No. 734,765. PATENTED JULY 28, 1903.

W. H. SOLEY.

PNEUMATIC TOOL.

APPLICATION FILED JUNE 3, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

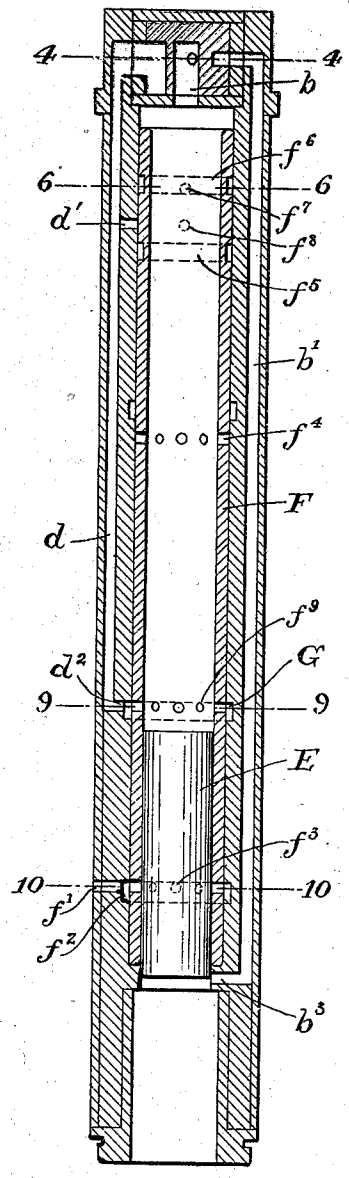


Fig. 2.

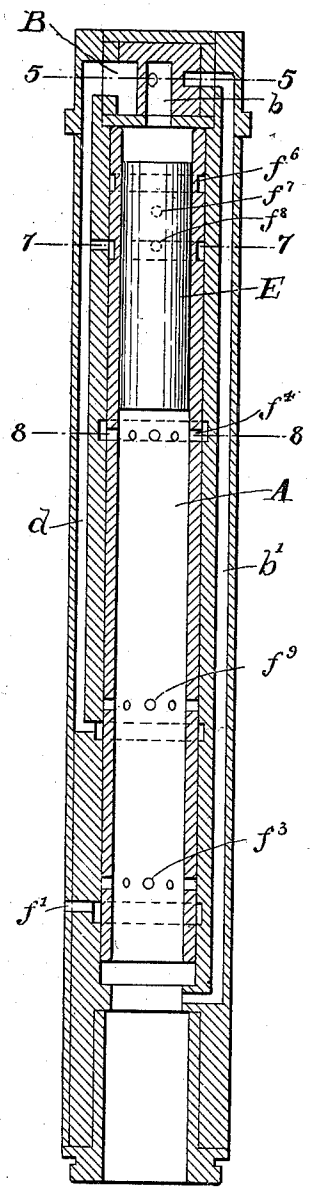


Fig. 4.

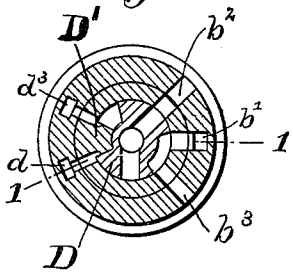


Fig. 5.

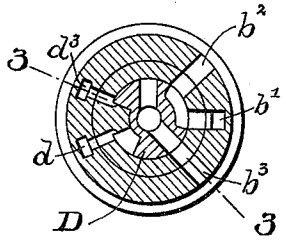
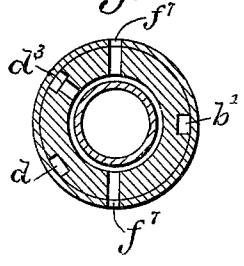


Fig. 6.



