W. H. SOLEY.

PNEUMATIC TOOL.

APPLICATION FILED MAY 13, 1902.

947,861. Patented Feb. 1, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

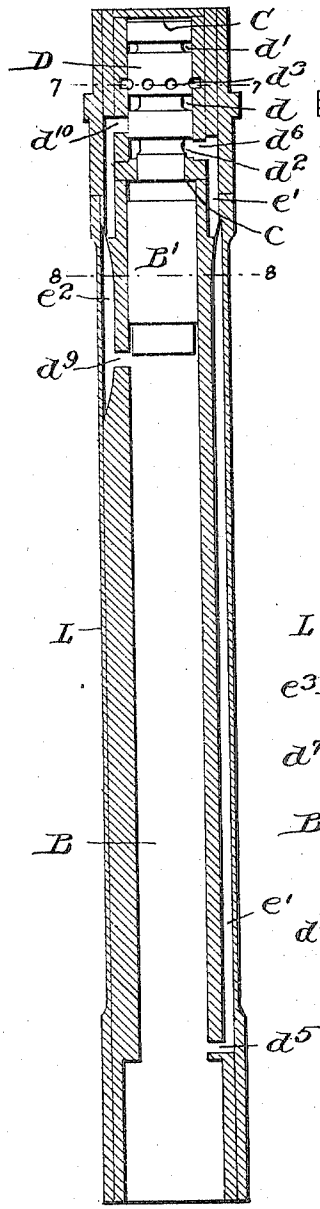


Fig. 2.

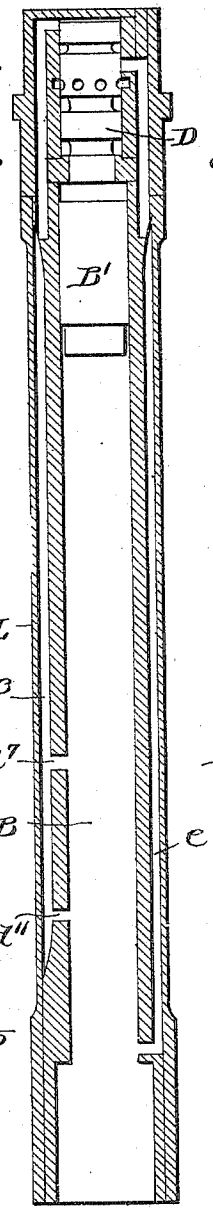


Fig. 3.

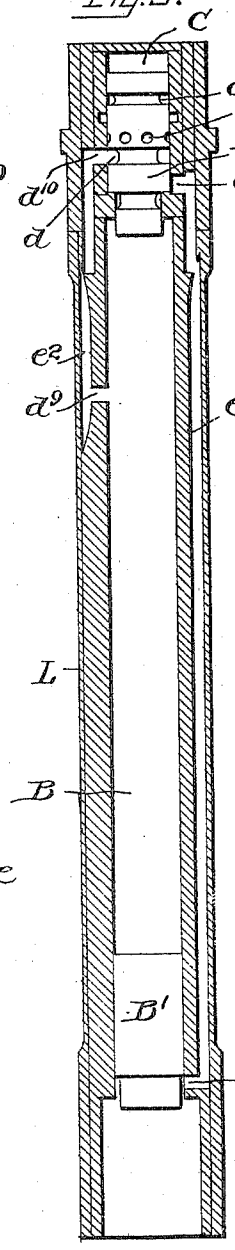
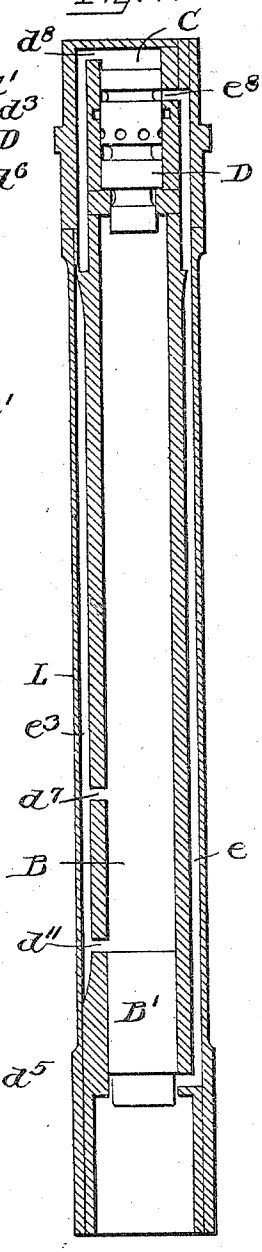


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 5.

