(No Model.) 2 Sheets—Sheet 1.

P. CHOUTEAU.

ENGINE.

No. 434,976. Patented Aug. 26, 1890.

Fig. 1.

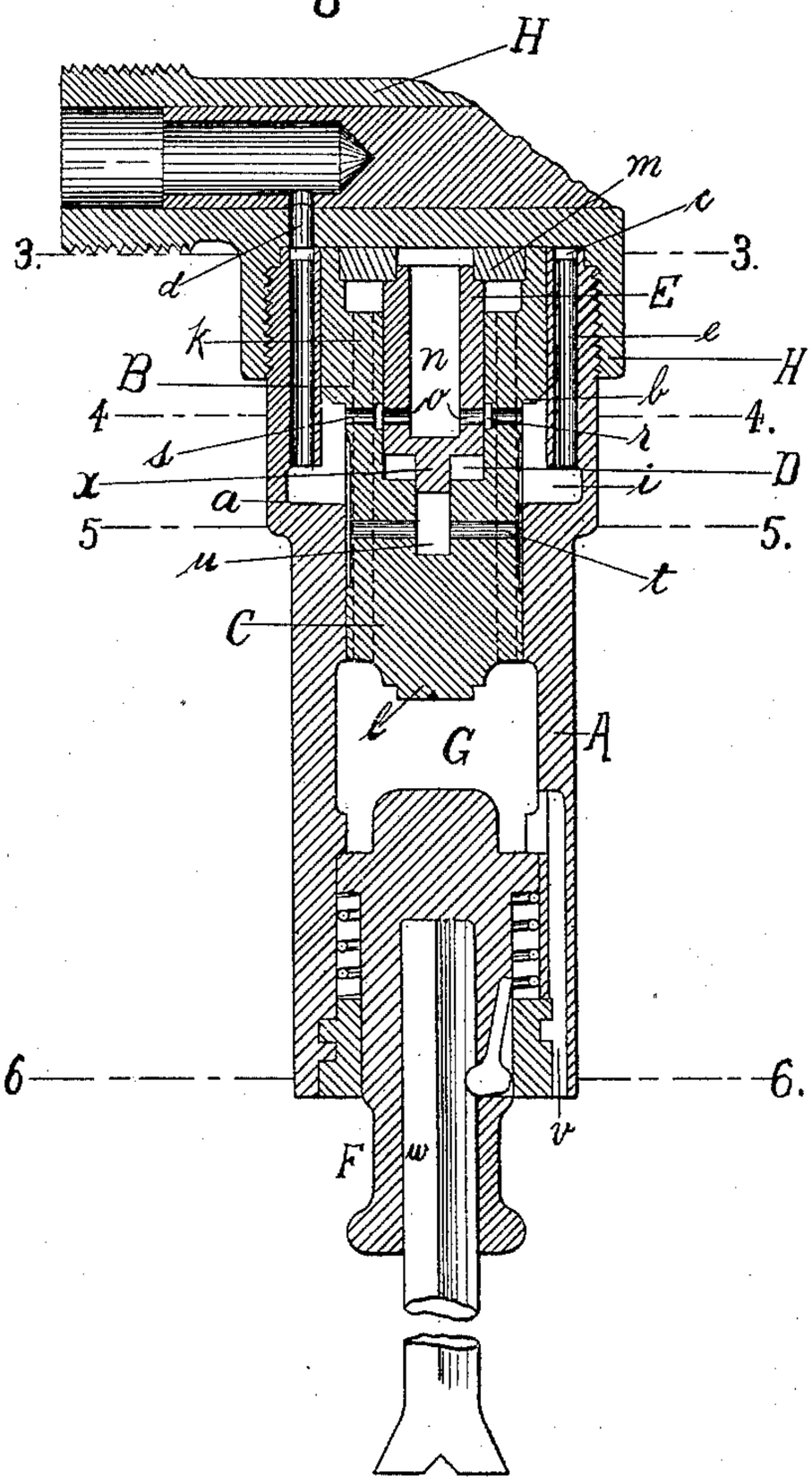


Fig. 3.

