(No Model.) 2 Sheets—Sheet 1.

F. C. RINSCHE.

ENGINE.

No. 574,003. Patented Dec. 29, 1896.

Fig. 1.

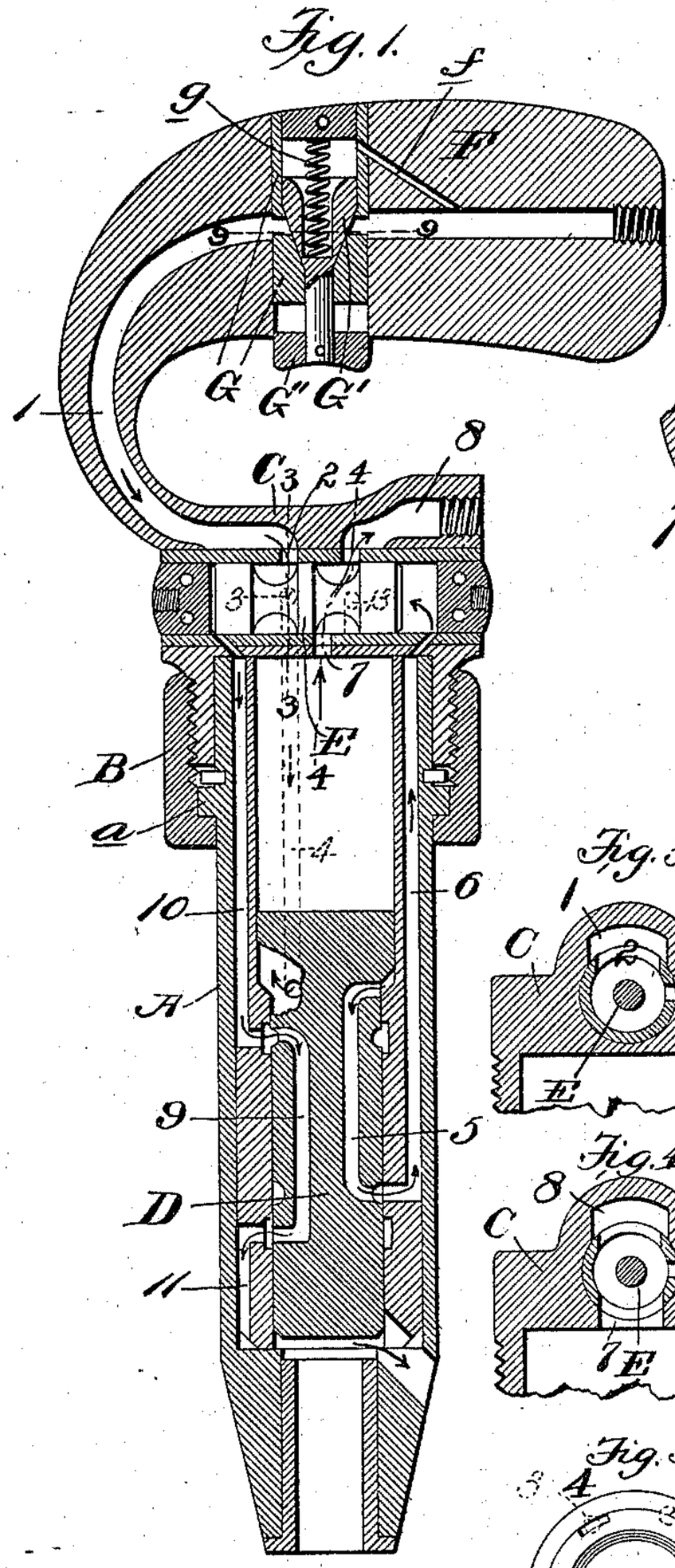


Fig. 2.

