W. F. SCHMIDT.

PNEUMATIC HAMMER.

APPLICATION FILED NOV. 1, 1897.

1,126,096.

Patented Jan. 26, 1915.

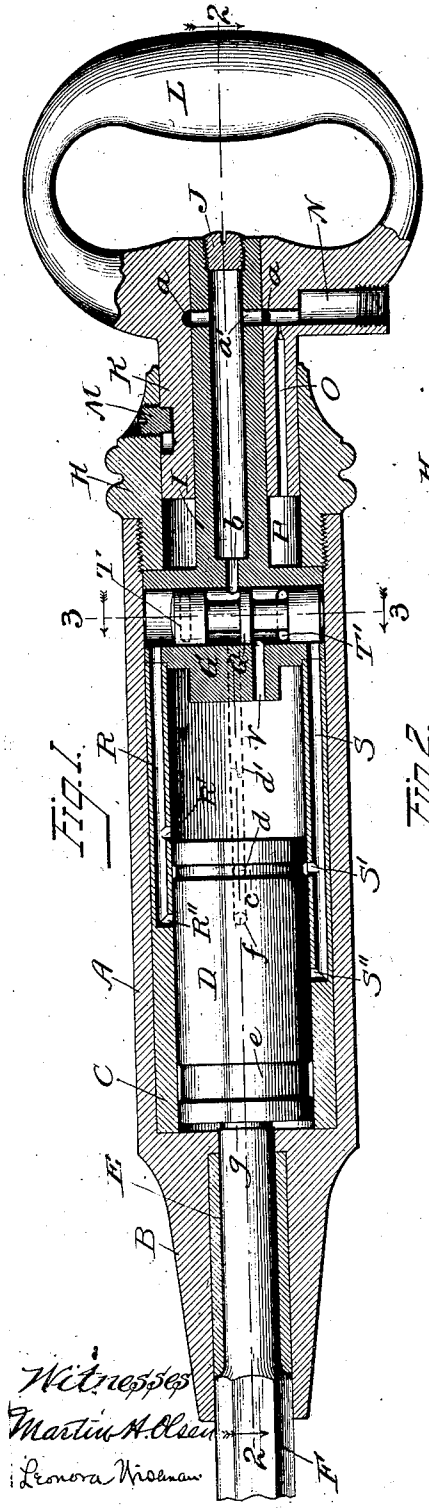


Fig. 1.

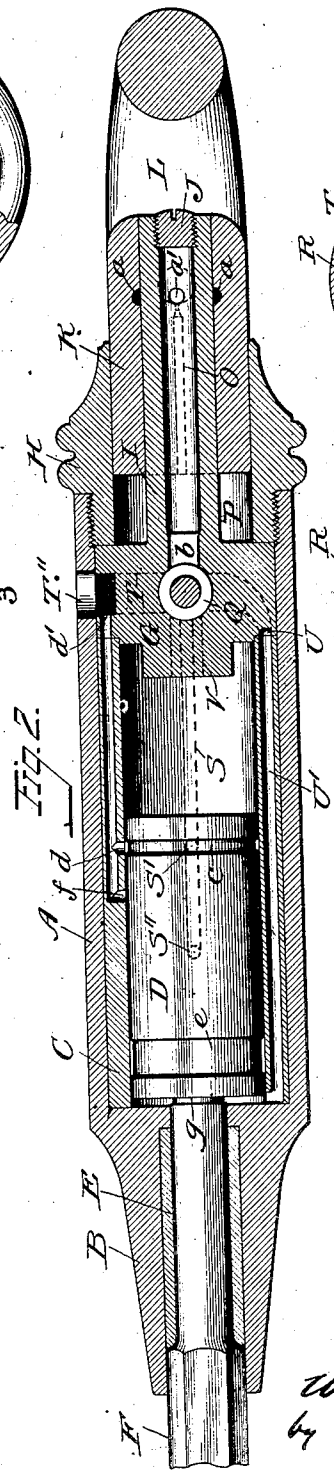


Fig. 2.