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PNEUMATIC TOOL.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

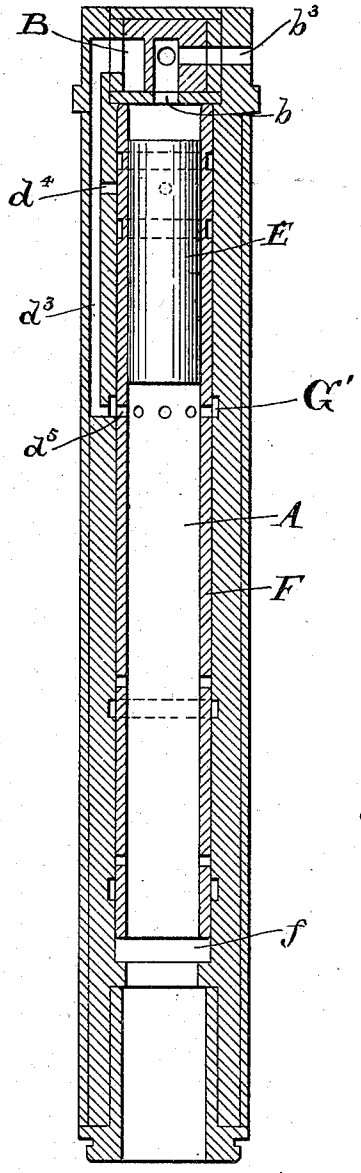


Fig. 7.

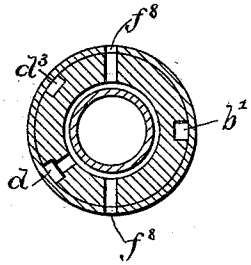


Fig. 8.

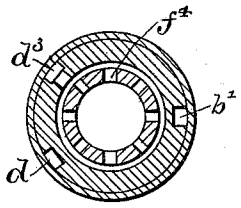


Fig. 9.

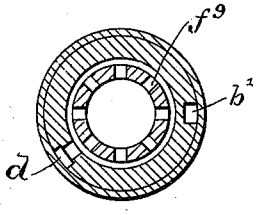
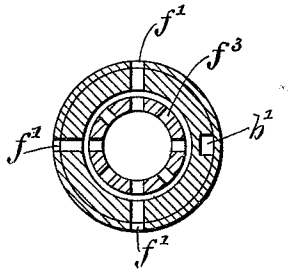


Fig. 10.



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No. 734,765. Patented July 28, 1903.

UNITED STATES PATENT OFFICE.

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

PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 734,765, dated July 28, 1903.

Application filed June 3, 1902. Serial No. 110,033. (No model.)

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.

Speaking generally, the object of my invention is to produce a pneumatic tool the piston or hammer of which will have a long traverse in the cylinder, although the length of the piston or hammer itself may be small.

I will first describe the embodiment of my invention shown in the accompanying drawings and then point out the invention in the claims.

In the drawings, Figure 1 is a longitudinal section on line 1 1 of Fig. 4. Fig. 2 is a similar view showing all the parts in the reverse position. Fig. 3 is a longitudinal section on line 3 3, Fig. 5. Fig. 4 is a transverse section on line 4 4, Fig. 1. Fig. 5 is a transverse section on line 5 5, Fig. 2. Fig. 6 is a transverse section on line 6 6, Fig. 1. Fig. 7 is a transverse section on line 7 7, Fig. 2. Fig. 8 is a transverse section on line 8 8, Fig. 2. Fig. 9 is a transverse section on line 9 9, Fig. 1. Fig. 10 is a transverse section on line 10 10, Fig. 1.

A is the piston-chamber, B the valve-chamber, both within the casing C. From the valve-chamber B a passage b extends through the casing, opening into the upper end of the piston-chamber, and b' is a passage from the valve-chamber extending through the casing and opening into the lower end of the piston-chamber through the port b^3.

b^2 is an inlet-passage from the source of pressure-supply to the valve-chamber.

b^3 is a passage from the valve-chamber to the exhaust.

D is the valve, having the valve-piston D', from one side of which the passage d extends downward through the casing and has ports d' and d^2 opening into the piston-chamber A. From the other side of the valve-piston D' the passage d^3 extends downward through the casing and has the ports d^4 and d^5 opening into the piston-chamber A. Within the piston-chamber A is the piston E and the movable cylindrical sleeve or pilot-valve F. The piston E is quite short, while the sleeve F, which, as will hereinafter appear, is practically a pilot-valve, extends substantially the entire length of the piston-chamber A, its range of movement being about five-eighths of an inch. On the bottom it rests upon a projection f from the casing. Near the lower end of the piston-chamber is a port f', leading directly through the casing, terminating in the annular groove f^2 in the casing.

