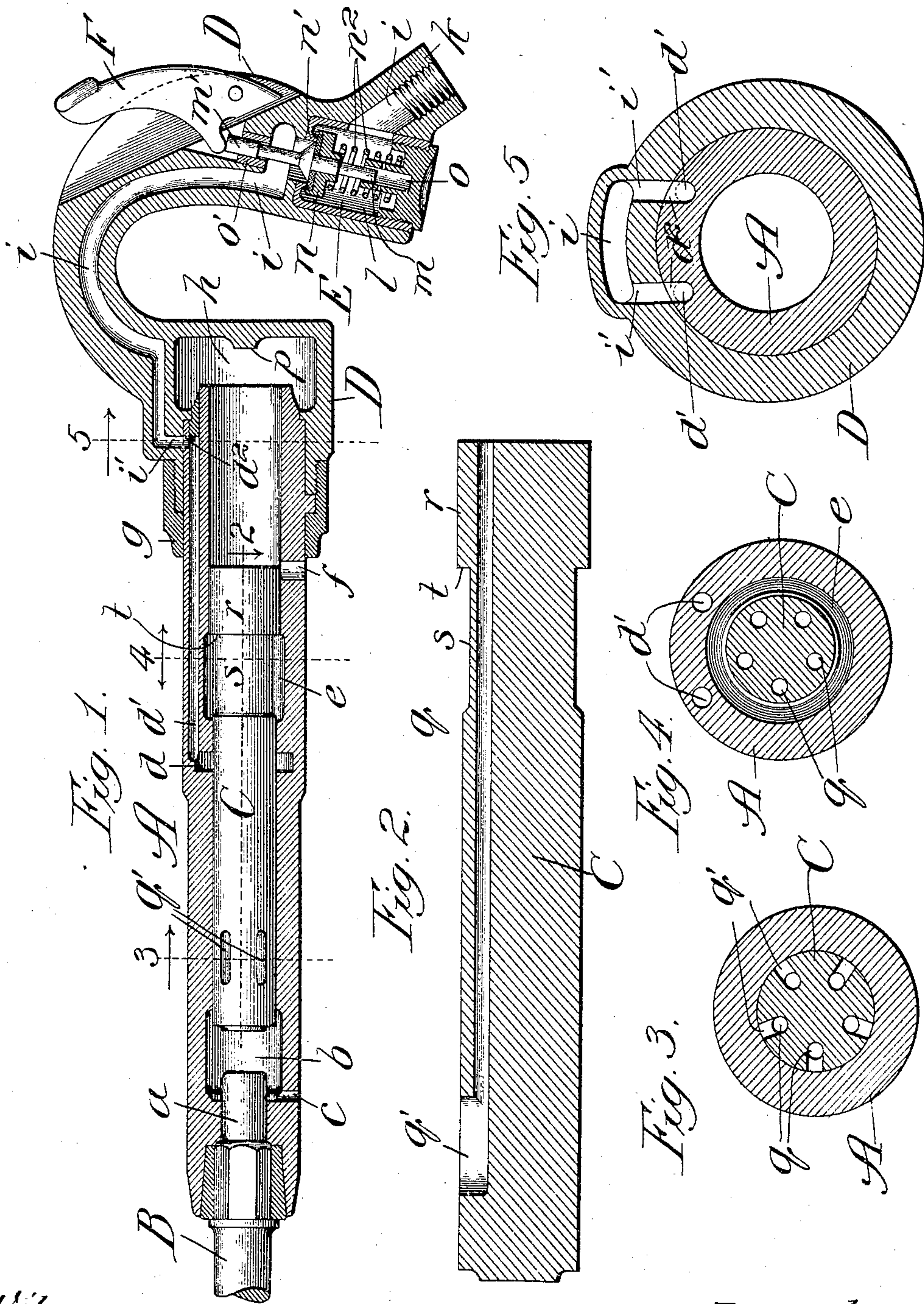


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H. LEINEWEBER.  
PNEUMATIC TOOL.  
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# UNITED STATES PATENT OFFICE.