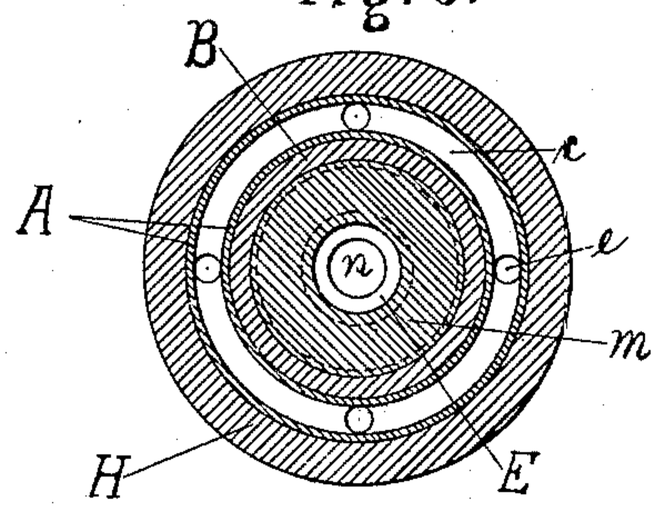


Fig. 4.

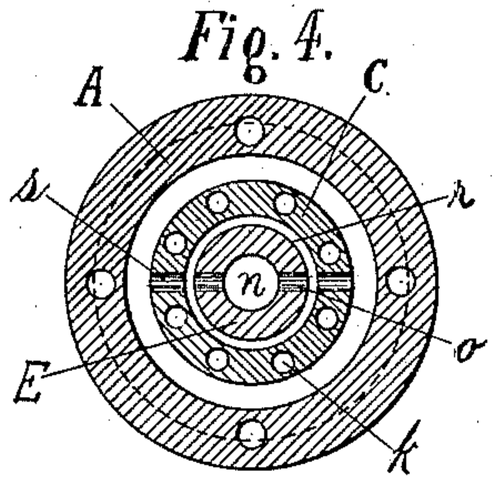


Fig. 5.

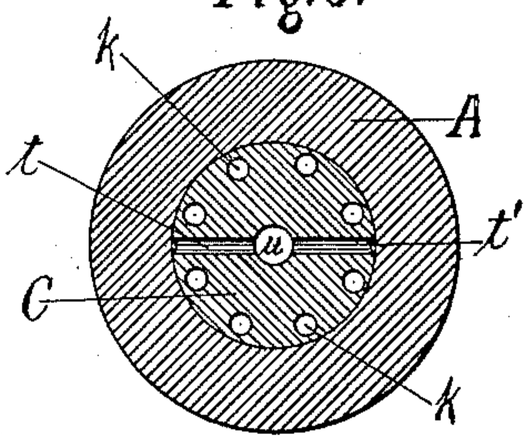
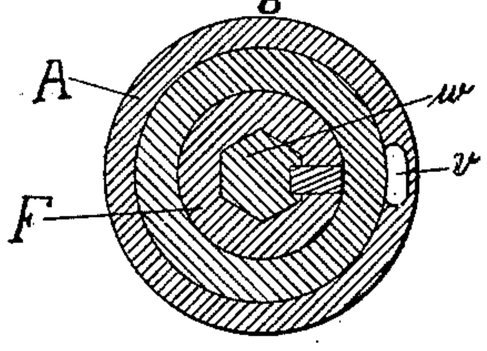


Fig. 6.



Witnesses.

Jos. W. Crooker.

Wm. H. Byrne

Inventor.

Pierre Chouteau

by Paul Bakewell

his attorney

(No Model.) 2 Sheets—Sheet 2.

P. CHOUTEAU.

ENGINE.

No. 434,976. Patented Aug. 26, 1890.

Fig. 2.