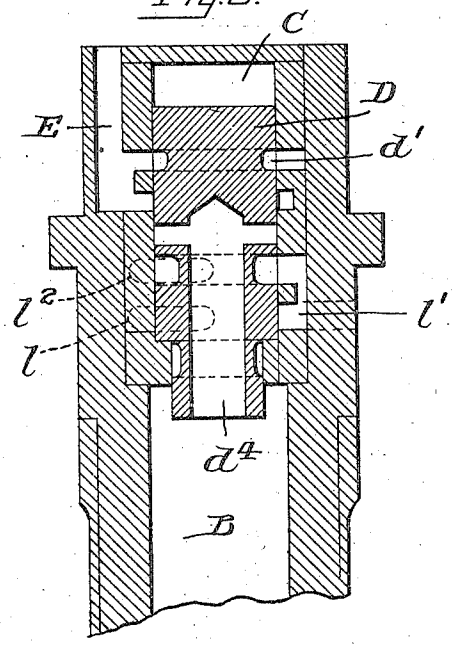


Fig. 6.

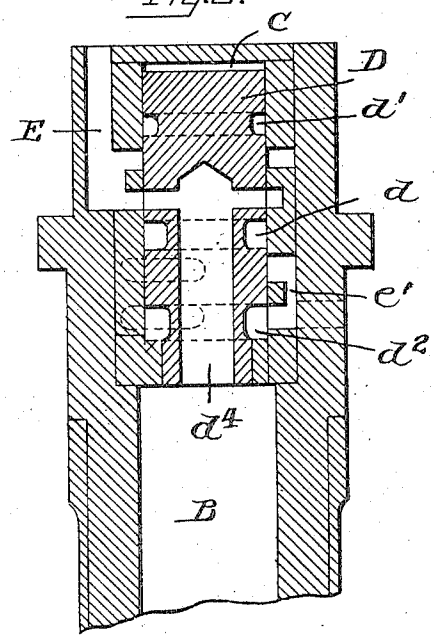


Fig. 7.

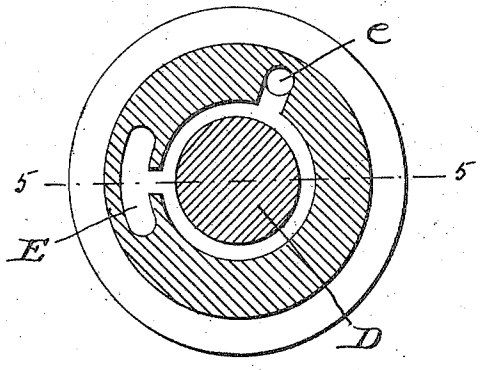
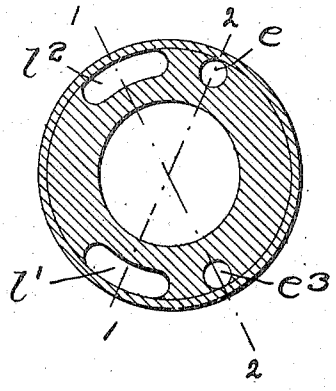


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM H. SOLEY, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO THOMAS H. DALLETT, OF CHEYNEY, PENNSYLVANIA, AND GEORGE A. DALLETT, OF PHILADELPHIA, PENNSYLVANIA, TRADING AS THOMAS H. DALLETT AND COMPANY, A FIRM.

PNEUMATIC TOOL.

947,861. Specification of Letters Patent. Patented Feb. 1, 1910.

Application filed May 13, 1902. Serial No. 107,130.

To all whom it may concern:

Be it known that I, WILLIAM H. SOLEY, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Pneumatic Tools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention, broadly considered, consists in controlling the movement of the valve in one direction by the air forced by the piston in its movement through a passage between the piston chamber whereby a long stroke of the piston may be obtained.

My invention also consists in certain details fully set forth in the specification.