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## PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 784,338, dated March 7, 1905.

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*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 Pneumatic Tool, 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 exerted alternately against it in opposite directions to reciprocate and drive a tool in the end of the casing.

The object of my invention is to provide in the class referred to a valveless pneumatic tool of improved construction in matters of detail, to the end that the forward or impact stroke of the piston shall be as free as possible from resistance from air in the casing, and therefore the more forcible, and that the return stroke shall be as mild as possible to reduce to the minimum the jar in handling the tool.

Referring to the accompanying drawings, Figure 1 is a view showing my improved pneumatic tool in longitudinal sectional elevation. Fig. 2 is an enlarged longitudinal section of the piston, taken at the line 2 on Fig. 1 and viewed in the direction of the arrow; and Figs. 3, 4, and 5 are enlarged sections of the device, taken, respectively, at the lines 2, 3, and 4 on Fig. 1 and viewed as indicated by the arrows.

A is the casing, of general cylindrical shape, having a tool B of any variety seated in its distal end to be actuated by the reciprocating piston C striking against the end of the tool-stem *a*, which projects into an enlargement *b* in the forward or distal end of the casing, the enlargement being shown to be provided with one or more vent-openings *c*. The casing is represented as somewhat enlarged diametrically throughout the section from near its transverse center to its rear end. In this enlarged portion of the casing, near the transverse center of the latter, is provided the internal annular air-feed groove *d*, at which terminate passages *d'* *d''*, shown as two in number, formed longitudinally in the casing-wall and each provided at its rear end with an in-

let-opening *d'*. Adjacent to the feed-groove *d* the casing is provided internally with a cylindrical enlargement *e*, beyond which one or more exhaust-ports *f* are formed in the casing-wall.

D is the head of the tool, affording a hand-grip by means of which to manipulate it, that shown being of a usual general form. It is fastened on the rear end of the casing, as by the nut *g*, and forms therein the air-pressure chamber *h*. In the handle or head is formed the air-passage *i*, terminating in branches *i'* *i''*, which register with the openings *d'* *d''* to afford communication of that passage with the passages *d'* *d''* and constitute the compressed-air supply passage leading to the feed-groove *d* from a nipple *k* on the handle, adapted to be coupled with the source of air-pressure, (not shown,) the supply of which is controlled by a spring-valve device E, adapted to be opened against the resistance of its closing-spring through the medium of a thumb-lever F, fulcrumed in suitable position on the head to engage the valve-stem. The valve device, as shown, comprises a housing *l*, interposed in the passage *i*, in one end of which is provided a socket-bearing *o* for an end of the valve-stem *m*, carrying the valve *n*, held normally against its seat *n'* by the spring *n''*, which end fits loosely in the bearing, the opposite end of the stem similarly fitting loosely in its bearing *o'* on the handle D and being surmounted there by a separate close-fitting plug *m'*. The loose fit in the bearings of the valve-stem affords to the latter slight lateral play, whereby similar play is afforded to the valve *n* to adapt it the better to engage and conform to its seat in the event of there being any unevenness therein or in the valve, thus to effect tight closure, and the plug *m'* closes the bearing *o'* against leakage.

The piston C is confined in the casing to reciprocate between the end of the tool-stem *a* and a boss *p*, provided centrally on the inner surface of the end wall of the chamber *h* to insure exposure to the driving air-pressure of the adjacent end of the piston whenever the latter bears against it, as when the pneumatic tool is held in upright position. The piston is closed at its forward end, but has one or more



air-ducts  $q$  (five being shown) extending from its rear end each to an elongated slot or opening  $q'$  in the side of the piston near its forward closed end. The rear end portion of the piston is enlarged circumferentially, as represented a  $r$ , and adjacent to the enlarged end is a circumferentially-reduced section  $s$  of about the length of the enlargement  $e$  in the casing and forming the circumferential shoulder or abutment  $t$ .

