No. 825,669. PATENTED JULY 10, 1906.

H. LEINEWEBER.

PNEUMATIC TOOL.

APPLICATION FILED MAR. 20, 1905.

3 SHEETS—SHEET 1.

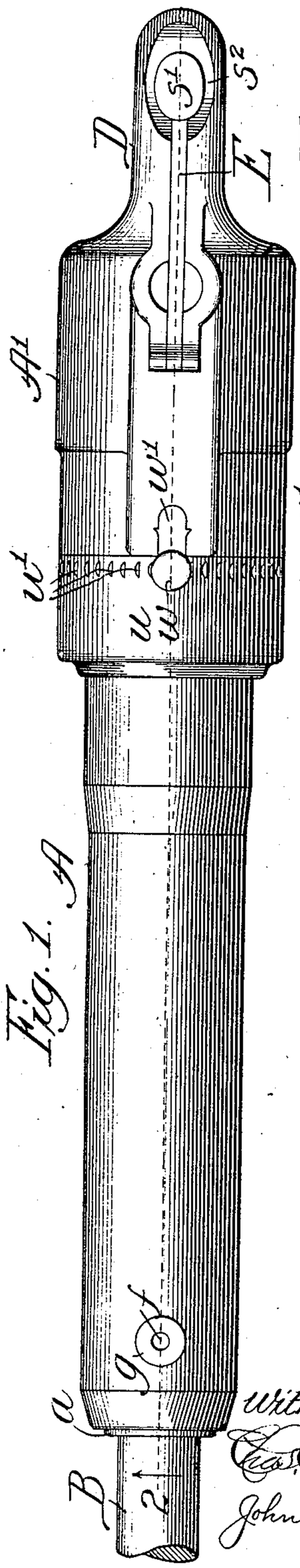

Fig. 1.

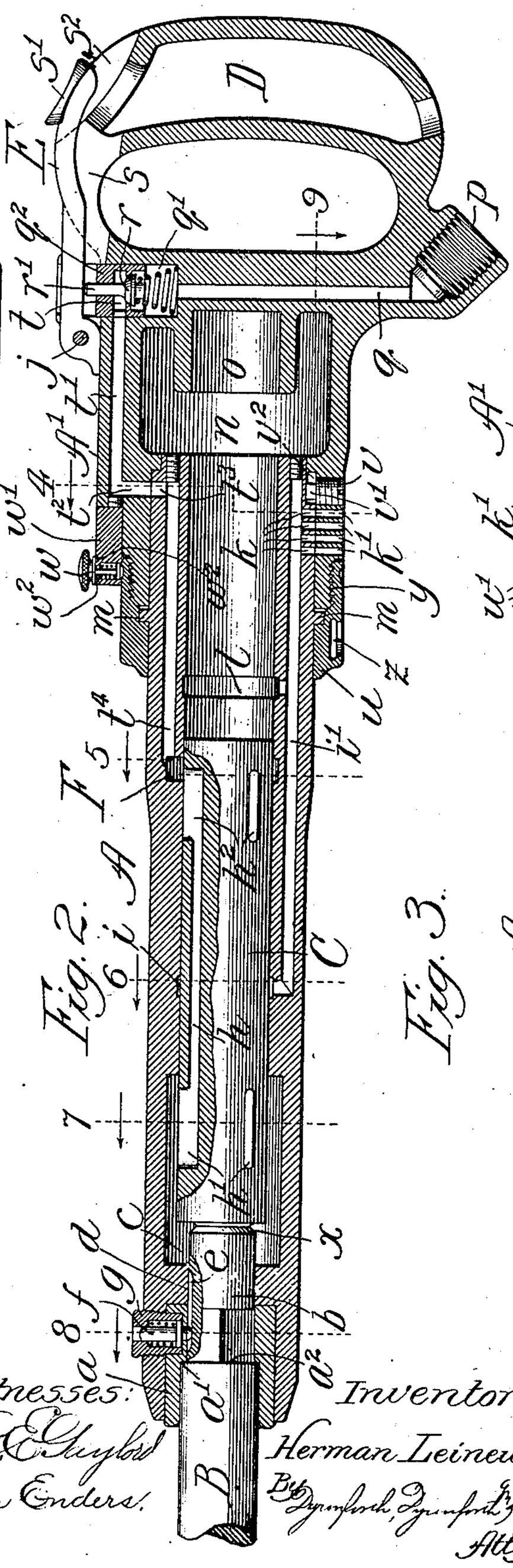

Fig. 2.

