No. 756,357. PATENTED APR. 5, 1904.

E. GUNNELL.

PNEUMATIC HAMMER.

APPLICATION FILED DEC. 17, 1900.

NO MODEL.

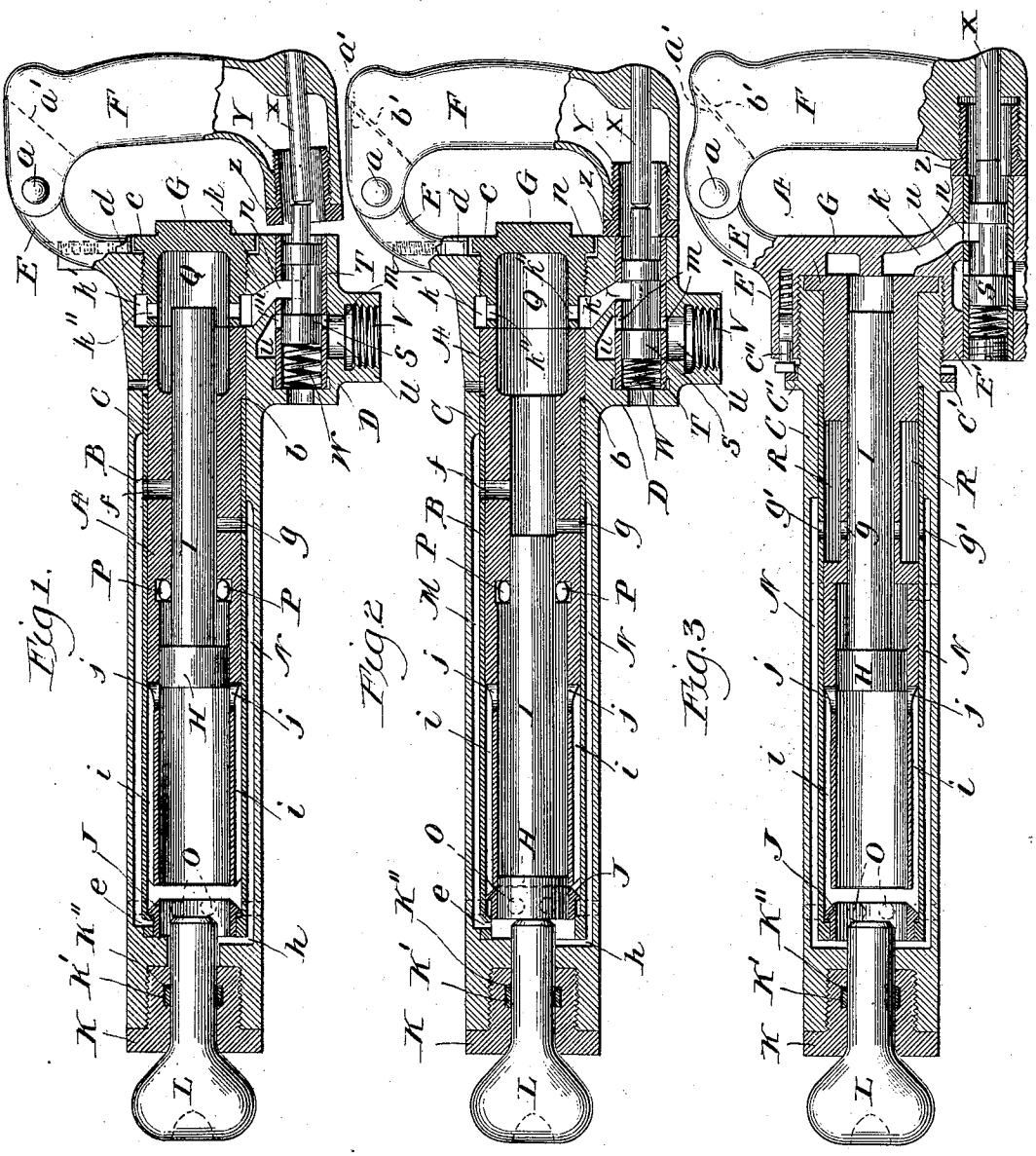


Fig. 1.

Fig. 2.

Fig. 3.

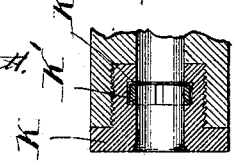


Fig. 4.

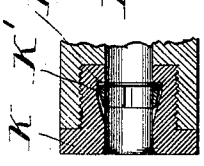


Fig. 5.

