

W. H. VAN SICKEL.  
PNEUMATIC TOOL.  
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934,640.

Patented Sept. 21, 1909.

FIG. 1.

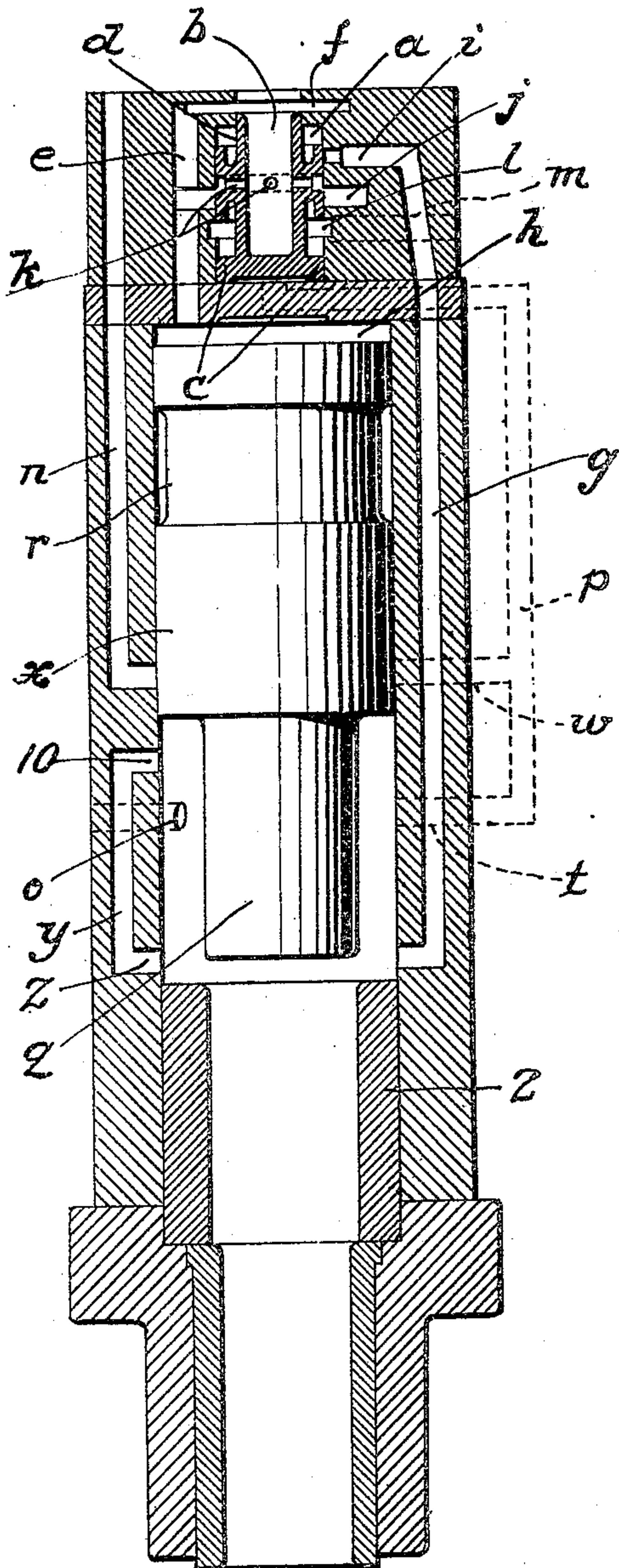
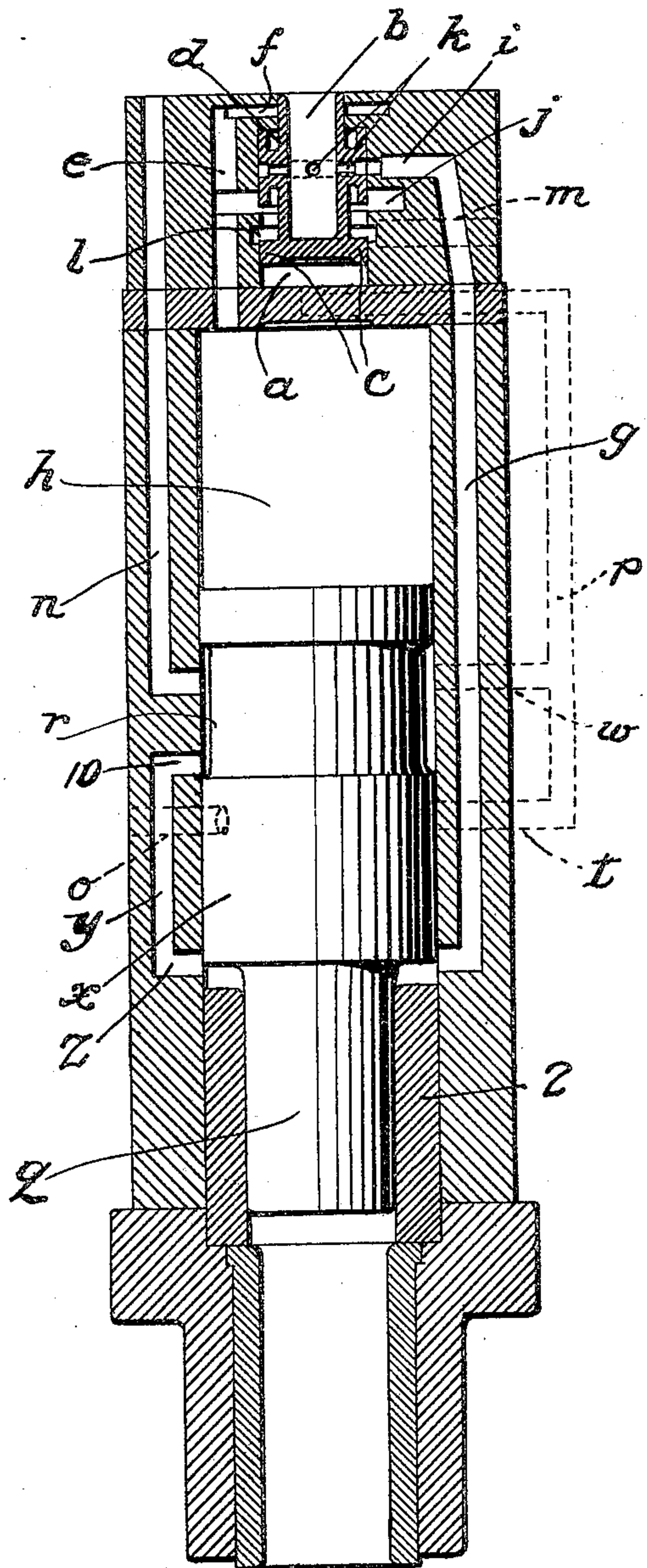