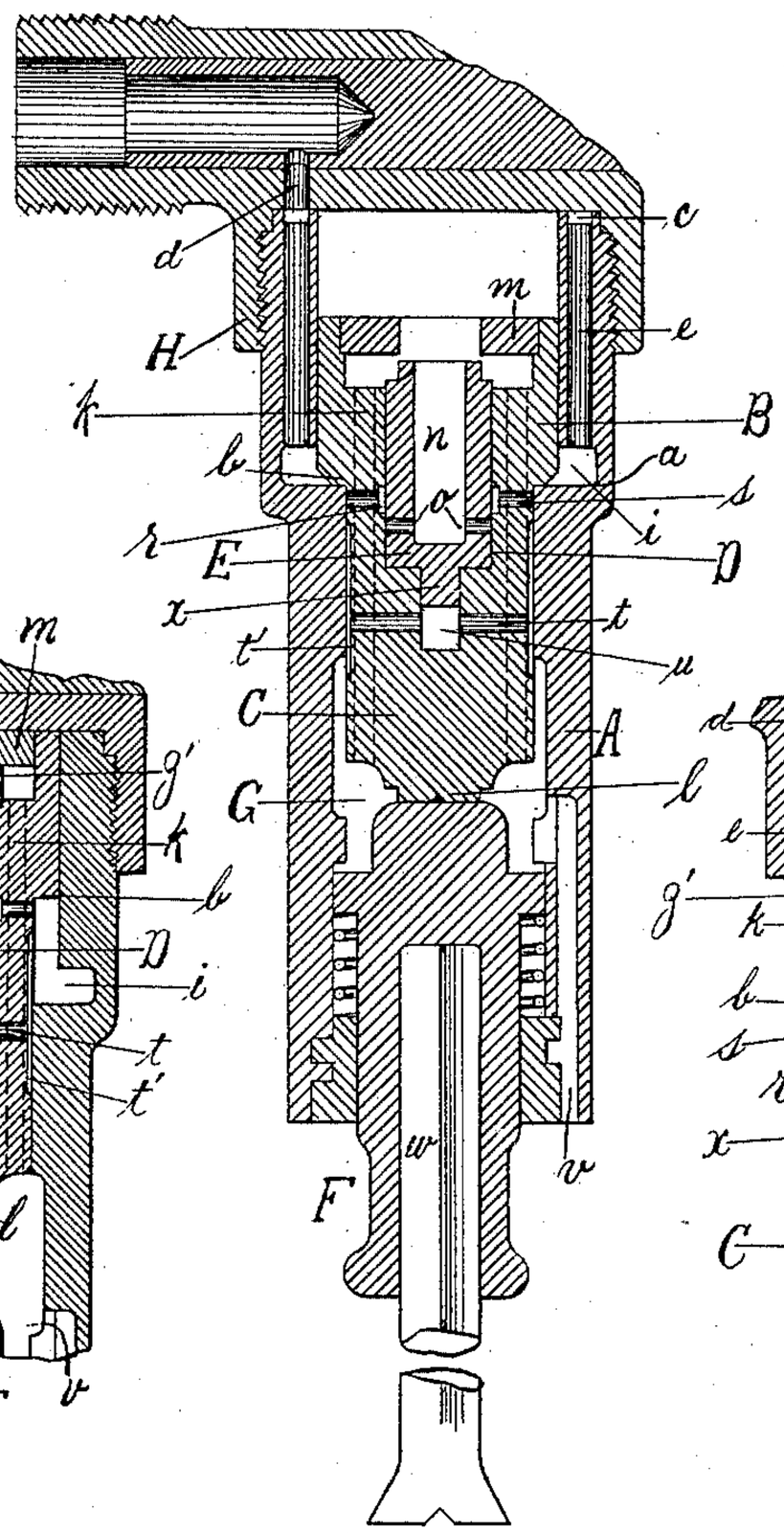


Fig. 7.