G is an annular orifice in the casing opposite the port d^2, and G' is a similar annular groove in the casing opposite port d^5.

In the sleeve F at its lower end and around the same are orifices f^3. In the sleeve above the point and around the same are the orifices f^9. Above these orifices in the sleeve are other orifices f^4 in the sleeve. Above the last-mentioned orifices is the annular groove f^5 around the sleeve. Near the top of the sleeve is the annular groove f^6 around the sleeve. f^7 and f^8 are orifices in the casing to the atmosphere.

The operation of the tool is as follows: Starting with the parts in the position shown in Fig. 1, the passage b is open to the live-air supply, which passes downward through the orifices f^9, port d^2, and passage d to one side of the valve-piston. The passage d^3 from the other side of the valve-piston is in communication through port d^4 with the orifice f^6, leading to the exhaust. This causes the valve to shift, so that the passage b is connected with the exhaust and the passage b' is in connection with the source of air-supply. The piston E and sleeve F will then commence to move upward together until the sleeve has reached the position shown in Fig. 2. As the sleeve has but a short range of movement, it will reach the position shown in Fig. 2 before the piston reaches the position shown in that figure. When the sleeve has reached the position shown in Figs. 2 and 3, the orifices f^4 in the sleeve F are in communication with

the port d^5, connected with the passage d^3. The passage d, through the port d', is in communication with orifices f^6 to the atmosphere. As soon as the lower end of the piston E has passed beyond the orifices f^4 the live air below the piston will pass through port d^5 and passage d^3 to the valve-chamber, shifting the valve. When the valve is shifted, the passage b will be connected with the air-supply and the passage b' with the exhaust. The piston and sleeve will then commence to move downward, but the sleeve having but a short movement will reach its ultimate downward position, Fig. 1, before the piston reaches the position shown in Fig. 1. The downward movement of the sleeve causes the opening f^3 in the sleeve to coincide with the annular groove f^2. The purpose of this is that in the downward movement of the piston the air below it may be exhausted quickly and directly, instead of relying upon the long passage b' to exhaust. When the piston in its downward movement has passed below the openings or orifices f^9, the live air above the piston will pass through said orifices into the passage d to one side of the valve, while the other side of the valve through the passage d^3 and port d^4 will be in communication with the exhaust through the orifices f^6. This completes one cycle of operation. As may be seen, I have, in effect, an auxiliary or pilot which in advance of the piston adjusts the ports and passages, so that in the subsequent passage of the piston the reversal is accomplished. I can thus arrange a cylinder of indefinite length and with a piston of small length obtain a long stroke.

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

1. In a pneumatic tool, in combination a piston-chamber and piston therein, a valve-chamber and a main valve therein, a pilot, or supplemental valve in the piston-chamber adapted to act in advance of the piston and connect one main-valve-operating passage with the piston-chamber.

2. In a pneumatic tool, in combination a piston-chamber and piston therein, a valve-chamber and a main valve therein, a pilot or supplemental valve in the piston-chamber adapted to act in advance of the piston and to connect one main-valve-operating passage with the piston-chamber and the other main-valve-operating passage with the exhaust.

3. In a pneumatic tool, in combination a piston-chamber and piston therein, a valve-chamber and a main valve therein, a pilot or supplemental valve in the piston-chamber adapted to act in both directions in advance of the piston, in one direction to connect one main-valve-operating passage with the piston-chamber and the other main-valve-operating passage with the exhaust and in the other direction to connect the last-mentioned valve-operating passage with the piston-chamber and the first-mentioned main-valve-operating passage with the exhaust.

4. In a pneumatic tool, a pilot or supplemental valve in the piston-chamber adapted to act in advance of the piston and in one direction opening a passage in front of the piston from the piston-chamber directly to the atmosphere.

5. In a pneumatic tool, a valve-chamber and valve, a piston-chamber and piston, a passage leading from the valve-chamber to the upper end of the piston adapted to be connected by the movement of the valve with the source of pressure-supply or exhaust, a valve-operating passage leading to the piston-chamber, a supplemental or pilot valve in the piston-chamber acting in advance of the piston and adapted in its movement to connect said valve-operating passage directly to the piston-chamber or to the exhaust dependent upon the direction of movement of said pilot or supplemental valve.