FIG. 2.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## PNEUMATIC TOOL.

934,640.

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*To all whom it may concern:*

Be it known that I, WILBER H. VAN SICKEL, 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 relates particularly to certain improvements in the valve mechanism of pneumatic tools and by which the operation of the tool is made more rapid and certain, and also to cushioning the piston in its downward stroke independent of the shift of the valve.

Speaking generally: I employ a hollow valve in the valve chamber, the interior of which, through its open end, is in constant communication with the air supply. In the upper portion of the valve chamber is a lateral passage through the valve chamber which, in one position of the valve, is covered by the valve skirt. When the valve moves to its other position, this passage is uncovered and receives air from the air supply. This passage terminates in a longitudinal passage leading to the upper portion of the piston chamber. In order to insure, with certainty, a full amount of air to act on the upper portion of the piston, I provide openings through the valve, which in the position of the valve, when the first mentioned lateral passage is uncovered from the valve skirt, communicate with a lateral passage through the valve chamber, opening into the longitudinal passage leading to the upper portion of the piston chamber. In the other position of the valve these openings through the valve communicate with a lateral passage through the valve chamber communicating with a longitudinal passage to the lower portion of the piston chamber. The action of the air upon the piston to drive it down being most important, my new valve mechanism enables the air to act quickly upon the upper portion of the piston, and sufficient air is insured to give the desired power. All of this I obtain with simplicity of construction.

I will now describe the embodiment of my invention illustrated in the accompanying drawing and then point out the invention in the claims.

In the drawings: Figure 1 is a sectional view of a pneumatic tool embodying my invention with the valve and piston in one position. Fig. 2 is a similar view with the parts in the other position.

*a* is the valve chamber, *b* the valve therein. This valve is hollow, the interior of which valve is in constant communication with the pressure supply through its open end. The lower portion or head of this valve is provided with the flanges *c* so that the exterior of the valve at this point is of greater area than the interior portion at that point and the area of the valve skirt *d*.

*e* is a longitudinal passage extending from the upper end of the piston chamber *h* to a point near the top of the valve chamber where it communicates with a lateral passage *f*, which lateral passage *f* is, in the position of the valve shown in Fig. 2, covered by the valve skirt *d*, and in the position shown in Fig. 1 it is not covered by the valve skirt.

*g* is a longitudinal passage extending from the lower portion of the piston chamber *h* to the lateral passage *i* extending through the wall of the valve chamber.

*j* is a lateral passage extending through the valve chamber, and communicating with the piston passage *e*.

*k* are ports or openings through the valve. In the position shown in Fig. 1, these openings *k* register with the passage *j*, and when in the position shown in Fig. 2, these openings *k* register with the passage *i*.

*l* is a chamber formed in the valve chamber and in constant communication with the exhaust passage *m*.

*n* is a longitudinal passage leading from an intermediate point of the piston chamber to the pressure supply.