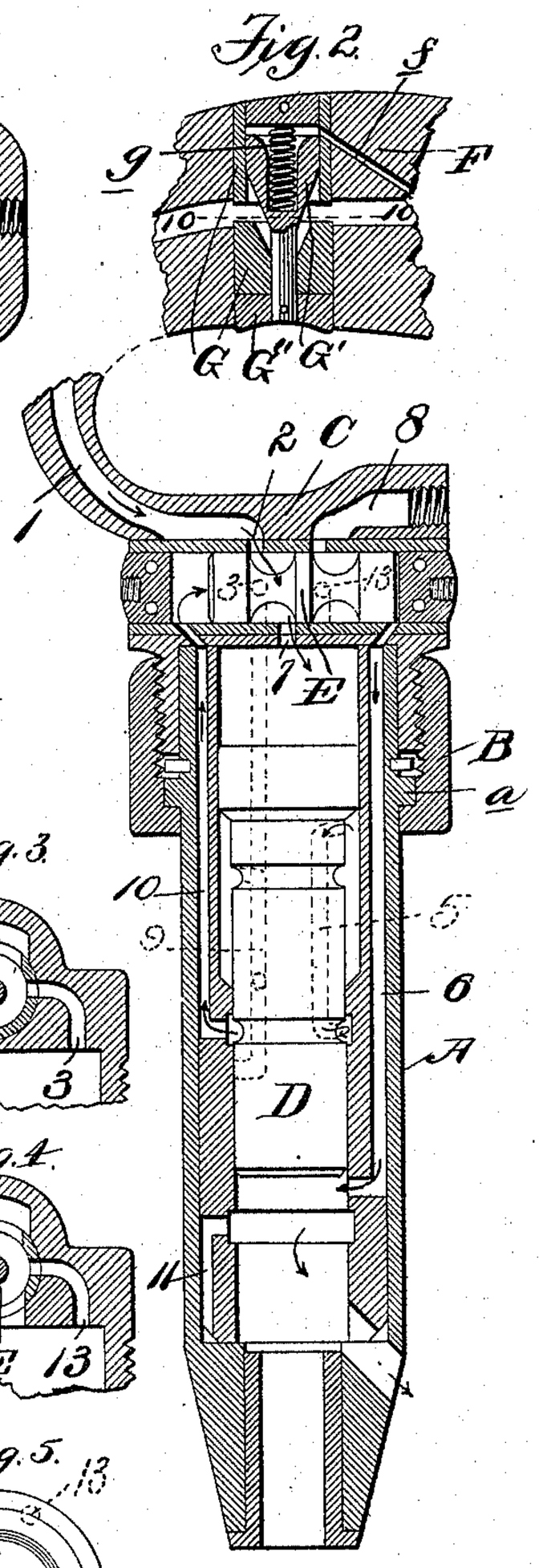


Fig. 3.

Fig. 4.

Fig. 5.

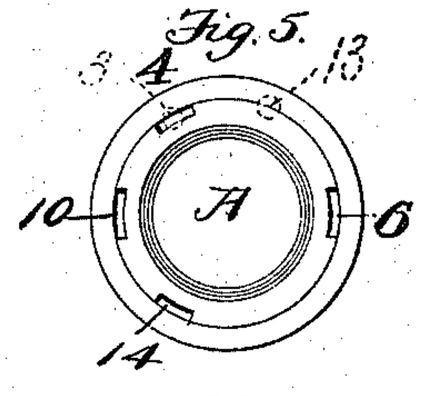
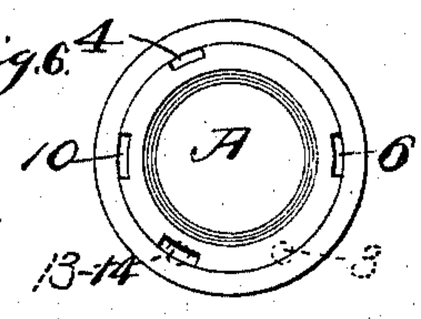


Fig. 6.



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(No Model.) 2 Sheets—Sheet 2.

F. C. RINSCHE.

ENGINE.

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Fig. 7.