Witnesses
Edward Bartlett.
Louis B. Erwin

Inventor
Elias Gunnell
by Edward Rector
his Atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 756,357. Patented April 5, 1904.

UNITED STATES PATENT OFFICE.

ELIAS GUNNELL, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO W. I. BABCOCK, OF CHICAGO, ILLINOIS.

PNEUMATIC HAMMER.

SPECIFICATION forming part of Letters Patent No. 756,357, dated April 5, 1904.

Application filed December 17, 1900. Serial No. 40,078. (No model.)

To all whom it may concern:

Be it known that I, ELIAS GUNNELL, a citizen of the United States, residing at Chicago, in the county of Cook, in the State of Illinois, have invented a certain new and useful Improvement in Pneumatic Hammers, of which the following is a description, reference being had to the accompanying drawings, forming a part of this specification,

My present invention relates, in some of its features, to pneumatic hammers of the type of that patented to me by Letters Patent of the United States No. 632,262, dated September 5, 1899, in which the piston is driven forward by the pressure of motive fluid constantly admitted to its rear end while the tool is in operation, and driven rearward, against such constant pressure, by the pressure of motive fluid intermittently admitted to its superior forward end or pressure area; while other features of my present invention are applicable to other types of tools, all as will be hereinafter more fully explained.

In the accompanying drawings, Figure 1 is a vertical longitudinal section of my hammer, with the piston in rearward position, and with the throttle valve controlling the admission of motive fluid to the tool closed; Figure 2, a corresponding view with the throttle valve open, and with the piston driven to the forward limit of its stroke; Figure 3, a corresponding view illustrating a modified construction; and Figures 4 and 5 sectional details showing the split spring rings for holding the working tool in place.

The same letters of reference are used to indicate identical parts in the several views.

The cylindrical body of the tool is in Figures 1 and 2 composed of an inner cylinder A, a surrounding sleeve B, and an outer casing C, the latter having formed upon the under side of its rear end a suitable casting D for the throttle valve chamber and for the connection of the motive fluid supply-pipe, and upon the upper side of its rear end a curved arm E to which the upper end of the grasping handle F is hinged at *a*. The sleeve B is confined in the casing C (with its front end abutting against the front wall of the internal bore of said casing) by the inner cylinder A which is provided with an annular shoulder at *b* abutting against the rear end of the sleeve B, and the inner cylinder A is itself confined in the casing C by a screw-plug G screwed into the rear end of the casing C and abutting at its forward end against the rear end of the cylinder A. The plug G is provided with a peripheral flange *c* having ratchet teeth with which co-operates a spring catch *d* to hold the plug in the position to which it is turned.

The cylinder A is bored out to two different diameters to receive the piston composed of the enlarged front end or head H and rearwardly extending stem or body I, and at its forward end terminates short of the front end of the sleeve B to form a chamber for the cylindrical valve J. The front end of the sleeve B is thickened interiorly, thereby contracting its internal bore, and in this contracted portion of the sleeve fits the forward portion or body of the cylindrical valve J, while the rear end of the valve is provided with an exterior annular enlargement or flange which fits and travels in the main bore of the sleeve B in front of the cylinder A, and is provided with a beveled surface as shown to co-operate with the seat formed for it by the front end of the cylinder A.

The front end of the casing C is provided with a reduced central bore and bushing K, through which the shank of the rivet set or other working tool L passes and projects into the interior of the cylinder or front end of the piston chamber, within the valve J.

A long passage M terminates at its forward end in a port *e* extending through the thickened portion of the front end of the sleeve B, and communicates at its rear end by a port *f* with the reduced rear portion of the piston chamber. When the valve J is in forward position, shown in Figure 1, and the piston in its rearward position, there shown, the port *e* is closed by the valve J and the port *f* by the stem I of the piston.

A second long passage N communicates at its rear end with the smaller portion of the piston chamber by a port *g*, and at its front end opens by a port *h* into the extreme for-

ward end of the piston chamber or internal bore of the cylinder, occupied by the valve J.

The forward portion of the cylinder A is provided upon its exterior with longitudinal grooves *i* communicating at their rear ends with the interior of the cylinder by ports *j*, and the sleeve B and casing C are provided in front of the cylinder A with exhaust ports O, which are open when the valve is in forward position, as in Figure 1, but closed when the valve is in rearward position, as in Figure 2. Other exhaust ports or openings P, extending through the cylinder A, sleeve B, and casing C at the rear end of the larger portion of the piston chamber, permit ingress and egress of air behind the head of the piston in the reciprocations of the latter.