In the drawings—Figure 1 is a longitudinal section on line 1—1, Fig. 8, with piston at top of stroke. Fig. 2 is a longitudinal section on line 2—2, Fig. 8, with piston at top of stroke. Fig. 3 is a section similar to Fig. 1, with valve and piston reversed. Fig. 4 is a section similar to Fig. 2 with valve and piston reversed. Fig. 5 is a section on line 5—5, Fig. 7. Fig. 6 is a similar section of Fig. 5 with valve reversed. Fig. 7 is a section on the line 7—7, Fig. 1. Fig. 8 is a section on the line 8—8, Fig. 1.

The cylinder is formed into the piston chamber B and the valve chamber C, the valve chamber C being separated from the piston chamber by the internal flange *c* forming a passage directly from the piston chamber to one end of the valve chamber. In the piston chamber B is the piston B′ and in the valve chamber is the valve D. This valve D has the circumferential grooves *d*, *d′*, and d^2. It has also the openings d^3 extending through the outer surface of the valve and terminating in the longitudinal passage d^4 which extends through the lower end of the valve.

E is the inlet passage for live air, which is in communication with the air supply, not shown.

In the vertical walls of the cylinder are cut the grooves *e*, *e′*, e^2, and e^3 and surrounding the cylinder is the casing L forming said grooves into channels or conduits. When the parts are in the position shown in Figs. 1, 2 and 6, the live air passes from passage E through the orifices d^3 into passage d^4 and thence to the top of the piston chamber B. The lower end of the piston chamber B through the port d^5 is in communication with the passage *e′*. The upper end of this passage *e′* is through the port d^6 in communication with the circumferential grooved portion d^2 of the valve, which communicates with the chamber *l′* formed in the cylinder and connected with the atmosphere. Under these conditions the piston descends until the upper end of the piston passes beyond the port d^7. When the piston reaches this point, the live air above the piston will pass through this port d^7 into the groove or passage e^3, and thence through port d^8 into the valve chamber above the valve, shifting the valve into the positions shown in Figs. 3, 4, and 5. The shift of the valve brings the groove *d′* opposite the live air inlet passage E and opposite the port e^8 leading to passage *e*. Live air is thus admitted to the bottom of the piston chamber. The passage e^2, which communicates with the upper end of the piston chamber through the port d^9, communicates, through the port d^{10}, with the circumferential grooved portion *d* of the valve, which communicates with the chamber *l′* connected with the atmosphere. Under these conditions the piston will ascend. Opening into the piston chamber from passage e^3 is also the port d^{11}. The ports d^7 and d^{11} are so arranged with reference to the travel of the piston that substantially at the time the piston covers port d^7, port d^{11} will be uncovered so that the valve will be acted on by the air to hold it in the position, Figs. 3, 4, and 5, during the whole stroke of the piston. As soon as the piston in its up stroke reaches the port d^9 so as to cover it, the exhaust above the piston will be closed and the further upward movement of the piston due to the air pressure behind it and the inertia of the piston will force the air in front of it into the passage d^4 against the valve at the closed end of the passage and against the end of the valve contiguous to the piston chamber. As the piston moves this air will become more and more compressed and its pressure raised until finally it rises sufficiently to move the valve into the initial position, Figs. 1, 2 and 6. By this arrangement the stroke of the piston may be arranged so as to be of any desired

length, as all that is necessary is to arrange the exhaust port d^9 at such a point below the top of the piston chamber that the piston will have a sufficient length of travel to compress the air above it sufficiently to move the valve, without striking the valve, and providing an opening from the valve chamber to the piston chamber, so that the air so compressed can act upon the valve.

Having now fully descibed my invention, what I claim and desire to protect by Letters Patent is—

1. In a pneumatic tool, in combination a piston chamber and a valve chamber, a valve in the valve chamber and a piston in the piston chamber, a passage from the valve chamber at one end of the valve to the upper end of the piston chamber, an exhaust passage communicating with the upper portion of the piston chamber below the upper limit of travel of the piston, and a passage in the valve opening into the upper end of the piston chamber.

2. In a pneumatic tool, in combination, a piston chamber, a valve chamber, a piston in the piston chamber, a valve in the valve chamber, a supply passage and an exhaust passage having ports communicating with the piston chamber at the lower end thereof, an exhaust passage communicating with the piston chamber at the upper end thereof, and a passage, communicating with the valve chamber at one end thereof, provided with two ports communicating with the piston chamber near the lower end thereof above the first named ports, the last named ports being separated by a distance substantially equal to the length of the piston.