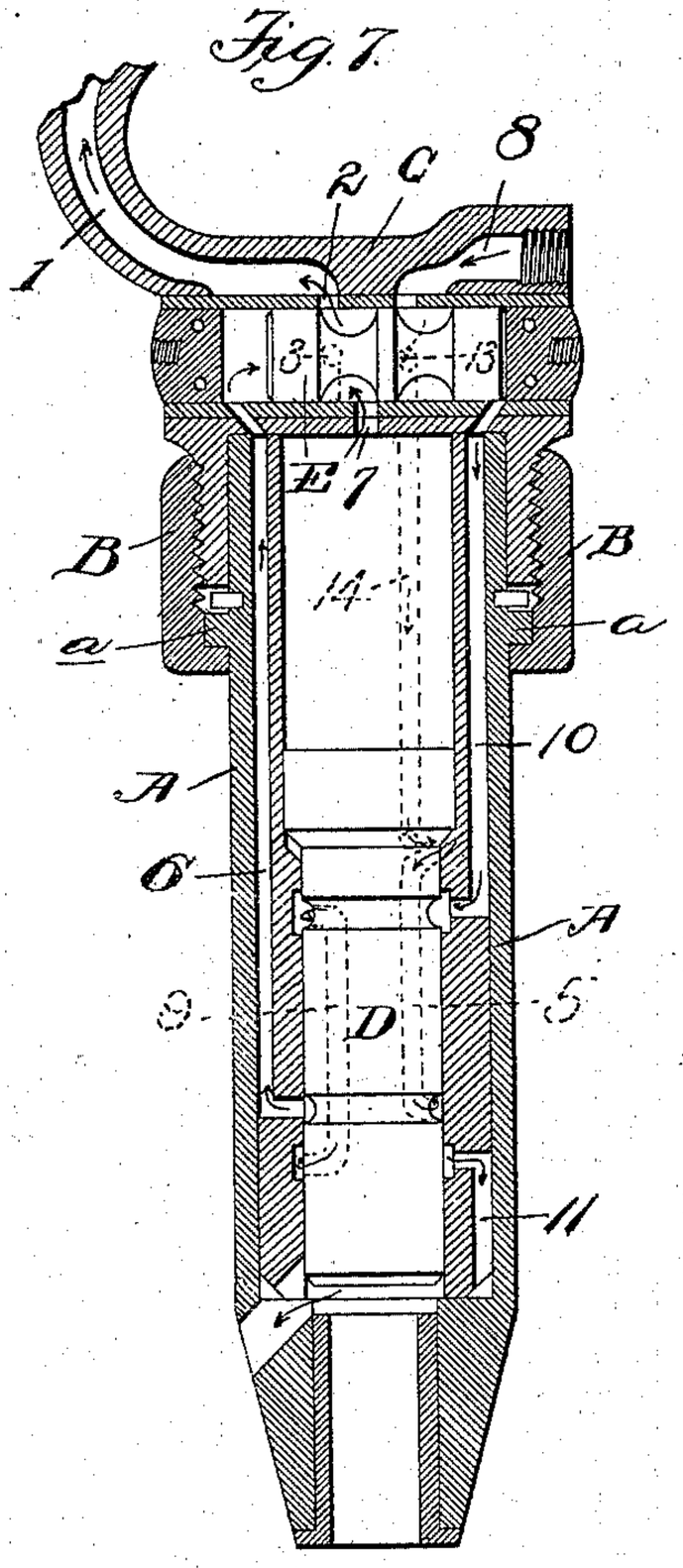


Fig. 8.