The rear end of the cylinder A and screw-plug G are bored out to form an enlarged chamber Q to which the motive fluid is constantly admitted when the tool is in operation through a circular row of ports *k'* connecting it with a surrounding annular chamber *k'* into which opens the main inlet passage *k* controlled by the throttle valve located in the casting D and hereinafter described.

In the position of the parts shown in Figure 1 the portion of the piston chamber in front of the piston is open to the exhaust through the ports O, and the piston will therefore be driven forward by the pressure of the motive fluid admitted to the chamber Q when the throttle valve is open. As the piston reaches the forward limit of stroke its head H will enter the valve J and contact with the shank of the tool L, and its rear end will simultaneously uncover the port *g* and permit the motive fluid behind the piston to pass forward through a passage N to the front end of the piston chamber and there act upon the front end of the cylindrical valve J and drive the latter rearward to the position shown in Figure 2, causing the beveled surface of its rear end to seat itself against the front end of the cylinder A and cut off communication between the exhaust ports O and the interior of the cylinder. This rearward movement of the valve J will also uncover the port *e*, so that motive fluid will pass forward through both of the passages M and N to the front end of the piston chamber and act upon the head H of the piston and drive the latter rearward. As soon as it has moved rearward far enough for its stem I to close the port *f* the admission of live air to the front end of the piston chamber will be cut off, and the further rearward movement of the piston will be effected by the expansion of the live air previously admitted and the acquired momentum of the piston. When the piston reaches the rearward position shown in Figure 1 and uncovers the ports *j* the pressure within the piston chamber which has driven the piston rearward will pass through said ports and the grooves or passages *i* to the rear end of the valve J, and there acting upon a pressure area superior to that of the front end of the valve will drive the latter forward and uncover the ports O, permitting the pressure in front of the piston to escape and the piston to be driven forward again after its momentum has been arrested by the pressure behind it in the chamber Q.

In the particular construction shown in my former patent heretofore referred to the valve J was given its rearward movement by pressure constantly admitted to its forward pressure area through a long passage extending rearward through the cylinder wall and in constant communication with the pressure supply, and was driven forward by pressure intermittently admitted to its preponderating rearward pressure area. Under my present construction the valve is shifted in each direction by intermittently admitted pressure, and the constant pressure supply-passage mentioned is dispensed with. In both instances, however, the valve serves to control both the inlet and exhaust of the motive fluid at the front end of the piston chamber, but this is not essential, since in Figure 3 of my present drawings I have illustrated a valve which operates to control only the exhaust, the admission of the motive fluid being controlled by the piston itself.

In the construction shown in Figure 3 I provide a reservoir chamber R in the cylinder A, which communicates with the smaller bore of the piston chamber by ports *g*, and by ports *g'* with the passages N leading to the front end of the piston chamber as in Figures 1 and 2. No passage corresponding to the passage M and having its front end controlled by the valve J is employed. As the piston reaches the forward end of its stroke and its head H enters the valve J and contacts with the shank of the tool L, its rear end will uncover the ports *g* and admit the motive fluid to the chamber R and passages N, and thence to the front end of the piston chamber where it will operate to shift the valve J rearward, to the position shown in Figure 2, thereby cutting off communication between the exhaust ports O and the interior of the piston chamber, and also serves to drive the piston rearward. The rear end of the stem I of the piston will cover and close the ports *g* at the beginning of its rearward movement but the expansive pressure of the extra supply of motive fluid in the reservoir chamber R, aiding that in the piston chamber, will serve to drive the piston on rearward, against the full pressure acting upon its smaller rear end, until the head of the piston passes rearward of and uncovers the ports *j*, thereby admitting pressure through the passages *i* to the rear pressure area of the valve J, as in Figures 1 and 2, and driving the latter forward again and opening the exhaust ports O, to permit another forward stroke of the piston.

The passage *k* through which the motive fluid is admitted from the supply pipe to the chamber Q is controlled by a balanced throttle valve S of familiar spool form fitting in a sleeve or bushing T driven in a bore in the casting D. The forward head of the valve controls the ports *m* in the sleeve T, which afford communication between the interior thereof and a chamber U formed in the casting D around the sleeve T and communicating with the main inlet V to which the supply-pipe is connected, and the interior of the sleeve T communicates by a port *n* with the passage *k* leading to the chamber Q. A strong coiled spring W located in the front end of the sleeve or bushing T and acting against the forward head of the valve presses the latter rearwardly and tends to hold it in the position shown in Figure 1, with its forward head closing the ports *m* and cutting off the supply of motive fluid to the tool.