*o* is an exhaust passage.

*p* is a passage leading from the valve chamber below the valve head and opening into the piston chamber at two points, one point opposite the point of opening of passage *n*, the other point opposite the exhaust *o*.

The operation of the tool is as follows: In the position shown in Fig. 1, the valve chamber below the valve is in communication with the exhaust through passage *p* and exhaust *o*. The pressure supply in the interior of the valve holds the valve in the position shown. The pressure below the piston *q* is exhausted through exhaust *o*. The pressure enters lat-



eral passage *f* and passes by longitudinal  
 passage *e* to the top of the piston, forcing the  
 piston down. A supplemental supply of air  
 is delivered on the top of the piston through  
 5 the ports *k*, lateral passages *j*, and longitu-  
 dinal passage *e*. When the grooved portion  
*r* of the piston reaches the opening of pas-  
 sage *n*, the solid portion *x* has covered the  
 opening *t* of passage *p* and exhaust *o*. Pres-  
 10 sure then passes to passage *p* through open-  
 ing *w* and, by reason of the greater area  
 acted on, the valve is moved to the position  
 shown in Fig. 2. In this position the skirt *d*  
 of the valve covers the passage *f*, and the  
 15 ports or openings *k* no longer register with  
 the passages *j*, and pressure does not pass  
 through the passage *e*. The passage *e* how-  
 ever, is in communication with chamber *l*  
 and the pressure above the piston exhausts.  
 20 The ports *k*, in this position of the valve, are  
 in communication with the passage *i*, and  
 pressure is admitted below the piston and it  
 is lifted. This continues until the grooved  
 portion of the piston passes beyond opening  
 25 of passage *n* and the solid portion *x* of pis-  
 ton has passed beyond the exhaust *o*, and  
 covered opening *w*, at which time the pres-  
 sure below the valve is relieved, and the con-  
 stant pressure in the interior of the valve  
 30 shifts it to the position shown in Fig. 1. I  
 also use certain means to cushion the piston  
 in its downward movement. The admission  
 of such cushioning being controlled solely  
 by the movement of the piston. By this ar-  
 35 rangement I am enabled to admit pressure  
 below the piston independent of the shift of  
 the valve, and thus allow pressure to act on  
 the top of the piston for a greater time than  
 is the case if the pressure admission below  
 40 the piston is dependent upon the shift of the  
 valve. For this purpose I employ the longi-  
 tudinal passage *y*, having the port *z* opening  
 into the piston chamber at a point at or near  
 its lower end, and also having a port 10  
 45 opening where, when the piston groove *r* un-  
 covers the opening or passage *n*, the piston  
 groove will register with the port 10 and  
 pressure will enter passage *y* and pass  
 through port *z* to a point at or near the  
 50 lower end of the piston chamber. By this  
 arrangement, the admission of the air to  
 cushion is in no way dependent upon the  
 shift of the valve. Therefore, the piston, in  
 its down stroke, can be held longer under  
 55 the action of live air and be provided with  
 cushioning, than if the admission of the air  
 to cushion were dependent upon the shift of  
 the valve. Further, while initially the bush-  
 ing 2 and striking portion of the piston  
 60 make a snug fit, still under wear of use  
 there is likely to be leakage at this point,  
 which leakage is compensated for by the in-  
 creased amount of live air admitted, in my  
 construction, to the lower portion of the pis-  
 65 ton chamber.

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

1. In a pneumatic tool, a piston chamber,  
 a piston therein, there being a longitudinal 70  
 passage leading from the upper portion of  
 piston chamber, a valve chamber, a hollow  
 valve therein, said valve having a flange in-  
 termediate of its length limiting the move-  
 ment of said valve in one direction, the in- 75  
 terior of said valve communicating at its  
 open end with the pressure supply, a lateral  
 passage at one end of said valve chamber  
 passing through the wall of said chamber  
 and communicating with the longitudinal 80  
 passage, said valve having a skirt which in  
 one position of the valve covers said lateral  
 passage, and in the other position passes be-  
 yond said passage, said valve having open-  
 ings therethrough, there being a passage 85  
 leading from the longitudinal passage, said  
 valve openings registering with said last-  
 mentioned passage when the lateral passage  
 is uncovered by the skirt.

2. In a pneumatic tool, a piston chamber, 90  
 a piston therein, there being a longitudinal  
 passage leading from the upper portion of  
 the piston chamber, a valve chamber, a hol-  
 low valve therein having a lower enlarged  
 head, the interior of the valve communicat- 95  
 ing at its open end with the pressure supply,  
 a lateral passage at the upper end of said  
 valve chamber passing through the wall of  
 said chamber and communicating with the  
 longitudinal passage, said valve having a 100  
 skirt which in the upper position of said  
 valve covers said lateral passage, and in the  
 lower position passes beyond said passage,  
 said valve having openings therethrough,  
 there being a passage leading from the longi- 105  
 tudinal passage, said valve openings regis-  
 tering with said last mentioned passage in  
 one position of the valve.