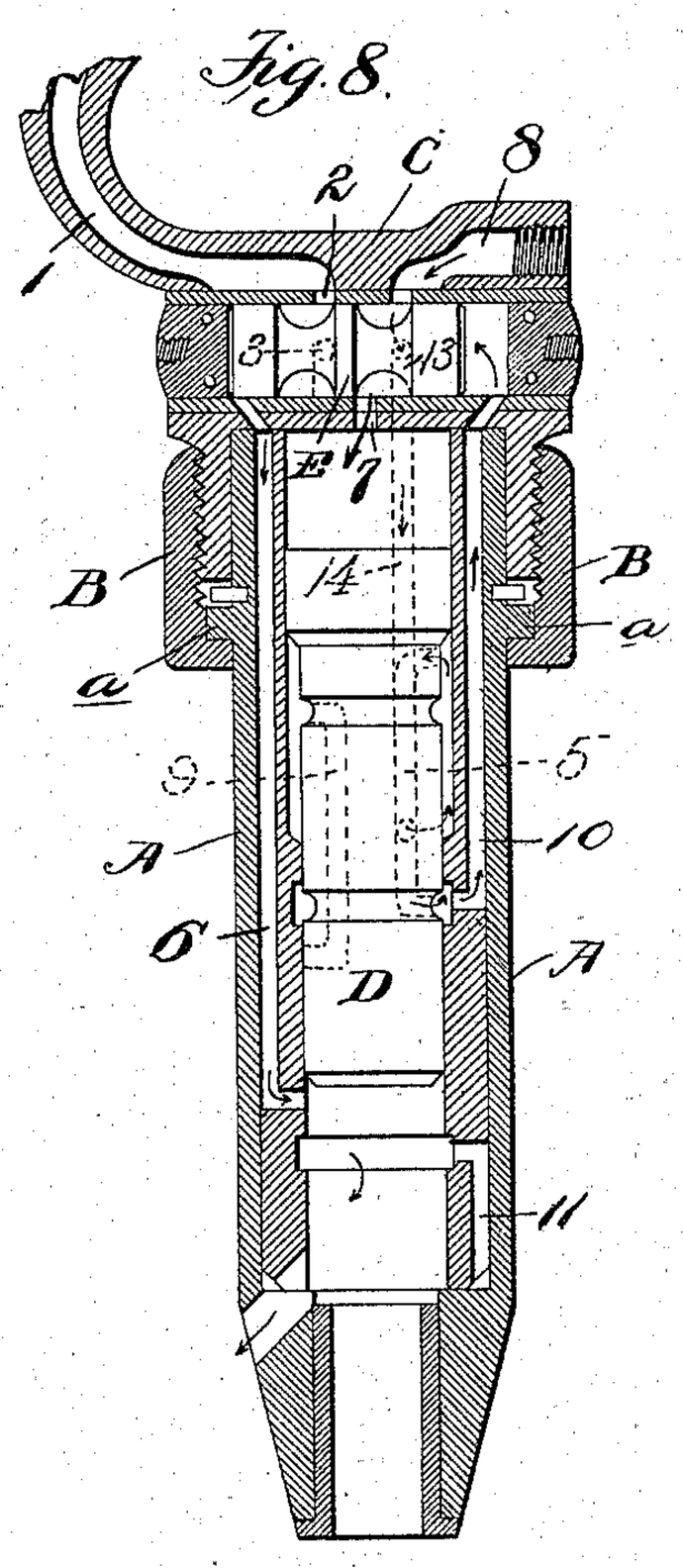


Fig. 9.

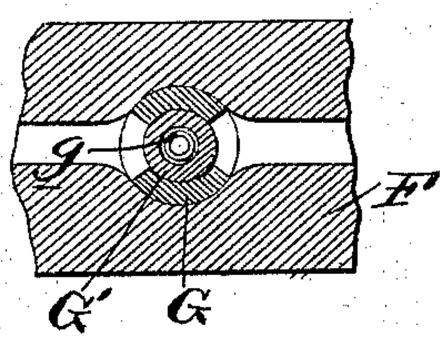
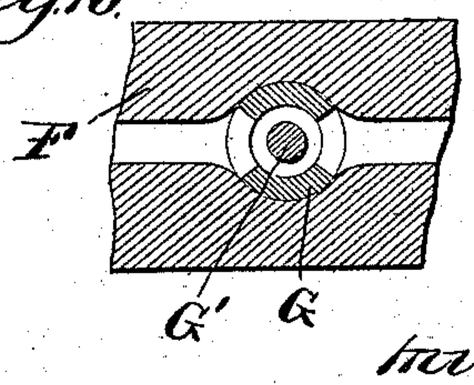


Fig. 10.



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UNITED STATES PATENT OFFICE.

FRANK C. RINSCHE, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE CHOUTEAU MANUFACTURING COMPANY, OF SAME PLACE.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 574,003, dated December 29, 1896.

Application filed June 22, 1896. Serial No. 596,530. (No model.)

To all whom it may concern:

Be it known that I, FRANK C. RINSCHE, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a longitudinal sectional view through my improved engine, showing the piston in its forward position. Fig. 2 is a similar view showing the piston in its rear position. Fig. 3 is a sectional view through the handle-base on line 3 3, Fig. 1. Fig. 4 is a sectional view through the handle-base on line 4 4, Fig. 1. Figs. 5 and 6 are rear end views of the cylinder. Figs. 7 and 8 are views similar to Figs. 1 and 2, showing the engine in a different operative position. Fig. 9 is a cross-sectional view through the controlling-valve in the handle on line 9 9, Fig. 1. Fig. 10 is a similar view on line 10 10, Fig. 2.

This invention relates to a new and useful improvement in engines of that class which are commonly known as "pneumatic hand-tools." The engine is adapted to be run by compressed air as a motive fluid, which is supplied thereto by a flexible pipe. A chisel or like tool is inserted in the opening in the front end of the cylinder, upon which chisel the reciprocating piston delivers impacting blows. The engine is designed for use in cutting and carving stone, calking boilers, &c.