The handle F, which, as heretofore described, is hinged at its upper end at *a* to the arm E projecting upwardly and rearwardly from the rear end of the cylinder, has tightly driven into a suitable bore in its lower end a forwardly extending rod or pin X whose front end is adapted to contact with the rearwardly projecting stem of the throttle valve S, whereby pressure upon the handle F, when the working tool L is pressed against the rivet or other work, will force the valve S forward in its chamber, against the resistance of the spring W, and open the ports *m* and admit motive fluid to the tool.

The arm E to which the upper end of the handle is hinged extends rearwardly, beyond the pivot *a*, to the dotted line *a'*, and the handle is provided with a corresponding slot to receive and embrace this rearwardly projecting end of the arm E. The rear wall of this slot is indicated by the dotted line *b'*, Fig. 2, and its contact with the rear end *a'* of the arm E limits the swinging movement of the handle F upon its pivot *a*, and consequently limits the rearward movement of the valve S under the stress of the spring W. For the purpose of adjustably limiting the forward movement of the lower end of the handle, and consequently regulating the opening movement of the valve S, the forwardly projecting lower end of the handle F is interiorly threaded to receive a nut Y which is provided upon its front end with an outwardly projecting flange Z which fits between the forward end of the handle and the rear side of the casting D containing the valve chamber and valve and contacts with said casting to limit the forward movement of the lower end of the handle and consequent opening movement of the valve when pressure is applied to the handle. By turning this nut in one direction or the other the movement of the handle and degree of opening of the valve effected thereby may be regulated as desired. The flange Z of the nut has a milled exterior to enable it to be readily turned by the operator to effect the desired adjustment.

The spring W is preferably of such strength as to be overcome, and the valve permitted to be opened, only by pressure upon the handle sufficient to hold the tool up to its work, so that no inadvertent or accidental opening of the valve is liable to occur. Instead of the spring W the valve may be constantly pressed rearward by motive fluid admitted to a closed chamber in front of the forward head of the valve through a minute passage or leak constantly communicating with the main inlet V.

In the construction shown in Figure 3 the casting D, cylinder head G and curved arm or handle support E are formed integrally with each other and separate from the cylindrical body or casing of the tool and screwed upon the rear end of the latter, being provided with an interiorly threaded, forwardly projecting sleeve E' adapted to receive the exteriorly threaded rear end of the cylinder or casing. The inner cylinder A is in this instance provided upon its rear end with a circumferential flange which is clamped between the rear end of the casing C and cylinder head G when the latter is screwed into position upon the rear end of the tool. The outer casing or cylinder of the tool is provided with a circumferential flange C' provided upon its rear face with ratchet teeth with which co-operates a spring catch C'' to keep the parts from becoming unscrewed. The remainder of the construction is substantially the same as in Figures 1 and 2, excepting that the inlet passage *k* opens directly into the rear end of the piston chamber behind the piston, instead of opening into an enlarged chamber Q, as in Figures 1 and 2.

I am aware that it is not broadly new to control the throttle valve of pneumatic tools by pressure applied to the tool or the handle thereof in holding it up to its work; but I believe I have produced a simpler and more efficient construction than those heretofore employed, and one in which the advantage of a large and direct inlet for the motive fluid, controlled by the throttle valve, is attained to a greater degree than heretofore.

In the present instance the rivet set L or other working tool is removably held in position in the front end of the cylinder by means of a split spring ring K' fitting in an annular chamber K'' formed for it in the bushing K and surrounding and frictionally engaging the shank of the tool L, Figures 4 and 5. In assembling the parts the ring K' is compressed sufficiently to permit its insertion through the bore of the bushing K until it comes opposite the recess or chamber K'', whereupon it springs outward into said recess. Upon then inserting the shank of the tool L and forcing it rearward its rear end will slightly expand the ring K' and the shank of the tool will pass on through the ring until it

reaches its innermost position. The frictional grip of the ring upon the shank of the tool will prevent any accidental displacement of the latter. For the purpose of preventing the working tool being forcibly expelled by any inadvertent blow of the piston when the tool is not held up to its work I make the recess K″ in Figure 5 tapering in form, and provide a corresponding beveled ring K′. This ring frictionally grips the shank of the working tool and prevents its accidental displacement, as does the ring K′ in Figure 4; but if the working tool be forcibly driven forward by the piston when not pressed against the work the beveled ring K′ in Figure 5, moving forward with the shank of the tool and engaging the beveled or tapering wall of the recess K″, will be wedged inward and compressed upon the shank of the tool and so firmly grip the latter as to prevent its further forward movement.

In either case the working tool may be readily removed by giving it a twisting movement and steadily pulling it outward, and can be reinserted in the manner before explained.