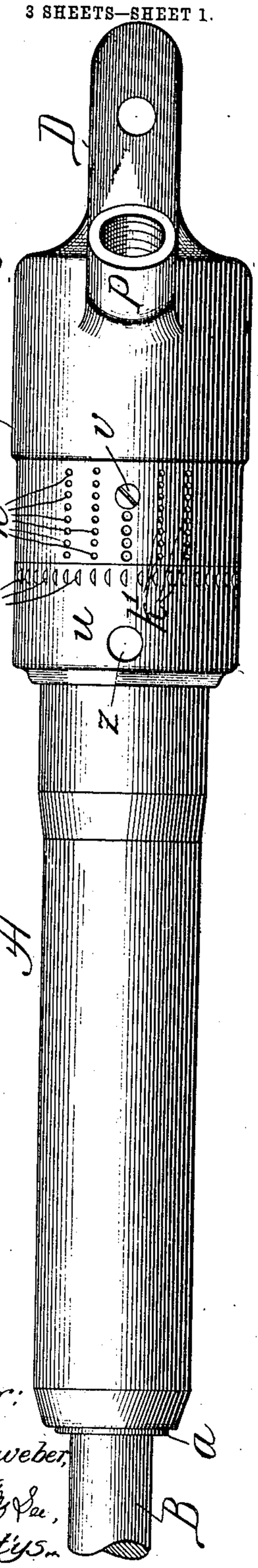

Fig. 3.

Witnesses:
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3 SHEETS—SHEET 2.

Fig. 6.

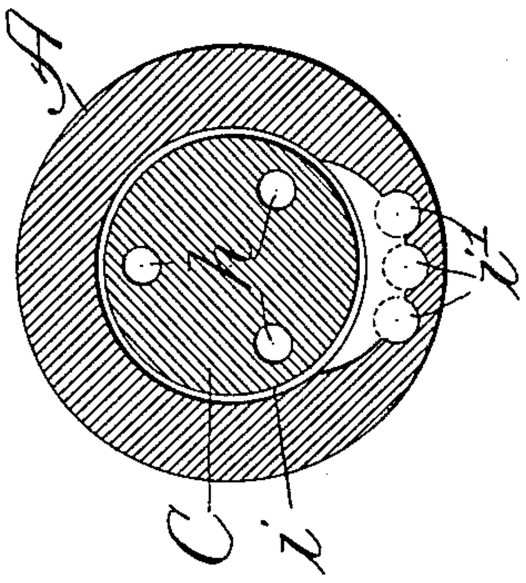


Fig. 9.

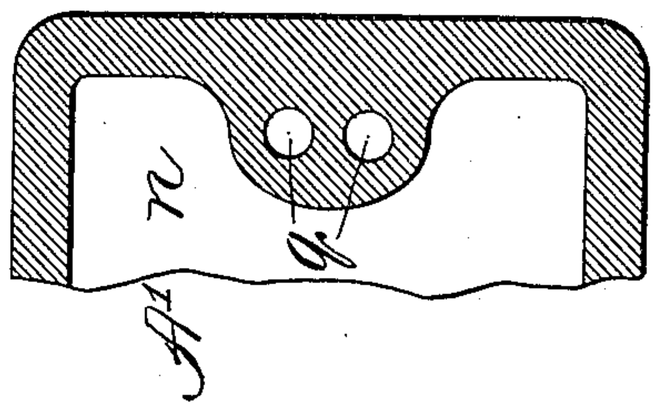


Fig. 5.

