H. E. LE GENDRE.

PNEUMATIC TOOL.

APPLICATION FILED NOV. 4, 1910.

1,053,304. Patented Feb. 18, 1913.

Fig. 1.

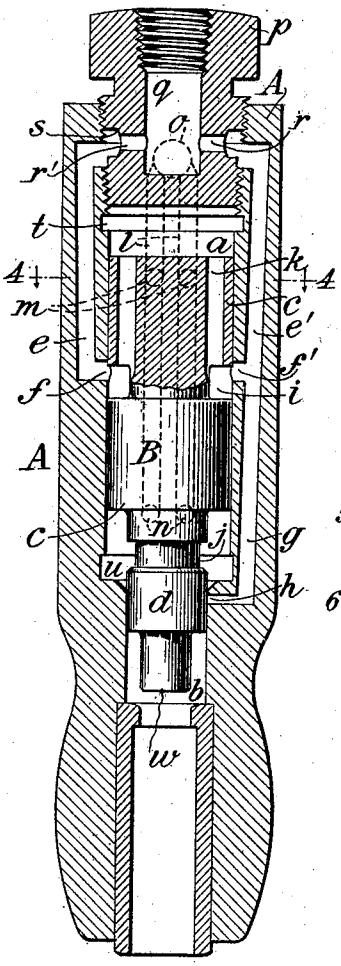


Fig. 2.

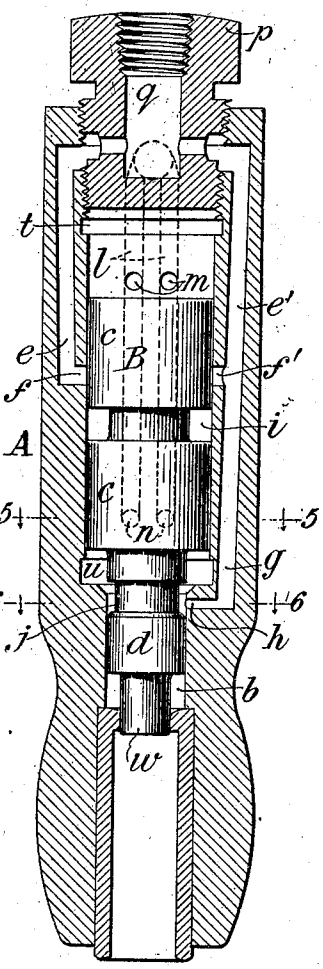


Fig. 3.

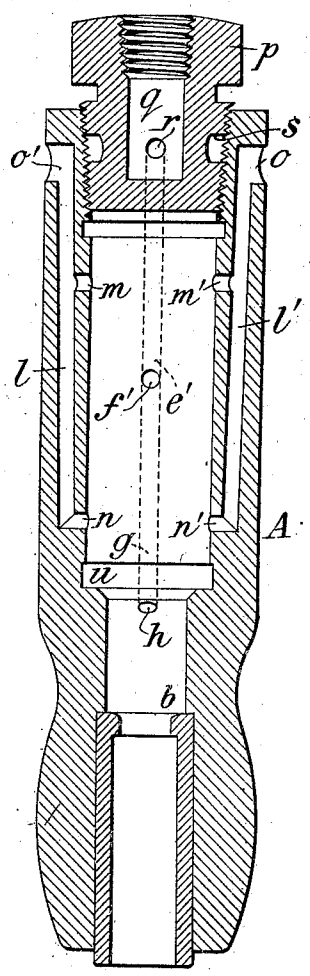


Fig. 4

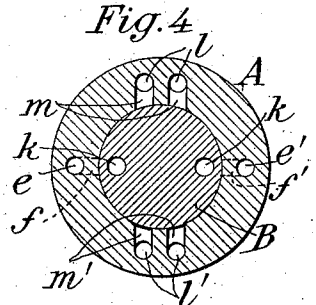


Fig. 5

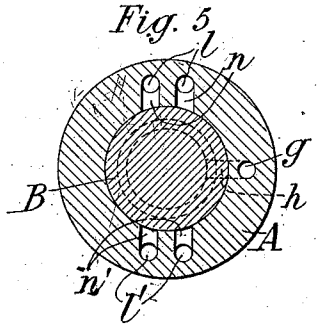
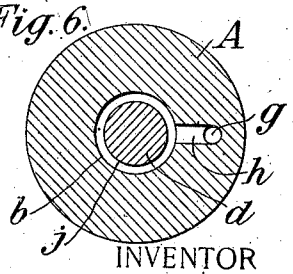


Fig. 6.