3. In a pneumatic tool, a piston chamber,  
 a piston therein, there being a longitudinal 110  
 passage leading from the upper portion of  
 piston chamber, a valve chamber in line with  
 said piston chamber, a hollow valve therein,  
 the interior of which communicates at its  
 open end with the pressure supply, a lateral 115  
 passage at one end of said valve chamber  
 passing through the wall of said chamber  
 and communicating with the longitudinal  
 passage, said valve having a skirt, which  
 in one position of the valve covers said lat- 120  
 eral passage, and in the other position passes  
 beyond said passage, said valve having open-  
 ings therethrough, there being a passage  
 leading from the longitudinal passage, said  
 valve openings registering with said last 125  
 mentioned passage in one position of the  
 valve.

4. In a pneumatic tool, a piston chamber,  
 a piston therein, there being a longitudinal  
 passage leading from the upper portion of 130



piston chamber, a valve chamber, a hollow valve therein, the interior of which communicates at its open end with the pressure supply, a lateral passage at one end of said valve chamber passing through the wall of said chamber and communicating with the longitudinal passage, said valve having a skirt which in one position of the valve covers said lateral passage, and in the other position passes beyond said passage, said valve having openings therethrough, there being a passage leading from the longitudinal passage, said valve openings registering with said last mentioned passage in one position of the valve, there being a passage leading from the lower portion of the piston chamber, said passage communicating with the valve chamber, said valve openings registering with said communication in the other position of the valve.

5. In a pneumatic tool, a piston chamber, a piston therein, there being a longitudinal passage leading from the upper portion of the piston chamber, a valve chamber, a hollow valve therein having a lower enlarged head, the interior of the valve communicating at its open end with the pressure supply, a lateral passage at the upper end of said valve chamber passing through the wall of said chamber and communicating with the longitudinal passage, said valve having a skirt which in the upper position of said valve covers said lateral passage, and in the lower position passes beyond said passage, said valve having openings therethrough, there being a passage leading from the longitudinal passage, said valve openings registering with said last mentioned passage in one position of the valve, there being a passage leading from the lower portion of the piston chamber, said passage communicating with the valve chamber, said valve openings registering with said communication in the upper position of the valve.

6. In a pneumatic tool, a piston chamber, a piston therein, there being a longitudinal passage leading from the upper portion of piston chamber, a valve chamber in line with said piston chamber, a hollow valve therein, the interior of which communicates at its open end with the pressure supply, a lateral passage at one end of said valve chamber passing through the wall of said chamber and communicating with the longitudinal passage, said valve having a skirt, which in one position of the valve covers said lateral passage, and in the other position passes beyond said passage, said valve having openings therethrough, there being a passage leading from the piston passage, said valve openings registering with said last mentioned passage in one position of the valve,

there being a passage leading from the lower end of the piston chamber, said passage communicating with the valve chamber, said valve openings registering with said communication in the other position of the valve.

7. In a pneumatic tool, the combination with the piston chamber and piston having a cut-away portion therein, the valve chamber and valve therein, of a passage in constant communication with the air supply, a passage from the piston chamber to the valve chamber for shifting the valve in the downward movement of the piston, and a passage admitting air below the piston in the shift of said valve, of a second passage leading to the lower portion of the piston chamber, the cut-away portion of the piston, in the downward movement of the piston, independent of the shift of the valve, connecting the constant air passage and the said second passage leading to the lower portion of the cylinder.

8. In a pneumatic tool, the combination with the piston chamber and piston having a cut-away portion therein, the valve chamber and valve therein, of a passage in constant communication with the air supply, a passage from the piston chamber to the valve chamber for shifting the valve in the downward movement of the piston, and a passage admitting air below the piston in the shift of said valve, of a second passage leading to the lower portion of the piston chamber, the cut-away portion of the piston, in the downward movement of the piston, connecting the constant air passage with the passage to the valve chamber to shift the valve, and with the said second passage to the lower portion of the cylinder.

9. In a pneumatic tool, the combination with the piston chamber and piston having a cut-away portion therein, the valve chamber and valve therein, of a passage in constant communication with the air supply, a passage from the piston chamber to the valve chamber for shifting the valve in the downward movement of the piston to admit air below the piston, of a passage leading to the lower portion of the piston chamber, the cut-away portion of the piston, in the downward movement of the piston, first connecting the constant air passage with the passage to the valve chamber and then the constant air passage with the passage to the lower portion of the piston chamber.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 16th day of February, 1909.

WILBER H. VAN SICKEL.

Witnesses:

M. M. HAMILTON,  
E. E. WALL.