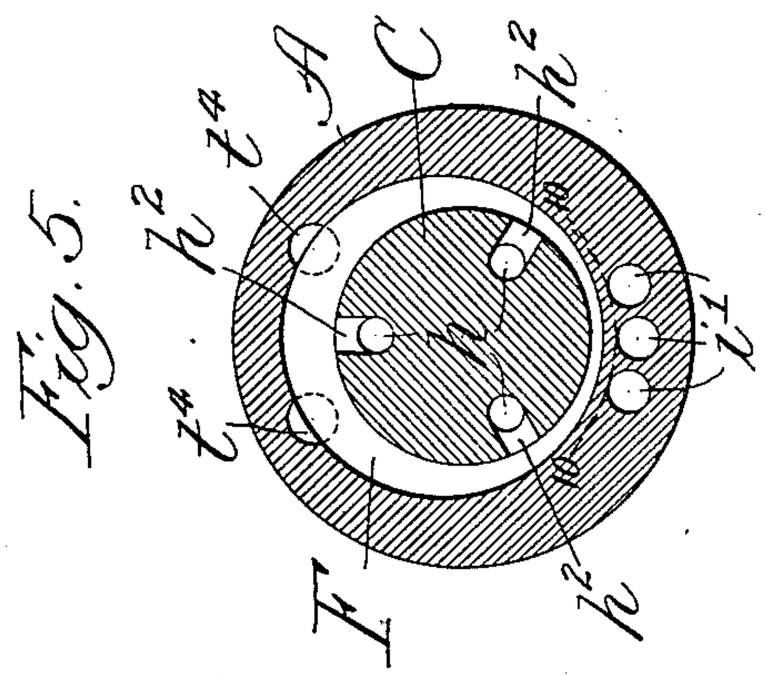


Fig. 8.

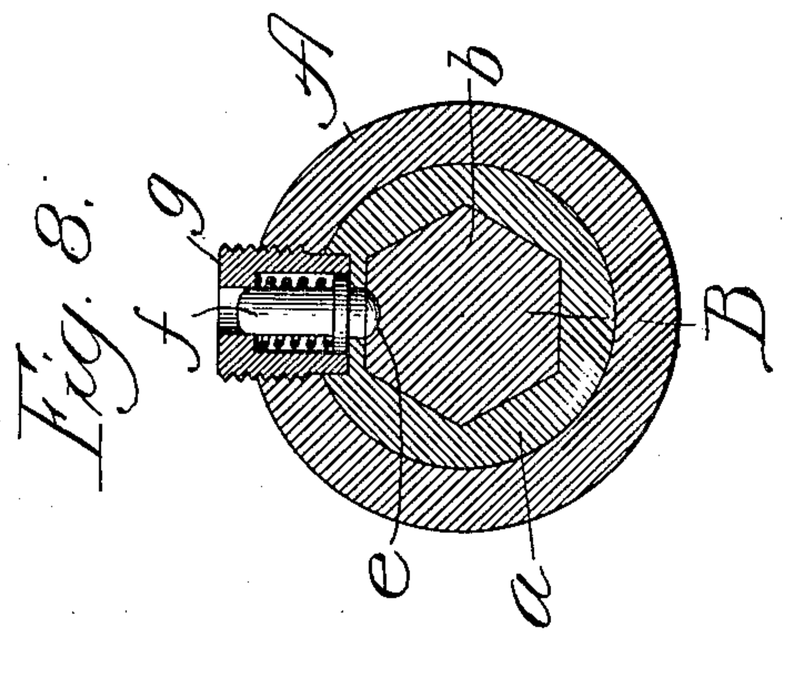


Fig. 4.