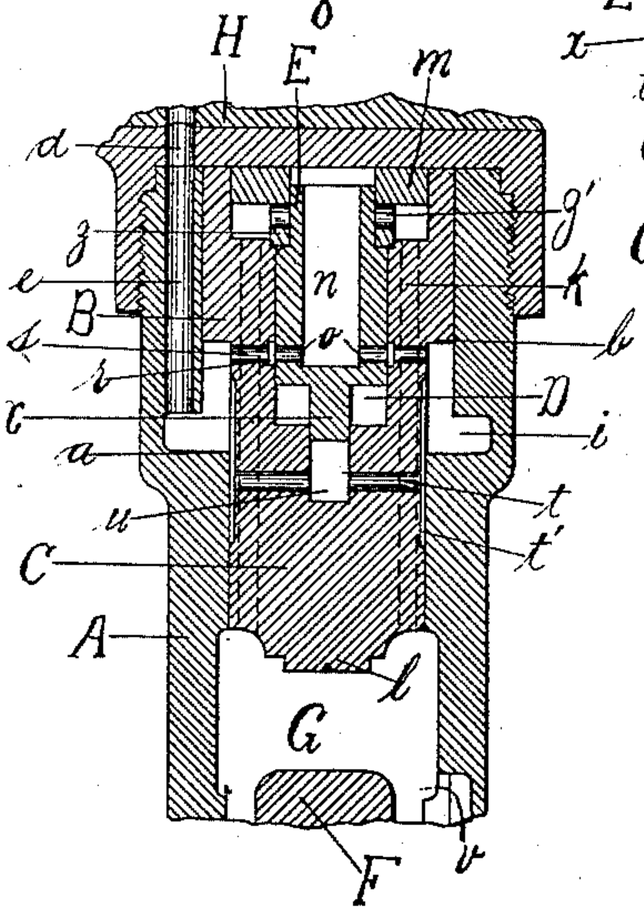
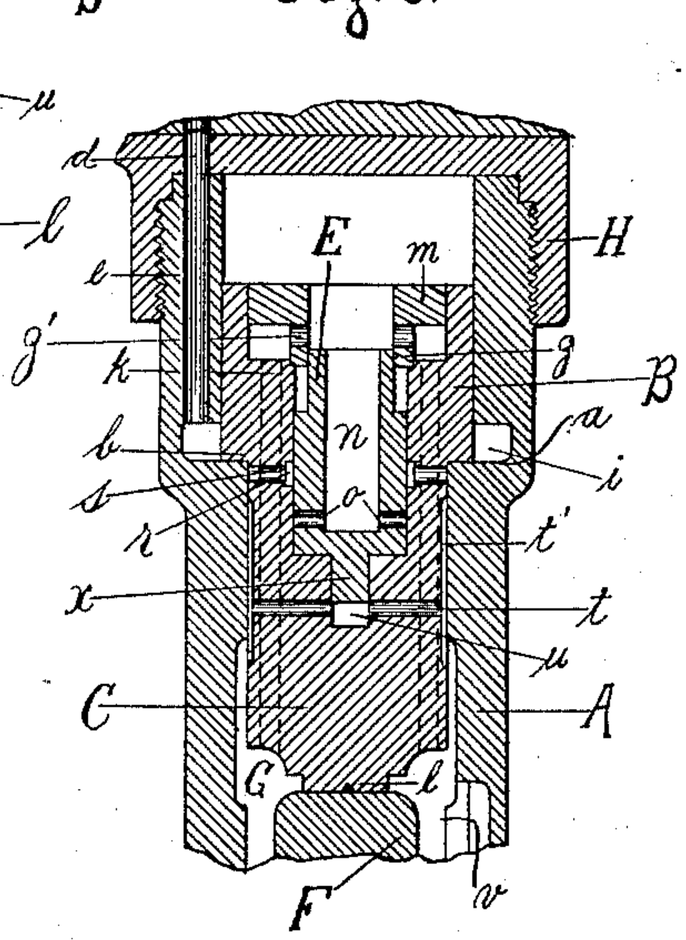


Fig. 8.



Witnesses.
Jos. W. Crosby.
Wm. H. Bynum.

Inventor.
Pierre Chouteau by
Paul Bakewell
his attorney

UNITED STATES PATENT OFFICE.

PIERRE CHOUTEAU, OF ST. LOUIS, MISSOURI.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 434,976, dated August 26, 1890.

Application filed June 9, 1890. Serial No. 354,678. (No model.)

To all whom it may concern:

Be it known that I, PIERRE CHOUTEAU, a citizen of the United States, residing in the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Direct-Acting Steam or Pneumatic Engines, of which the following is a full, clear, and exact description.

My invention relates to improvements in that class of direct-acting steam, pneumatic, or other motive-fluid engines in which the piston is reciprocated in the cylinder by the motive fluid being admitted alternately above and below the piston by the action of its valve, which itself is actuated by the motive fluid without the intervention of valve-operating mechanism, and has for its object to simplify the parts of such engine, so that, in construction, parts that have been in practice found weak can be made stronger and the parts difficult to manufacture dispensed with, all the improvements combining to make a more perfect machine in construction and operation.

My invention consists in improvements in, first, the form and construction of the distributing-valve and the corresponding part of the piston, which, in conjunction with the valve, forms the exhaust-port from the upper end of the cylinder; second, in the construction of the inlet-passage leading from the port in the throttle-regulating valve to the interior of the cylinder; third, in the construction of the seating-shoulder of the piston, and, fourth, in the construction and position of the exhaust-passage from the cylinder.

It consists, more particularly, in improvements in various parts of the improved form of direct-acting engines for which United States Letters Patent No. 384,186 were granted June 5, 1888, on the application of G. A. Barth, and to which reference is hereinafter made.