Having thus fully described my invention, I claim—

1. In a pneumatic hammer, the combination, with the cylinder and the throttle valve controlling the admission of the motive fluid thereto, of a hinged grasping handle co-operating with said valve to open the same when the tool is held up to its work by pressure applied to said handle.

2. In a pneumatic hammer, the combination, with the cylinder and the throttle valve controlling the admission of the motive fluid thereto, of a grasping handle hinged at one end to one side of the tool at its rear end and co-operating at its opposite free end with the throttle valve at the opposite side of the tool to open said valve when the tool is held up to its work by pressure applied to said handle.

3. In a pneumatic hammer, the combination, with the cylinder or body of the tool provided at one side of its rear end with an outwardly projecting arm or handle-support, and at its opposite side with a casting containing a throttle valve chamber, a throttle valve located in said chamber and controlling the admission of the motive fluid to the cylinder, and a grasping handle hinged at one end to the arm or handle-support and co-operating at its opposite free end with the throttle valve to open the same when the tool is held up to its work by pressure applied to said handle.

4. In a pneumatic hammer, the combination, with the cylinder and the throttle valve controlling the admission of the motive fluid thereto, of a hinged grasping handle co-operating with said valve to open the same when the tool is held up to its work by pressure applied to said handle, and means for regulating the extent of such opening of the valve by said handle.

5. In a pneumatic hammer, the combination, with the cylinder and the throttle valve controlling the admission of the motive fluid thereto, of a hinged grasping handle co-operating with said valve to open the same when the tool is held up to its work by pressure applied to said handle, and an adjustable stop or contact device interposed between the handle and cylinder or fixed part thereof to limit the movement of the handle in opening the valve.

6. In a pneumatic hammer, the combination, with the cylinder and the throttle valve controlling the admission of the motive fluid thereto, of a grasping handle hinged at one end to the rear end of the cylinder or body of the tool at one side thereof, and co-operating at its opposite free end with the throttle valve on the opposite side of the tool to open the same by pressure applied to the handle, and an adjustable stop or contact piece interposed between the free end of the handle and the cylinder or fixed part thereof to limit the movement of the free end of the handle in opening the valve.

7. In a pneumatic hammer, the combination, with the cylinder and the throttle valve controlling the admission of the motive fluid thereto, of a grasping handle hinged at one end to the rear end of the cylinder or body of the tool at one side thereof, and co-operating at its opposite free end with the throttle valve on the opposite side of the cylinder to open the same by pressure applied to the handle, and an adjustable nut interposed between the free end of the handle and the cylinder or a fixed part thereof to limit the movement of the handle in opening the valve.

8. In a pneumatic hammer, the combination of the cylinder provided upon one side of its rear end with the arm or handle-support E and upon the opposite side thereof with the casting D containing the throttle valve chamber, the valve S located in said chamber and controlling the admission of the motive fluid to the cylinder, the grasping handle F hinged at one end to the arm E and co-operating at its opposite free end with the valve S to open the same when the tool is held up to its work by pressure applied to said handle.

9. In a pneumatic hammer, the combination of the cylinder provided upon one side of its rear end with the projecting arm or handle-support E, and upon the opposite side thereof with the casting D containing the throttle valve chamber, the throttle valve S located in said chamber and controlling the admission of the motive fluid to the cylinder, and the grasping handle F hinged at one end to the arm E and provided with a shoulder or contact surface b' co-operating with the like shoulder or contact surface a' upon the arm E, and co-operating at its opposite free end with the throttle-valve S to open the same.

10. In a pneumatic hammer, the combination

of the cylinder provided upon one side of its rear end with the projecting arm or handle-support E and upon the opposite side thereof with the casting D containing the throttle valve chamber, the valve S in said chamber controlling the admission of the motive fluid to the cylinder, and the grasping handle F hinged at its upper end to the arm E and provided at its lower end with the pin or rod X co-operating with the valve S.

11. In a pneumatic hammer, the combination of the cylinder provided upon one side of its rear end with the projecting arm or handle-support E and upon the opposite side thereof with the casting D containing the throttle valve chamber, the valve S in said chamber controlling the admission of the motive fluid to the cylinder, the grasping handle F hinged at one end to the arm E and provided at its opposite end with the pin or rod X co-operating with the valve S, and the tubular regulating nut screwed into the free end of the handle F and provided with the flange Z interposed between said handle and the casting D.

ELIAS GUNNELL.

Witnesses:
EDWARD RECTOR,
JOHN H. BERKSTRESSER.