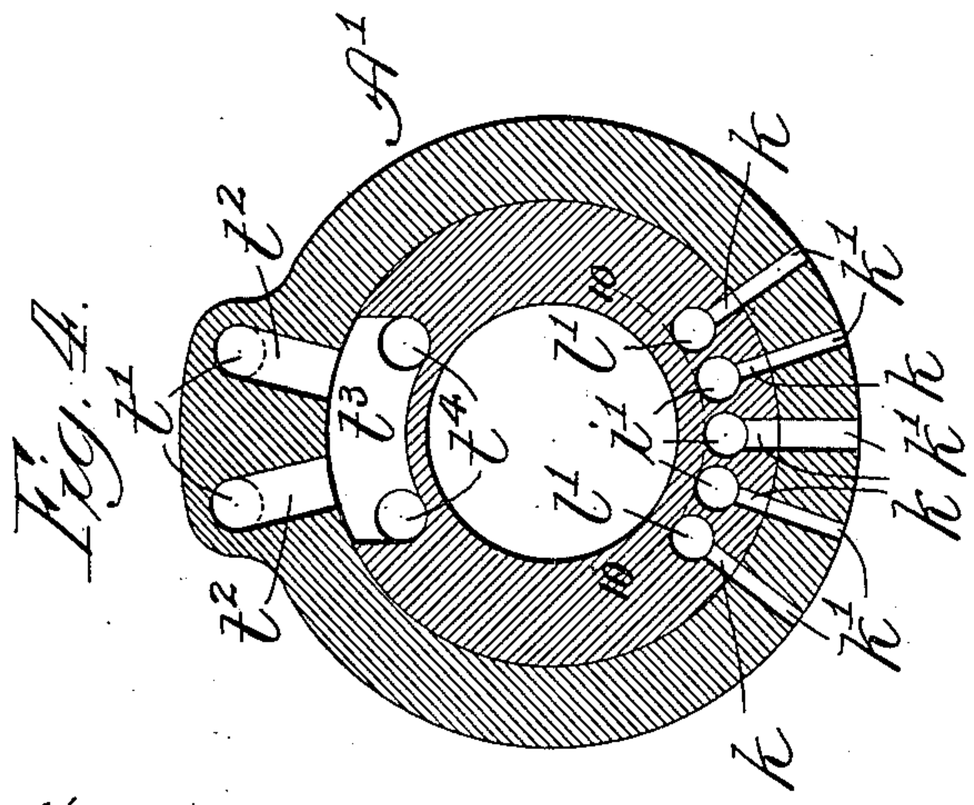
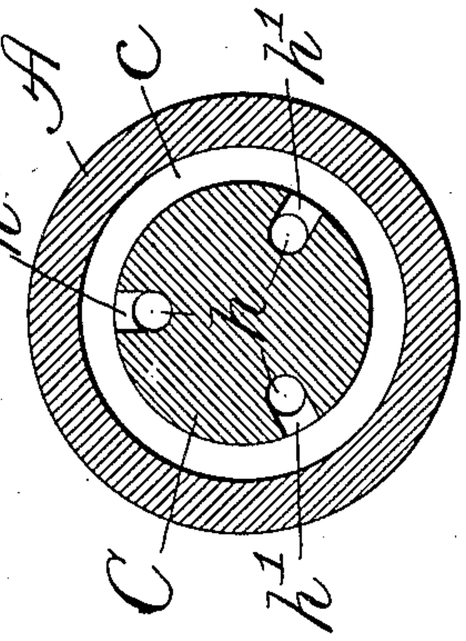


Fig. 7.



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No. 825,669. PATENTED JULY 10, 1906.

H. LEINEWEBER.

PNEUMATIC TOOL.

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3 SHEETS—SHEET 3.