In the accompanying drawings, in which like letters of reference denote like parts in the several figures, Figures 1 and 2 are longitudinal central sections of a small direct-acting engine adapted to be used as a hand-tool in various kinds of work—such as chipping, stone-dressing, &c.—showing, respectively, the piston at the upper and lower terminations of its stroke. Figs. 3, 4, 5, and 6 are transverse sections taken, respectively, on lines 3 3, 4 4, 5 5, and 6 6 in Fig. 1; and Figs. 7 and 8 are part longitudinal sections, taken as in Figs. 1 and 2, of the engine as described in the specification forming part of Letters Patent No. 384,186, showing the form of the distributing-valve and the part of piston operating conjointly therewith to form the exhaust-passage described therein.

The improvements herein described pertain to that type of direct-acting engines in which there is combined a cylinder bored out concentrically to two different diameters for different portions of its length corresponding to the different diameters of the piston and piston-rod, a piston and piston-rod bored out centrally in part of their length, so as to provide a chamber to accommodate a cylindrically-formed distributing-valve, a distributing-valve reciprocating within such chamber provided with suitable inlet and outlet ports and passages and controlling the action of said piston, a throttle or regulating valve admitting the motive fluid to the cylinder through suitable inlet-passages, a suitable outlet or exhaust passage, and means for removably securing a tool, so as to be conveniently used with the engine.

A represents the cylinder bored out concentrically to two different diameters corresponding with the diameters of the piston B and piston-rod C and forming circular seating-shoulder *a*. The circular shoulder *b* at the lower end of the piston B, formed by the relatively-different diameters of the piston and the piston-rod C, is turned or beveled off in part of its width. The object of this is to allow the live motive fluid, in acting on this shoulder, as it does in the return movement of the piston, an opportunity to get in under the same when the piston is at the end of its forward stroke or in the position as shown in Figs. 2 and 8. In the upper edge of the cylinder A a circular groove *c* (shown in Fig. 3) is cut, so as to provide a free passage-way for the motive fluid from the inlet-port *d* in the cap end H of the cylinder to the several supply-passages *e* found in the wall of the cylinder A and leading to the circumferential recess or groove *i* cut in the interior of the cylinder-casing at a point in its length corresponding with the shoulder *a*, thereby allowing a free open supply-passage for the mo-

tive fluid to the inlet-passages *s* and *t*. The piston B and the piston-rod C are bored out centrally, forming a cylindrical chamber or cavity D, which extends from the upper end of the piston B to a suitable depth within the piston-rod, the lower end of which is made solid, so as to form a hammer-head *l*. The upper end of the chamber D is enlarged, and into it is fitted, so as to be flush with the end of the piston, the flat ring *m*, into the central opening of which is fitted the upper diametrically-reduced end portion of a cylindrical distributing-valve E, which, to the extent of that portion of its length below the shoulder formed by its reduced end, is fitted to and capable of vertical reciprocation within the chamber D, its reduced end entering and leaving the circular opening in the ring *m* in such movement, as shown, respectively, in the different positions of the valve in Figs. 1 and 2, thereby closing and opening a passage from the top of the cylinder through the opening in the ring to the outlet-passages *k*. The valve E is formed with a vertical central supply-passage *n*, extending from its upper open end to a suitable depth therefrom, inlet-passages *o* being formed near the lower end thereof through the wall of the distributing-valve and communicating, when the valve is in a position to close the passage-way through the ring *m*, as in Fig. 1, with an annular space *r*, formed by a circumferential recess cut in the wall of the chamber D, which in turn communicates with the exterior of the cylinder through passages *s* cut through the walls of the chamber D.

The inlet and outlet passages *t* communicate, in conjunction with the longitudinal grooves *t'*, cut in the surface of the piston-rod C, from the small central extension *u* of the chamber D to the live-fluid recess *i* and the exterior atmosphere through the exhaust-passage *v*, respectively, when the piston is at the upper and lower termination of its stroke. The exhaust-passage *v* is formed by a longitudinal groove cut on the inside of the wall of the extension of the cylinder A, into which the tool-chuck F is fitted for holding the tool *w*, and extends from the exhaust-chamber G to a point exterior thereto beside the tool, so as to direct the exhaust-fluid to where the tool is doing its work, using it as a blower to clear the face of the work of the chippings or dust made by the tool.