6. In a pneumatic tool, in combination with a valve-chamber and valve, a piston-chamber and piston, a passage leading from the valve-chamber to the upper portion of the piston-chamber, a passage leading from the valve-chamber to the lower portion of the piston-chamber said passages being, in the movement of the valve alternately connected with the source of pressure-supply and exhaust, a valve-operating passage leading from one side of the valve to the piston-chamber, a valve-operating passage leading from the opposite side of the valve to the piston-chamber, a supplemental or pilot valve in the piston-chamber acting in advance of the piston in both directions and adapted in its movement in one direction to connect one valve-operating passage directly with the piston-chamber and the other valve-operating passage with an exhaust and vice versa in the other direction of movement.

7. In a pneumatic tool, in combination, a valve-chamber, a valve in said chamber, a piston-chamber, a piston in said chamber, passages and ports controlled extending from the valve-chamber to opposite ends of the piston-chamber controlled by the valve and valve-operating passages extending from opposite sides of the valve to the piston-chamber, and a pilot or supplemental valve in the piston-chamber acting in advance of the piston and controlling the connection of said valve-operating passages with the piston-chamber and exhaust.

8. In a pneumatic tool, in combination a valve-chamber and valve, a piston-chamber and piston, a sleeve in the piston-chamber surrounding said piston and of greater length than the piston, a valve-operating passage extending from one side of said valve to the piston-chamber, said passage being adapted to be covered by said sleeve, orifices in said sleeve adapted in the movement of the sleeve to register with said passage and connect it with the piston-chamber within said sleeve.

9. In a pneumatic tool in combination, a valve-chamber and valve, a piston-chamber and piston, a sleeve in the piston-chamber surrounding said piston and of greater length than said piston, a valve-operating passage extending from one side of the valve to the piston-chamber, said passage being adapted to be covered by said sleeve, there being a groove on the outer surface of said sleeve adapted in the movement of the sleeve to register with said passage, orifices from said piston-chamber directly to the atmosphere, the position of said orifice being such that the groove in the sleeve registers with said orifices when said groove registers with the passage.

10. In a pneumatic tool, in combination, a valve-chamber and valve, a piston-chamber and piston, a sleeve in the piston-chamber surrounding said piston and of greater length than the piston, a valve-operating passage extending from one side of the valve to the piston-chamber, a valve-operating passage from the opposite side of the valve to the piston-chamber, said passages being adapted to be closed by the sleeve, there being two sets of orifices in the sleeve adapted in the movement of the sleeve in one direction to connect one valve-operating passage with the piston-chamber within the sleeve and in the movement in the other direction to connect the other valve-operating passage with the piston-chamber within the sleeve.

11. In a pneumatic tool, in combination, a valve-chamber and valve, a piston-chamber and piston, a sleeve in the piston-chamber surrounding the said piston and of greater length than the piston, a valve-operating passage extending from one side of the valve to the piston-chamber, a valve-operating passage from the opposite side of the valve to the piston-chamber, said passages being adapted to be closed by the sleeve, there being two sets of orifices in the sleeve, adapted in the movement of the sleeve in one direction to connect one valve-operating passage with the piston-chamber within the sleeve and in the movement in the other direction to connect the other valve-operating passage with the piston-chamber within the sleeve, there being two sets of orifices extending from the piston-chamber directly to the atmosphere, there being two grooves in the outer surface of the sleeve, the position and arrangement of grooves, exhaust orifices and passages being such that in the movement of the sleeve in one direction one set of exhaust-orifices is connected with one valve-operating passage through the medium of one groove, while in the movement of the sleeve in the other direction the other set of exhaust-orifices is connected with the other valve-operating passage through the medium of the other groove.

12. In a pneumatic tool, in combination with a piston-chamber and piston therein, passages from the lower portion of said piston-chamber leading directly to the atmosphere, a sleeve in said piston-chamber surrounding said piston, said sleeve being of length greater than that of the piston, and provided with orifices adapted in the downward movement of said sleeve to register with said passage, and open connection between the piston-chamber and the atmosphere in front of the piston.

In testimony of which invention I have hereunto set my hand, at Philadelphia, on this 19th day of May, 1902.

WILLIAM H. SOLEY.

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