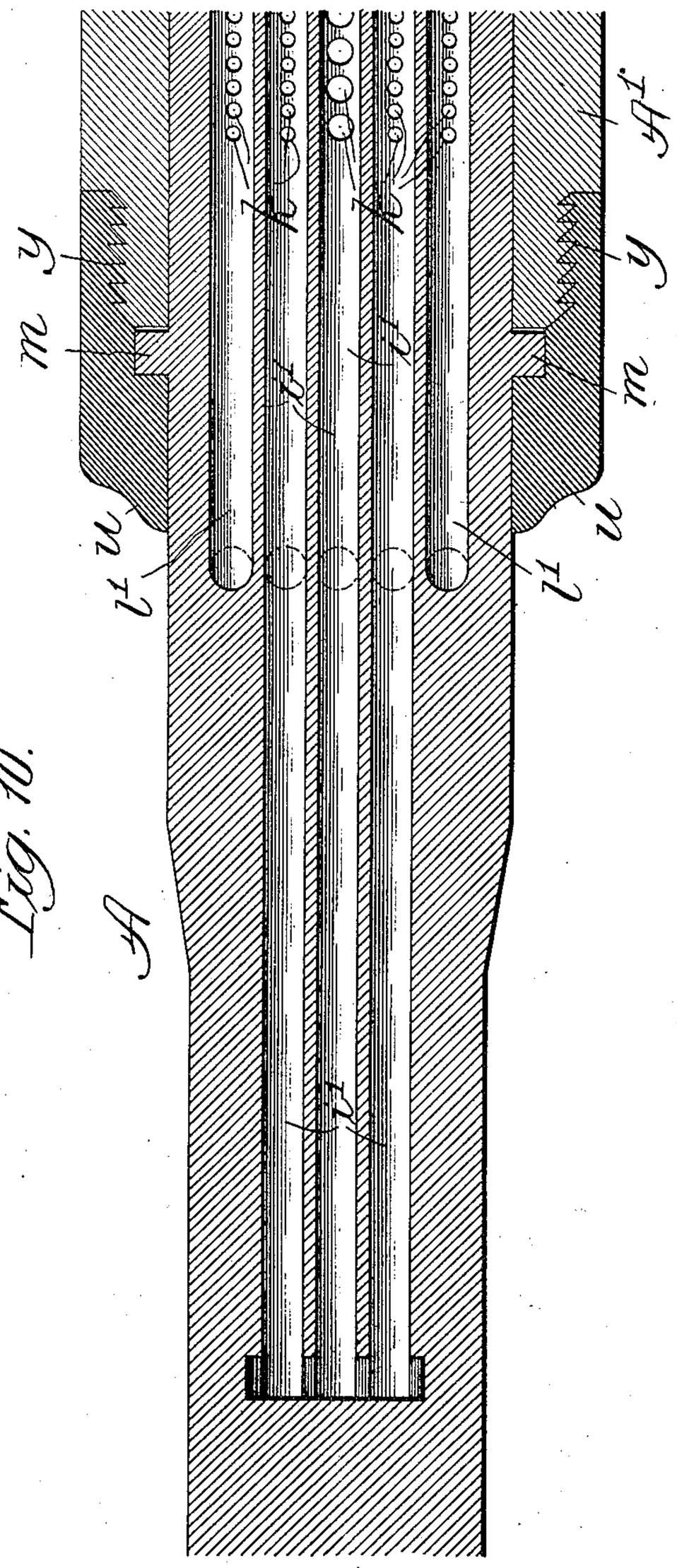

Fig. 10.

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UNITED STATES PATENT OFFICE.

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PNEUMATIC TOOL.

No. 825,669. Specification of Letters Patent. Patented July 10, 1906.

Application filed March 20, 1905. Serial No. 251,048.

To all whom it may concern:

Be it known that I, HERMAN LEINEWEBER, a citizen of the United States, residing at South Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Pneumatic Tools, of which the following is a specification.

My invention relates to an improvement in the class of pneumatic hammers in which a piston confined in a casing is actuated by air-pressure to reciprocate against a tool to drive it, such as a riveting-tool, a chisel, or the like, in the end of the casing.

I have devised my improvements with reference to the pneumatic tool forming the subject of Letters Patent No. 778,319, granted to me on the 27th day of December, 1904, though they are not limited to use with that particular construction of the tool.

My object is to improve a pneumatic tool of the gentral construction of that set forth in the aforesaid Letters Patent in matters of detail.

Referring to the accompanying drawings, Figure 1 is a top plan view of a pneumatic tool containing my improvements. Fig. 2 is a section taken at the line 2 on Fig. 1 and viewed in the direction of the arrow. Fig. 3 is a view like that in Fig. 1, but presenting the opposite side of the implement. Figs. 4, 5, 6, 7, and 8 are sections taken, respectively, on the lines 4, 5, 6, 7, and 8 in Fig. 2 and viewed in the direction of the arrows. Fig. 9 is a section taken at the line 9 on Fig. 2 and viewed in the direction of the arrow, and Fig. 10 a broken section taken at the line 10 10 on Fig. 4 and Fig. 5.

A is the casing, having a desired tool B, shown broken, and which may be a riveting-tool, a chisel, or the like, seated in its distal end in a bushing *a* therein provided with a shoulder *a'* and through which the stem *b* of the tool passes into an enlargement forming an air-chamber *c* in the casing. The bushing *a* abuts against an annular shoulder *d*, forming the forward end of the chamber *c* and through which the tool-stem passes, the shoulder serving a purpose hereinafter explained. The junction of the tool with its stem forms a shoulder a^2, from which a longitudinal groove *e*, formed in the tool-stem, extends short of its inner end, the groove being inclined at its ends, and into this groove projects a spring-pressed stud *f*, confined in a tubular nut *g*, screwed through the casing and the bushing *a*.

By the construction thus described the tool is held against dropping out of the casing when the implement is out of operation and carried with the tool end downward, and the stem *b*, being beveled on its end at *x*, may be readily inserted in place through the bushing, since the act of inserting it raises the stud *f* out of its path and the spring about the stud snaps the latter into engagement with the groove *d* when it comes into registration therewith. Moreover, when the implement is out of use and the tool is in its position of extreme protrusion the inner end of the stem is within the area of the annular shoulder *d*, so that in the event of accidental forward shooting of the piston C, hereinafter described, its end will encounter the shoulder instead of the tool-stem, whereas if it should then encounter the stem the force would tend to drive the tool out of the casing with possibly resultant damage to the implement and injury to any object the tool might strike besides inconvenience owing to the loss of the tool, even though only temporary, particularly if the operator is using the implement on elevated work, whence it drops.