The lower or closed end of the distributing-valve E is formed with a reduced extension or stem *x*, which is fitted into the reduced portion *u* of the valve-chamber D, thereby confining in the reciprocating movement of the valve E air or steam between the bottom proper of the valve and the bottom proper of the valve-chamber, making a cushion for or damper to the movement of the valve and still leaving enough surface on the end of the stem *x* for the motive fluid to act on in actuating the valve.

In the older form of valve, as shown in Figs. 7 and 8, the ring *m* was formed with a sleeve-extension *z*, in which were formed the passages *z'*, and the reduced portion of the distributing-valve E made correspondingly longer. In its reciprocation the end of the valve was never withdrawn from the sleeve *z*, only having movement enough to uncover or open the passages *z'*. The objections to this form were these: the comparatively long reduced portion of the valve made it weak, and the ring, with the sleeve-extension and passages formed therein, was a piece very difficult to construct perfectly and liable to break. The improvement, as shown in Figs. 1 and 2, permits of the reduced end portion being shortened, the metal being added to the body of the valve, making it much stronger, and also the end of the valve, being altogether withdrawn from the ring, affords a much more efficient and quicker-acting eduction-passage than the older form.

The circular groove *c* provides a free open passage from the port *d* in the throttle-valve to the induction-passages *e*, making it a matter of indifference in the working of the engine at what part of the circle of revolution the port *d* is stopped when the cap end H of the cylinder is screwed on, as shown in the drawings, thereby permitting it to be turned home and tight.

I claim—

1. In a direct-acting engine, the combination of a cylinder bored to two different diameters, a tubular piston and piston-rod formed with diameters corresponding with the different diameters of the cylinder, a cap end secured to the end of the cylinder carrying a throttle-valve and port, a circular distribution-passage cut in the face end of said cylinder, so as to provide a free open passage from port in throttle-valve to induction-passages, a hollow distributing-valve reciprocating within said hollow space in piston, and suitable inlet and outlet ports and passages, substantially as described.

2. In a direct-acting engine, the combination of a cylinder bored to two different diameters, a tubular piston and piston-rod formed with diameters corresponding, respectively, to the different diameters of the cylinder, the shoulder formed by the relatively different diameters of said piston and piston-rod being beveled in part of its width, a cap end secured to cylinder carrying a throttle-valve and port, a hollow distributing-valve reciprocating within said hollow space in piston, and suitable inlet and outlet ports and passages, substantially as and for the purposes described.

3. In a direct-acting engine, the combination of a cylinder bored to two different diameters, a tubular piston and piston-rod formed with diameters corresponding, respectively, with the different diameters of the cylinder, the hollow space in which is partly closed by a flat ring, a cap end secured to the end of cylinder carrying a throttle-valve and port, a hollow distributing-valve reciprocat-

ing within said hollow space in piston formed with a short reduced end portion, which in the reciprocating movement of said valve enters and is withdrawn from the central open space in said ring secured in the end of piston, thereby closing and opening the passage from the top of the piston to the eduction-passages, and suitable inlet and outlet ports and passages, substantially as and for the purposes described.

4. In a direct-acting engine, the combination of a cylinder bored out to two different diameters, a tubular piston and piston-rod formed with diameters corresponding with the different diameters of the cylinder, the hollow space within said piston and piston-rod being formed with a reduced extension in its lower or closed end, a cap end secured to cylinder carrying a throttle-valve and port, a tubular distributing-valve reciprocating within said chamber in piston provided with reduced projection extending into said reduced end portion of said chamber, and suitable inlet and outlet ports and passages, substantially as and for the purposes specified.

5. In a direct-acting engine, the combination of a cylinder bored to two different diameters, a tubular piston and piston-rod formed with diameters corresponding, respectively, with the different diameters of the cylinder, a cap end secured to cylinder carrying a throttle-valve and port, a hollow distributing-valve reciprocating within said hollow space in piston and piston-rod, and suitable inlet and outlet ports and passages, said cylinder being extended and diametrically enlarged internally, forming an exhaust-chamber, into the end of which is secured the chuck for holding the tool and in the wall of which is formed an exhaust or eduction passage leading to the exterior of the cylinder for conducting and directing the exhaust fluid to a point exterior to the engine convenient to make use of the exhaust-pressure, substantially as described.

In testimony whereof I have affixed my signature, in presence of two witnesses, this 5th day of June, 1890.

PIERRE CHOUTEAU.

Witnesses:
J. L. HORNSBY,
JOS. W. CROOKES.