In an application for a patent for an improvement in engines filed by me in the United States Patent Office on or about April 4, 1896, (serially numbered 586,250,) I showed and described an engine which, by changing the position of the handle relative to the cylinder and interchanging the inlet and exhaust, would cause the piston to deliver two kinds of blows upon the control of the inlet or exhaust, as the case might be. One of these blows, upon the control of the inlet, was weak, by reason of the reduced pressure, but quite rapid, while the other, upon the control of the exhaust, in which the pressure was not reduced, was strong, but delivered at intervals, that is, the exhaust at the rear end of the piston being choked would prevent a rapid movement of the piston to the rear, but as soon as the ports registered to throw the valve, the forward movement of the piston being unretarded, would be quick and of full strength. The engine forming the subject-matter of this application involves, practically, these same features, there being changes in the construction tending to simplify the engine and reduce its cost of manufacture. These features will be more clearly pointed out hereinafter.

In the drawings, A indicates the cylinder, which is bored to two different diameters. This cylinder is preferably formed of an outer shell or sleeve and an inner cylinder, between which parts the several ports are formed, preferably by grooving and boring the latter. However, this forms no part of my invention, and I do not therefore desire to be understood as limiting myself to the exact construction of the cylinder shown, as said cylinder would be as operative if made in one piece and the ports formed by boring the walls thereof. In the following description I will refer to the sleeve and inner cylinder as if it were made in one piece. This cylinder is preferably formed with a flange *a* near its rear end, with which engages a collar or coupling-sleeve B, which collar or coupling-sleeve is internally threaded to clamp in position a handle-base C, which handle-base contains the piston-valve and also serves as a cylinder-head.

D indicates the piston, whose forward end is reduced to fit the smaller bore of the cylinder, while its head operates in the larger bore.

E indicates the piston-valve, operating in a sleeve inserted in the handle-base or cylinder-head.

F indicates a handle, preferably formed integral with and extending rearwardly from the handle-base. This handle is formed with a passage, which is adapted to act either as a supply-inlet or exhaust, depending upon the operation of the engine, which passage is controlled by a valve located in the hand-grasp in position to be readily and easily operated by the operator's fingers. This valve, which I will call a "throttle-valve," is mounted in a sleeve G, which is bored to several diameters, the sides of said sleeve being cut away where

they register with the passage through the handle.

G′ is a valve which is tapered to coöperate with a cone-seat in the sleeve, said valve having a forwardly-projecting stem, upon which is mounted a head G″ to operate the valve. The rear end or larger bore of the sleeve is closed by a suitable plug, between which and the valve there is interposed a spring *g*, whose tendency is to constantly force the valve to its seat.

I will now describe the port arrangements. 1 indicates a passage through the handle, which is controlled by the valve G′. For the present I will assume that this is the inlet through which the motive fluid is conducted to the engine. This passage leads to a port 2 in the piston-valve sleeve, through the sleeve into a port 3, which is constantly in communication with port 2, and through a port 4 to a point in front of the head of the piston.

When the piston is at the front end of the cylinder, as shown in Fig. 1, a port 5, formed through the piston, connects the space in front of the piston-head with a port 6, formed in the cylinder, which port 6 leads to one end of the valve-chamber. This causes the motive fluid to throw the valve to the left and exhaust the motive fluid behind the piston through a port 7 and a passage 8 in the handle-base, which are made to communicate by the movement of the valve. The space at the right-hand end of the valve will be exhausted by the registration of piston-port 9 with a cylinder-port 10, which leads from the end of the valve, and an exhaust-port 11, formed in the cylinder. Under these conditions the piston will commence its stroke to the rear and will move in such direction until the forward end of port 5 registers with the cylinder-port 10, when the motive fluid in front of the piston will be conducted to the end of the valve-chamber, throwing the valve. The exhaust at the other end of the valve-chamber can now easily pass through port 6, as it has been opened by the rearward movement of the piston. This will break communication between port 7 and passage 8 and establish communication between inlet-port 2 and port 7, directing the motive fluid to the rear end of the piston, which will cause the same to move forward by reason of the excess of area of the rear face of the piston-head over the shoulder formed by the two diameters of the piston.

By permitting the valve G′ to retard the passage of the motive fluid to the engine it will be seen that such a reduction in the pressure will cause the piston to deliver lighter blows. I will assume now that the cylinder has been turned half-way round relative to the handle, as shown in Figs. 7 and 8, and that the motive fluid is being conducted to the engine through passage 8, passage 1 being now used for the exhaust.