The reciprocating piston C, which closely fits inside the casing, contains a plurality of longitudinal air-ducts *h*, each terminating at its ends, respectively, in elongated lateral openings *h' h²*, through which the driving air-pressure passes alternately in contrary directions, exhausting when the openings *h'* register in the movements of the piston with an annular groove *i*, formed in the inner wall of the casing near the chamber *c* therein, the exhaust-air passing through ducts *i'*, of which three are shown, formed longitudinally in the wall of the under side of the casing and leading to a plurality of small discharge-ports *k* in the casing-wall, the exhaust taking place from the openings h^2 when they register with an annular groove *l*, formed in the inner casing-wall and with which the three exhaust-ducts *i'* communicate, as also two additional ducts *l'*, which lead to discharge-ports *k*.

D is the handle on the end of a hollow head A' in the form of a sleeve fitting about the rear end of the casing and reaching nearly to a shoulder *m*, adjacent to which the head is screw-

threaded, as shown at *y*. The head contains in its outer end portion an air-chamber *n*, larger than the chamber *c*, and into it projects centrally from the handle-equipped end of the head a thimble *o*, the bore of which is of a diameter adapting it to receive the adjacent end of the piston for cushioning the back stroke of the latter. On the under side of the handle near its base is provided a nipple *p*, with which to connect the hose, (not shown,) through which air-pressure is supplied from a suitable source to the implement, and from this nipple there extend across the base of the handle air-ducts *q q*, terminating in an enlargement *q'* on the opposite side of the handle-base, containing a bushing q^2, which forms a seat for a spring-pressed valve *r*, the stem *r'* of which protrudes beyond the top of the head A', underneath the valve-operating lever E, fulcrumed at *j* and housed in a recess *s*, formed in the top of the hande D and beyond which only the thumb-bearing *s'* on the free end projects to be accessible to the thumb of the operator. The recess *s* terminates in an enlarged cavity s^2, formed in the top of the handle, in which the thumb-piece fits and which affords a guide for the thumb-piece in depressing it to direct it regularly and prevent the thumb from exerting torsional pressure against it, which would tend to disorganize the lever. By thus shielding the lever E between the sides of the recess *s* it is not liable to injury by bending or breaking in the event of dropping the implement.

An air-duct *t* is provided in the bushing q^2, and from it lead branch ducts *t' t'*, longitudinally in the wall of the head A' to branches t^2, extending at right angles to the branches *t'* and registering with a pocket t^3, formed in the outer wall of the casing, from which pocket extend longitudinally in the casing-wall continuations t^4 t^4 of the ducts *t'* to an annular air-feed chamber F, formed in the inner wall of the casing between the exhaust-grooves *l* and *i*.

With each row of small exhaust-ports *k*, provided in the casing at an end of each of the five exhaust-passages *i'* and *l'*, there registers a similar row of ports *k'*, formed through the wall of the head A'. It is advantageous to provide these exhaust-ports on the under part of the implement instead of on a lateral side thereof, since thereby the air which exhausts through them with considerable force does not blow against the body of the operator and saves him from consequent discomfort, and the provision of these ports in large number of small size tends to protect the internal working parts of the implement against dust, chippings, and other foreign matter, which is more liable to enter the casing through larger exhaust-ports, particularly when provided in a side of a casing, since then when the implement is out of use and laid on the opposite side, leaving the exhaust-ports uppermost, foreign matter is more liable to enter them by gravity than when these ports are laterally disposed.

The handle-equipped tubular head A' is fastened in place by a nut *u*, screwed upon its threaded end *y* against the shoulder *m*. For further holding the head against turning a headed screw *v* is inserted through it at its under side, the head being angular, as shown at *v'* in Fig. 2, and entering a slot v^2, provided to receive it in the outer wall of the casing A. The screw *v* affords a means for accurately registering the ports *k'* with the ports *k*.