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PNEUMATIC TOOL.

1,053,304. Specification of Letters Patent. Patented Feb. 18, 1913.

Application filed November 4, 1910. Serial No. 590,625.

To all whom it may concern:

Be it known that I, HENRY E. LE GENDRE, a citizen of the United States, residing in Creskill, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Pneumatic Tools, of which the following is a specification.

This invention relates to pneumatic tools, and aims to provide certain improvements therein.

It is particularly directed to pneumatic hammers of the type known as valveless hammers, that is to say, those hammers in which there is no separate valve employed, the plunger itself acting to control the admission and exhaust of the air.

The principal object of the invention is to provide a tool of this type in which the plunger is cushioned upon its downward stroke, and preferably also upon its upward stroke. By this means crystallization of the plunger and excessive wear on the parts is avoided. This construction also permits the intensity of the blow to be modified as desired by the operator, without regulating the flow of air. This feature of improvement is particularly valuable when the device is used as a stone cutting tool, since it enables the operator to make coarse or fine cuts by a mere adjustment of the chisel.

The invention also includes other features of improvement which will be hereinafter more fully described.

In the drawings wherein I have illustrated one form of my invention,—Figure 1 is a vertical sectional view of the instrument, showing the plunger as it is moving downwardly to deliver its blow. Fig. 2 is a similar view showing the plunger as it is moving upwardly. Fig. 3 is a vertical sectional view with the plunger omitted and illustrating the casing at right angles to the positions shown in Figs. 1 and 2. Fig. 4 is a horizontal sectional view of the instrument on the line 4—4, Fig. 1, and Figs. 5 and 6 are like views on lines 5—5 and 6—6, respectively, in Fig. 2.

In said drawings A indicates the casing and B the plunger. Casing A is provided with a longitudinal bore *a* formed with a contracted portion *b* at its lower end. Within this bore fits the plunger B. This plunger is formed with a body portion *c* of approximately the same diameter as the bore *a* of the casing and with an extension *d* of approximately the same diameter as the contracted portion *b* of the bore and into which it projects. The casing is provided with passages for the admission of motive-fluid to the rear of the plunger, there preferably being a plurality of these passages *e*—*e'* with ports *f*—*f'*, and with a passage for the admission of fluid to the front of the plunger, there preferably being but one of these passages *g*, with its port *h*, and preferably formed as an extension of one of the passages *e*—*e'*. The opening and closing of these ports are controlled by the plunger B and for this purpose it is provided with the recess *i* in the body portion *c* and a recess *j* in its extension *d*, these recesses being preferably in the form of annular grooves. Plunger B also has longitudinal passages *k* therein, opening into the recess *i* in its body portion and into the bore in rear thereof, there preferably being a plurality of these. This permits motive-fluid to pass to the rear of the plunger when recess *i* is opposite ports *f*—*f'* of passages *e*—*e'*, and motive-fluid is permitted to pass into the front of the bore when recess *j* is opposite port *h* of passage *g*. Casing A is also provided with passages for the exhaust of motive-fluid from the front and rear portions of the bore, there preferably being a plurality of these passages *l*—*l'* to facilitate rapid exhaust of the motive-fluid. Each of the passages *l*—*l* is formed preferably with ports *m* and *n* and passages *l'*—*l'* with ports *m' n'* communicating with the upper and lower portions of the bore, the opening and closing of these ports being controlled by the plunger. Passages *l l* communicate with the atmosphere through a port *o* preferably common to both passages *l* and passages *l'* through a port *o'* similar to *o*, preferably common to both passages *l'*. The upper end of bore *a* is closed by a plug *p*, preferably screw-threaded into the end of the casing. This plug is provided with a passage *q* for the admission of motive-fluid, and is preferably threaded for the reception of the threaded end of a supply-pipe or hose. Passage *q* communicates with admission passages *e*—*e'* through branch passages *r*—*r'* preferably communicating with a groove *s*

formed around the plug. In the upper and lower parts of bore *a* are preferably formed recesses *t* and *u* for the expansion of motive-fluid when compressed by the plunger as it reciprocates back and forth. Casing A also has preferably formed thereon a nose *w* by which the blow of the plunger is delivered.