The operation is as follows: With the piston in the initial position for starting—namely, with its forward end against the adjacent end of the tool-stem  $a$ —the reduced section  $s$  will communicate with the groove  $d$ . By then opening the valve device E to admit air-pressure into the feed-groove through the passages leading thereto the pressure will enter about the reduced section  $s$  of the piston and act against the shoulder  $t$  to drive the piston to the end of its back stroke, in attaining which the reduced piston-section will register with the port  $f$  and permit the pressure to exhaust. In that position of the piston its openings  $q'$  register with the feed-groove  $d$  and admit air-pressure from the latter through the piston-ducts  $q$  into the relatively large chamber  $h$ , sufficient pressure entering the latter before the piston reaches the end of its back stroke to cushion it, and the pressure in the chamber  $h$  drives the piston forward to act against the tool B, the forward stroke of the piston being effected because of the thorough exhaust before the forward stroke begins of the pressure which has produced the back stroke without any resistance from live air. In the forward course of the piston its rear end passes the port  $f$ , permitting the pressure in the chamber  $h$  to exhaust, and the reduced section  $s$  is again brought into communication with the feed groove or pocket  $d$  to effect the back stroke. Thus the piston is reciprocated, its forward stroke being produced with greater force than its back stroke because of the comparatively small area presented by the shoulder  $t$  to the actuating pressure.

The more important feature of novelty in my improved construction is that of the reduced section  $s$  of the piston forming, with the casing-enlargement  $e$ , a pressure-chamber having the abutment  $t$  and adapted by the movements of the piston to be brought alternately into and out of communication with the pressure-feed groove  $d$  and whereby the exhaust from each stroke may be thoroughly effected through a single port leading from the casing. As will be understood, the enlargement  $b$  is not a pressure-chamber, being merely provided and vented to prevent cushioning of the piston in its forward stroke.

The enlargement  $e$  affords the advantage of enabling the size of the shoulder or abutment

$t$  to be reduced to the minimum and of permitting the air in the enlargement to expand, and thus reduce its resistance to the piston in its forward stroke and to reduce its force against the shoulder in the back stroke of the piston, with the effect, supplemented by the small size of the shoulder, of rendering accordingly mild such back stroke. On the other hand, the enlargement  $b$  in the forward end of the casing permits the air that enters therein to expand, and thereby reduce its resistance to the forward stroke of the piston, with the effect of rendering the impact-stroke against the tool B the more forcible.

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

1. In a pneumatic tool having a casing carrying at one end the tool and at its opposite end a handle, the combination of the casing having a valve-controlled air-pressure-supply passage, a pressure-chamber in its rear end, an annular pressure-feed groove in its inner wall, between the ends thereof, communicating with said passage, and a circumferential enlargement in said wall back of said groove, a piston reciprocably confined in the casing, having ducts extending longitudinally into it from its rear end and each terminating in a lateral opening in the piston near its opposite end, an enlarged rear end and a reduced section adjacent to said enlarged end cooperating with said circumferential enlargement and forming an abutment therein, and an exhaust-port in the casing common to the pressure from said enlargement and that in said pressure-chamber, substantially as and for the purpose set forth.

2. In a pneumatic tool having a casing carrying at one end the tool and at its opposite end a handle, the combination of the casing having a valve-controlled air-pressure-supply passage, a pressure-chamber in its rear end, a vented circumferential enlargement of the inner wall in its forward end, an annular pressure-feed groove in its wall, between said ends, communicating with said passage, and a circumferential enlargement in said wall back of said groove, a piston reciprocably confined in the casing, having ducts extending longitudinally into it from its rear end and each terminating in a lateral opening in the piston near its opposite end, an enlarged rear end and a reduced section adjacent to said enlarged end cooperating with said last-named circumferential enlargement and forming an abutment therein, and an exhaust-port in the casing common to the pressure from said last-named enlargement and that in said pressure-chamber, substantially as and for the purpose set forth.

HERMAN LEINEWEBER.

In presence of—

L. HEISLAR,

WALTER N. WINBERG.