lower end is opposite to the port n at the bottom of the cylinder, and when the throttle is opened the motive fluid enters through the supply-passages g g' in the tool-head, passing to the recess or cavity in the top of the cap of the valve-casing and into the contracted upper portion of the valve-chamber above the valve through the passages l^2 l^4 and thence through the longitudinal passages M and N in the valve-casing and cylinder and port n into the lower end of the cylinder beneath the piston. The piston is thus raised, the motive fluid above the piston being forced out through the passages p' and O, Fig. 3, in the upper portion of the cylinder and valve-casing into the annular groove O, thence entering the annular space around the contracted waist of the valve and escaping through the exhaust-ports Q in the valve-casing, annular space surrounding the valve-casing, and into the atmosphere through the exhaust-ports q in the head of the tool. The motive fluid also enters the enlarged portion of the valve-chamber above the annular enlargement f' of the valve through the ports m^2 m^3 in the cap of the valve-casing, the pressure on the upper end of the valve and its annular enlargement predominating over the pressure on the lower end of the valve and holding the latter down. When the piston in its upward movement uncovers the exhaust-ports R, the pressure beneath the piston is relieved, and when the piston in its continued upward movement uncovers the port n^2 of the passage N′, Fig. 1, the pressure on the annular enlargement of the valve is relieved, as the air can escape down through the passage N′ into the cylinder and out through the exhaust-ports R. The pressure in the bottom of the valve-chamber beneath the valve, to which the motive fluid is admitted through the passages l^2 and l^3, then lifts the valve. The motive fluid, which then has free access to the lower contracted portion of the valve-chamber through said passages l^2 l^3, as just explained, passes through the annular groove p, Fig. 3, and down through the passages O and p' into the upper portion of the cylinder above the piston, which is thus forced downwardly to deliver its impact on the riveting or other tool. During the first portion of the downward movement of the piston the motive fluid beneath the same escapes freely to the atmosphere through the exhaust passages and ports R and r, and a portion of the fluid also escapes through the port n, passages N and M, and port m' into the enlarged portion of the valve-chamber around the contracted waist of the valve, passing out through the exhaust-passages Q and ports q in the valve-casing and head of the tool. When the piston in its downward movement uncovers the port n', connecting with the passage N′, the motive fluid passes up through said port, passage M′, and ports m^2 m^3 in the cap of the valve-casing into the upper end and enlarged portion of the valve-chamber above the annular enlargement of the valve to again lower the valve. The motive fluid then again passes down through the passage N and port n into the lower end of the cylinder beneath the piston to raise the latter, as before explained. As the valve-casing is provided with a relatively large number of ports or passages O, which admit the fluid to the cylinder above the piston, the latter is moved downwardly with great force and speed. The operation of the engine is therefore very rapid and efficient. As the inlet-ports to the upper end of the cylinder communicate with the latter some little distance below the top of the piston-chamber, an air-cushion is formed in the upper end of the cylinder, which relieves the shock or jar on the hand of the operator in the use of the tool.

The terms "upper" and "lower," "top" and "bottom," &c., have been used in this specification to simplify the description. It will, however, be understood that the tool is portable and used in different positions and that such terms are merely relative to indicate the opposite ends or portions of the tool.

I claim as my invention—

1. The combination of a barrel provided with a cylinder-cavity, a removable cylinder located in said cavity and having an interlocking detachable engagement with said barrel and having a portion which projects out of one end of the barrel and is shaped for the engagement of a tool for detaching the cylinder from the barrel, said cylinder having external grooves which together with said

barrel form fluid-passages, a piston in said cylinder, a hollow head detachably secured to the projecting portion of the cylinder, and a valve inclosed in said hollow head, substantially as set forth.

2. The combination of a barrel, a cylinder removably screwed into said barrel and provided with grooves which with the barrel form fluid-passages, said cylinder having a portion which projects out of one end of the barrel and is provided with screw-threaded end and with a part shaped for the engagement of a tool for turning the cylinder, a valve-casing seated on the end of said cylinder, a valve in the valve-casing, a hollow head surrounding said valve-casing and screwed on the projecting threaded end of said cylinder, said valve-casing being held in place by said hollow head, and a piston in the cylinder, substantially as set forth.