Operation:—The plunger being in the position illustrated in Fig. 1, motive-fluid will be admitted to the rear of the plunger to drive it downward through inlet passage *q*, branches *r*, *r'*, passages *e*, *e'* and ports *f*, *f'* in the casing, and through groove *i* and passages *k* in the plunger. Fluid in front of the plunger is expelled through exhaust ports *n*, *n'* and passages *l*, *l'*. As the plunger moves downward, it will cover ports *f*, *f'* and also the ports *n*, *n'*, thus cutting off motive-fluid from the rear thereof and closing the exhaust from the front of the bore. Further movement will uncover port *h* in the front end of the bore and admit motive-fluid to the front of the plunger through passage *g*. This fluid will be compressed in the front of the bore, cushioning the plunger and gradually diminishing its force. Expansion of the fluid which is compressed in front of the plunger will initiate its rearward movement and impart to it sufficient momentum to complete its movement. Fluid in rear of the plunger will be expelled through ports *m*, *m'* and passages *l*, *l'*. Rearward movement of the plunger will cover port *h* and the ports *m*, *m'*, thus cutting off fluid from in front of the plunger and closing the exhaust in the rear. Further movement will uncover the ports *f*, *f'* and the plunger will be in position to again move downward and thus repeat the cycle of operation.

With this hammer, to secure blows of varying intensities, it is only necessary to vary the distance between the end of the plunger and the end of the tool, which is inserted in the socket in the end of the casing.

While I have illustrated and described but one embodiment of the invention, I do not desire to be misunderstood as limiting myself thereto, as many changes and modifications may be made thereon without departing from the spirit of the invention.

What I claim is:

1. A pneumatic tool comprising a casing and a plunger, said casing having a longitudinal bore therein of two different diameters, adapted to receive said plunger, said plunger having a body portion adapted to reciprocate in the larger portion of said bore and an extension adapted to reciprocate within the smaller portion of said bore, admission passages in communication with the larger and smaller portions of said bore, and exhaust passages in communication with the larger portion of said bore at different longitudinal points, the body portion of said plunger controlling the admission of motive fluid to the rear of said plunger, and the exhaust from the front and rear thereof, and said extension controlling the admission of motive fluid to the front of said plunger.

2. A pneumatic tool comprising a casing and a plunger, said casing having a longitudinal bore therein of two different diameters, adapted to receive said plunger, said plunger having a body portion adapted to reciprocate in the larger portion of said bore and an extension adapted to reciprocate within the smaller portion of said bore, admission passages in communication with the larger and smaller portions of said bore, and exhaust passages in communication with the larger portion of said bore at different longitudinal points, the body portion of said plunger having passages therein from its sides to its rear and controlling the admission of motive fluid to the rear of said plunger, and the exhaust from the front and rear thereof, and said extension controlling the admission of motive fluid to the front of said plunger.

3. A pneumatic tool comprising a casing and a plunger, said casing having a longitudinal bore therein of two different diameters, adapted to receive said plunger, said plunger having a body portion adapted to reciprocate in the larger portion of said bore and an extension adapted to reciprocate within the smaller portion of said bore, admission passages in communication with the larger and smaller portions of said bore, and exhaust passages in communication with the larger portion of said bore at different longitudinal points, the body portion of said plunger controlling the admission of motive fluid to the rear of said plunger, and the exhaust from the front and rear thereof, and said extension having a groove therein through which motive fluid is admitted from the smaller to the larger portion of the bore for returning said plunger.

4. A pneumatic tool comprising a casing and a plunger, said casing having a longitudinal bore therein of two different diameters, adapted to receive said plunger, said plunger having a body portion adapted to reciprocate in the larger portion of said bore and an extension adapted to reciprocate within the smaller portion of said bore, admission passages in communication with the larger and smaller portions of said bore, and exhaust passages in communication with the larger portion of said bore at different longitudinal points, the body portion of said plunger controlling the admission of motive fluid to the rear of said plunger, and the exhaust from the front and rear thereof, and said extension controlling the admission of motive fluid to the front of said plunger and being of sufficient length to remain con-

stantly within said smaller portion of the bore without being withdrawn throughout reciprocations of the plunger.

5. A pneumatic tool comprising a casing and a plunger, said casing having a longitudinal bore therein of two different diameters, adapted to receive said plunger, said plunger having a body portion adapted to reciprocate in the larger portion of said bore and an extension adapted to reciprocate within the smaller portion of said bore, admission passages in communication with the larger and smaller portions of said bore, and exhaust passages in communication with the larger portion of said bore at different longitudinal points, the body portion of said plunger controlling the admission of motive fluid to the rear of said plunger, and the exhaust from the front and rear thereof, and said extension controlling the admission of motive fluid to the front of said plunger and cutting off admitted motive fluid and trapping it in front of the plunger before said plunger reaches the end of its forward stroke for cushioning the same.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

HENRY E. LE GENDRE.

Witnesses:
EDW. REDHEAD,
A. B. GROVER.