Assuming the parts to be in the position shown in Fig. 7, the motive fluid will not be admitted to the rear of the piston, the position of the valve not permitting, but will pass through ports 13 and 14 to a point in front of the piston-head. These ports 13 and 14 are in constant communication with passage 8 when the cylinder is in this "reversed position," as I will call it. Said ports 13 and 14 correspond in office and function to ports 3 and 4, and when the cylinder is thus reversed ports 3 and 4 do not communicate with each other, but are "blind," and, in fact, are diametrically opposite each other, as shown in Fig. 6, where the dotted circle indicates the position of port 3. In the same manner are ports 13 and 14 made blind when the cylinder is in the position first described, that is, when passage 1 was the inlet and passage 8 the exhaust, in which event the ports 3 and 4 were used. This is illustrated in Fig. 5. There being, then, a constant pressure of motive fluid in front of the piston, as was the case in the first instance, when the piston is at the front end of the cylinder, as shown in Fig. 7, this pressure in front of the piston passes through piston-port 5 and through cylinder-port 6 to the end of the valve, which is thereby thrown, the pressure at the other end of the valve being exhausted through cylinder-port 10, piston-port 9, and exhaust-passage 11. When the valve is thrown, the pressure behind the piston is exhausted through port 7 and passage 1. The piston now commences its stroke to the rear, and when piston-port 5 registers with cylinder-port 10 the valve is thrown to the position shown in Fig. 8, the exhaust at the other end of the valve being conducted off through port 6, whose forward end is opened by the front end of the piston, as shown. When the valve is in this position, communication between port 7 and passage 1 (the exhaust) is cut off and communication between passage 8 and port 7 established, which directs the motive fluid to the rear face of the piston, and by reason of the excess of area of this rear face over the shoulder formed by the two diameters of the piston the piston is forced forwardly. By manipulating valve G′ when the parts are in this relation to each other the exhaust is controlled. When the exhaust is thus controlled by being choked, the movement of the piston to the rear is retarded, that is, it takes a longer time for the piston to complete its stroke to the rear, which is necessary before the piston-controlling valve can be thrown so as to admit the motive fluid behind the piston. When the motive fluid is admitted behind the piston, said piston will be moved forward quickly and with full strength. Thus it will be seen that by controlling the exhaust when the engine is thus assembled the piston will deliver blows of full strength, intervals of time intervening between each blow, the length of which intervals depending upon the area of the exhaust for the rear end of the chamber, said area being under control of the operator.

In Figs. 1 and 2 I have shown a port *f*

leading from the passage 1 to the chamber in which the valve-spring *g* is located. The object of this port is to conduct the motive fluid, when passage 1 is used as an inlet-port, behind the larger head of the valve, so that the pressure of the motive fluid will have a tendency to seat the valve. When passage 1 is used as an exhaust, port *f* will enable the valve to be operated more easily by preventing compression of air behind the same.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination with the cylinder and piston, of a handle-base or cylinder-head at the rear end thereof, a piston-controlling valve in said handle-base, and ports 3 and 13 in the handle-base which coöperate with ports 4 and 14 in the cylinder respectively, when the handle is in different positions relative to the cylinder; substantially as described.

2. The combination with the cylinder and piston, of a handle-base formed with two passages 1 and 8, adapted to be used either for the inlet or exhaust, a valve located in the handle-base to which said passages lead, ports 3 and 13 in the handle-base which are constantly open to said passages respectively, and ports 4 and 14 in the cylinder which register with the ports 3 and 13 respectively when the handle is in certain of its positions, two of said ports, as 3 and 4, being blind when ports 13 and 14 communicate, and vice versa; substantially as described.

3. In an engine, the combination with the handle through which is formed a passage, of a sleeve arranged across said passage and formed with openings registering with said passage, and a cone-seated valve operating in said sleeve and across the passage; substantially as described.

4. In an engine, the combination with the handle through which is formed a passage, of a sleeve formed with openings registering with said passage, said sleeve being bored to different diameters, a valve operating in said sleeve across the passage, and a spring for seating said valve and closing the passage through the sleeve; substantially as described.

5. In an engine, the combination with the handle through which is formed a passage, a valve arranged to operate across said passage, and a port leading from said passage to behind the valve, whereby, when said passage is used as an inlet-passage, the valve is seated by pressure; substantially as described.

6. In an engine, the combination with the handle through which is formed a passage, of a sleeve formed with openings registering with said passage, a valve operating in said sleeve across the passage, and a port leading from said passage to a point behind the valve; substantially as described.

In testimony whereof I hereunto affix my signature, in presence of two witnesses, this 16th day of June, 1896.

FRANK C. RINSCHE.

Witnesses:
F. R. CORNWALL,
HUGH K. WAGNER.