3. The combination of a cylinder, a piston in said cylinder, a hollow head provided with a supply-passage for the motive fluid, a valve-casing located in said head at the end of said cylinder and forming a distributing-chamber between the end of the valve-casing and the adjacent end of the head, which distributing-chamber communicates with said supply-passage in the head, a longitudinally-disposed valve-chamber in said valve-casing having an annular enlargement, a solid valve movable longitudinally in said valve-chamber and having an enlarged portion located in the enlargement of said valve-chamber, said valve-casing having longitudinal passages connecting said distributing-chamber with opposite ends of said valve-chamber, additional longitudinal passages connecting said distributing-chamber with one end of the valve-chamber, and a plurality of longitudinal passages connecting said last-mentioned end of the valve-chamber with the adjacent end of the cylinder, said valve-casing and cylinder having passages controlled by said valve for admitting and exhausting motive fluid to and from opposite ends of the cylinder, substantially as set forth.

4. The combination of a cylinder, a piston therein, a head, a valve-casing located in said head at one end of said cylinder and provided with a valve-chamber disposed longitudinally relative to said cylinder and having reduced opposite end portions and an enlarged intermediate portion, a solid valve movable longitudinally in said valve-chamber and having reduced opposite end portions working in the end portions of said valve-chamber and an annular enlargement working in the enlarged intermediate portion of said valve-chamber, fluid-passages in said valve-casing connecting with the opposite end and intermediate portions of said valve-chamber, passages connecting the adjacent ends of said valve-chamber and cylinder, a passage connecting the far ends of said cylinder and valve-chamber, a port connecting said passage with the enlarged portion of said valve-chamber, a passage connecting the intermediate portion of said cylinder with the far end of the valve-chamber and with the enlarged portion of the valve-chamber beyond the annular enlargement of said valve, exhaust-passages in said cylinder, and exhaust-passages leading from said valve-chamber, substantially as set forth.

5. The combination of a cylinder, a piston in said cylinder, a hollow head provided with a supply-passage for the motive fluid, a valve-casing located in said hollow head and provided in one end with a recess forming a distributing-chamber communicating with said supply-passage in said head, a valve-chamber disposed longitudinally in said valve-casing and having an enlarged intermediate portion, a solid valve having an annular enlargement movable longitudinally in said valve-chamber for controlling the admission and exhaust of the motive fluid to and from said cylinder, said valve-casing having passages connecting said distributing-chamber in its end with the opposite ends of said valve-chamber, and passages connecting the opposite ends and intermediate portion of the valve-chamber with the opposite ends and intermediate portion of said cylinder, and exhaust-passages leading from said cylinder and valve-chamber, substantially as set forth.

6. The combination of a cylinder, a piston in said cylinder, a hollow head provided with a supply-passage for the motive fluid, a valve-casing located in said hollow head and provided in one end with a recess communicating with said supply-passage, a longitudinally-disposed valve-chamber in said valve-casing having different diameters, a solid valve having parts of different diameters movable longitudinally in said valve-chamber and controlling the operation of the engine, and longitudinal passages in said valve-casing connecting said recess in the end of the valve-casing with opposite ends of said valve-chamber, substantially as set forth.

7. The combination of a hollow head, a body having a screw-threaded engagement with said hollow head, a locking-block confined in a recess in one of the said parts and movable toward the threaded portion of said other part, and a wedge for forcing said locking-block against said threaded portion, substantially as set forth.

8. The combination of a head having a cavity provided with an internal screw-thread, a threaded body screwed into said cavity, a locking-block confined in a recess in said head, and a wedge for forcing said locking-block against said threaded body, substantially as set forth.

9. The combination of a head having a

cavity provided with an internal screw-thread, a threaded body screwed into said cavity, a locking-block confined in a recess in said head and having teeth adapted to engage said threaded body, a wedge confined in a recess in said head, and bearing against said locking-block and having a screw-thread stem, and a nut screwed on said stem and bearing against said head to move said wedge endwise to force said locking-block against said threaded body, substantially as set forth.

Witness my hand this 14th day of November, 1903.

CHARLES A. FAESSLER.

Witnesses:
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JNO. J. BONNER.