To secure the nut *u* against accidental turning with the result of loosening and disengaging the parts while the implement is in action, it is provided with a circumferential series of notches *u'*, and with these notches engages a spring-pressed headed stud *w*, having its bearing in a lip *w'*, projecting over the nut from the forward end of the head A'. To release the nut from the stud *w*, the latter is raised against the resistance of its controlling-spring out of engagement with the notches *u'*, and by turning it partially around when thus raised two diametrically opposite teats w^2 on the under side of its head which enter recesses in the lip in the normal position of the stub will bear against the top of the lip *w'* to prevent the spring of the stud from snapping it back into place until it is turned back. A spanner-recess *z* is shown to be provided in the nut to facilitate turning it through the medium of a spanner-wrench.

The exhaust-grooves afford a desirable feature of improvement, inasmuch as the piston C cannot be so close-fitting as to prevent air-pressure from a chamber *c* or *n* from leaking past it and getting ahead of it to obstruct its action, and these grooves intercept any such leakage air and immediately direct it through the exhaust-passages to the ports *k k'*, thereby constituting each groove a leakage-intercepting groove.

The operation is as follows, with the parts in the relative positions in which they are represented in the drawings: On pressing the lever E to open the valve *r* air-pressure flows through the passages *q*, *q'*, *t*, *t'*, t^2, t^3, and t^4 into the feeding-chamber F, whence it enters the piston-openings h^2 and passes through the piston-ducts *h*, discharging therefrom at the openings *h'* into the chamber *c* and [illegible]ducing the back stroke of the piston, whic[illegible]mble *o*, driving ahead of it into the latter su[illegible]ient air from the chamber *n* to cushion the stroke and take the impact thereof off the hand of the operator. As the forward end of the piston clears the groove *i*, all air under pressure contained in the chamber *c* exhausts by way of that groove and the passages *i'*, connected therewith, through the ports *k k'*. When the back stroke of the piston brings its openings *h'* into registration with the feeding-cham-

ber F, the pressure-supply therefrom passes at those openings through the piston-ducts and discharges at the openings h^2 into the chamber n to drive the piston forward against the tool B, the air in the chamber n exhausting when the piston clears the groove l by way of the latter through the passages i' and l', communicating therewith, and the ports k k', to which those passages lead. The number of exhaust-passages leading from the chamber n is greater than the number thereof leading from the chamber c, because of the greater capacity of the rear chamber and the larger quantity of pressure requiring to be exhausted therefrom in a given time.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a pneumatic tool, the combination with the casing containing a reciprocating piston and air-chambers at opposite ends thereof, to which the actuating air-pressure is fed through the piston, and from which said pressure is exhausted, of an impact-shoulder in the forward chamber, a bushing seating against said shoulder, a tool inserted at its stem into the casing through said bushing and shoulder, said stem containing a longitudinal groove, a tubular nut screwed through the casing into said bushing, and a spring-pressed stud confined in said nut and working through the casing and bushing to engage said groove, for the purpose set forth.

2. In a pneumatic tool, the combination with a casing provided with air-chambers in its opposite ends, of a reciprocating piston within the casing, containing a longitudinal air-duct terminating at its ends in elongated lateral openings in the piston, an air-feeding chamber formed in the inner casing-wall between said end chambers and communicating with the air-pressure supply and from which the piston-actuating pressure alternately enters said air-chambers through the piston-duct, an annular leakage-intercepting groove formed in the inner casing-wall between said air-chambers, and an exhaust-passage in said wall leading from said groove.

3. In a pneumatic tool, the combination with a casing provided with air-chambers in its opposite ends, of a reciprocating piston within the casing, containing a longitudinal air-duct terminating at its ends in elongated lateral openings in the piston, an air-feeding chamber formed in the inner casing-wall between said end chambers and communicating with the air-pressure supply and from which the piston-actuating pressure alternately enters said air-chambers through the piston-duct, forward and rear annular leakage-intercepting grooves formed in the inner casing-wall between said air-chambers, an exhaust-passage leading from said forward groove and an exhaust-passage leading from said rear groove.

4. In a pneumatic tool, the combination with the casing containing a reciprocating piston with an air-chamber in the forward end of the implement and a relatively larger air-chamber in the rear end thereof, to which chambers the actuating air-pressure is fed through the piston, of exhaust-grooves in the inner casing-wall at opposite sides of its transverse center, exhaust-passages leading from the forward groove and a greater number of exhaust-passages leading from the rear groove, and a plurality of relatively small exhaust-ports formed in the wall of the implement and at which said passages terminate, for the purpose set forth.

HERMAN LEINEWEBER.

In presence of—
J. H. LANDES,
J. W. DYSENFORTH.