3. In a pneumatic tool, in combination, a piston chamber, a valve chamber, the lower end of the valve chamber opening directly into the piston chamber, a piston in the piston chamber, a valve in the valve chamber, a passage in the valve opening directly to the piston chamber, orifices extending from said passage to the outer surface of the valve, a live air passage leading from the valve chamber to the lower portion of the piston chamber, said valve having a circumferential groove, an inlet for the air under pressure terminating in the valve chamber, the groove and orifices being so arranged that in one position of the valve the orifices in the valve register with the air inlet and in the other position of the valve the annular groove registers with the air inlet and passage to the lower portion of the piston chamber.

4. In a pneumatic tool, in combination, a piston chamber, a valve chamber, the lower end of the valve chamber opening directly into the piston chamber, a piston in the piston chamber, a valve in the valve chamber, a passage in the valve opening directly to the piston chamber orifices, extending from said passage to the outer surface of the valve, a live air passage leading from the valve chamber to the lower portion of the piston chamber, said valve having a circumferential groove, an inlet for the air under pressure terminating in the valve chamber, the groove and orifices being so arranged that in one position of the valve the orifices in the valve register with the air inlet and in the other position of the valve the annular groove registers with the air inlet and passage to the lower portion of the piston chamber, an exhaust passage from the upper portion of the piston chamber to the valve chamber, a second exhaust passage from the lower portion of the piston to the valve chamber, an exhaust chamber and passages leading from the exhaust chamber, circumferential grooves d and d^2 in the valve, the arrangement of said grooves being such that in one position of the valve the groove d registers with the exhaust passage from the upper portion of the piston and one passage to the exhaust chamber and in the other position of the valve the groove d^2 registers with the exhaust passage from the lower portion of the piston chamber and the other passage to the exhaust chamber.

5. In a pneumatic tool, a valve chamber, an air inlet to the valve chamber, an exhaust chamber, passages from said exhaust chamber to the valve chamber, a valve in said chamber, said valve having circumferential grooves contiguous to each other, an exhaust passage from the upper portion of the piston chamber, an exhaust passage from the lower portion of the said piston chamber, said valve in its movement in one direction being adapted through one circumferential groove to connect one of the exhaust passages with the exhaust chamber and in its movement in the opposite direction through the other circumferential grooves to connect the other exhaust passage with the exhaust chamber, a passage in said valve opening into the upper end of the piston chamber, orifices through said valve, above said exhaust grooves, opening into said passages, a live air groove in said valve above said orifices, a live air passage leading to the lower end of the piston chamber, a live air inlet passage to the valve chamber, the orifices in the valve and live air grooves being so arranged that in one position of the valve the orifices register with the live air inlet and in the other position of the valve, the live air groove registers with said air inlet and live air passage to the lower end of the piston chamber.

6. In a pneumatic tool, a valve chamber, an air inlet to the valve chamber, an exhaust chamber, passages from said exhaust chamber to the valve chamber, a valve in said chamber, said valve having circumferential grooves contiguous to each other, an exhaust passage from the upper portion of the piston cham-

ber, an exhaust passage from the lower portion of the said piston chamber, said valve in its movement in one direction being adapted through one circumferential groove to connect one of the exhaust passages with the exhaust chamber and in its movement in the opposite direction, through the other contiguous circumferential groove, to connect the other exhaust passage with the exhaust chamber, a passage in said valve opening into the upper end of the piston chamber, orifices through said valve, above said exhaust grooves, opening into said passages, a live air groove in said valve above said orifices, a live air passage leading to the lower end of the piston chamber, a live air inlet passage to the valve chamber, the orifices in the valve and live air grooves being so arranged that in one position of the valve the orifices register with the live air inlet and in the other position of the valve the live air groove registers with said air inlet and live air passage to the lower end of the piston chamber, and a passage leading from the piston chamber to the upper end of the valve chamber.

7. In a pneumatic tool, a valve provided with two circumferential grooves on its lower portion, orifices through said valve above said grooves terminating in a longitudinal passage extending to the lower end of the valve and open at that end, and a circumferential groove in said valve above said orifices.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 24th day of April, 1902.

WILLIAM H. SOLEY.

Witnesses:
M. F. ELLIS,
M. M. HAMILTON.