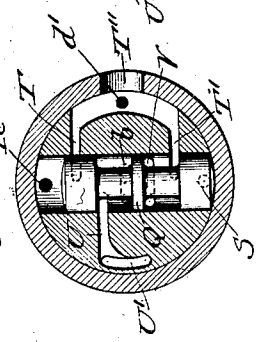


Fig. 3.

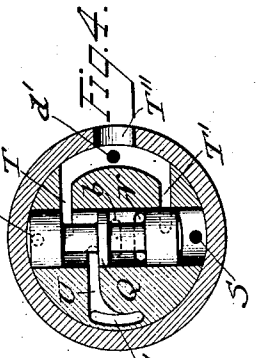


Fig. 4.

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UNITED STATES PATENT OFFICE.

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PNEUMATIC HAMMER.

1,126,096. Specification of Letters Patent. Patented Jan. 26, 1915.

Application filed November 1, 1897. Serial No. 657,046.

To all whom it may concern:

Be it known that I, WILLIAM F. SCHMIDT, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, 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 part of this specification.

My invention relates to that class of pneumatic hand tools in which the reciprocating piston of a direct acting engine, operated by compressed air, is employed as a hammer to deliver blows upon the shank of a chisel or other working tool, and it is the object of my invention to simplify and increase the efficiency of this class of tools; all as hereinafter more fully explained and particularly pointed out in my claims.

In the accompanying drawings Figure 1 represents a longitudinal vertical section of my new tool; Fig. 2 a horizontal section on the line 2—2 of Fig. 1; Fig. 3 a vertical cross-section through the valve chamber, on the line 3—3 of Fig. 1, with the valve in lower position; and Fig. 4 a similar view with the valve in upper position.

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

The body of the tool consists of an outer casing A having a tapering nose B at its front end, and an inner cylinder C snugly fitting within the casing A and containing the piston chamber within which reciprocates the piston D. The front end of the cylinder C is open and communicates with the central tool-receiving bore extending forward through the tapered front end of the casing A. This tool-receiving bore has driven into it a bushing or sleeve E within which fits the round shank of the chisel or other working tool F, the extreme rear end of the shank of such tool projecting into the front end of the piston chamber in position to be struck by the front end of the piston at the end of its forward stroke. At the forward end of its rounded portion the shank of the tool F is slightly enlarged, forming a shoulder which fits against the front end of the sleeve E when the tool is in position. The rear end of the cylinder C is closed by the valve block G which is circular in cross-section and fits snugly within the outer casing A and abuts against the rear end of the cylinder C. This valve block is held in place by a cylindrical nut H screwed into the rear end of the casing A and abutting against the rear side of the valve block. The valve block has formed integral with and extending rearwardly from it a central tube I whose bore is closed at its extreme rear end by a screw plug J. Fitting upon this tube, between it and the surrounding nut H, is a forward cylindrical extension K of the handle L of the tool. The handle is held from displacement by means of a screw M passing through a threaded hole in the nut H and projecting at its inner end into a longitudinal recess in the extension K of the handle, this connection permitting slight longitudinal movement of the handle upon the tube I. The handle L is provided with an inlet opening N, interiorly threaded at its outer end to receive the nipple of the flexible hose through which compressed air or other motive fluid is conveyed to the tool, and communicating at its reduced inner end with an annular groove *a* formed in the inner surface of the central bore of the handle surrounding the tube I. The latter is provided with ports *a'* which register with this groove in the handle when the latter is pressed forward to the position shown in the drawings, thus permitting the motive fluid to enter the tube I. A longitudinal passage O formed in the cylindrical extension K of the handle communicates at its rear end with the inner end of the inlet port N, and at its forward end opens into the annular space P surrounding the tube I within the cylindrical nut H at the forward end of the extension K. By means of this passage O when the motive fluid is admitted to the inlet port N it will pass at once to the annular chamber P, and there acting upon the front end of the cylindrical extension K of the handle force the latter rearward, if it has previously been resting in forward position, or serve to hold it in rearward position if already in such position. Communication between the inlet port N and interior of the tube I will thus be cut off, and can only be opened by pressing the handle forward against the resistance of the motive fluid in the chamber P. In using the tool the handle is pressed forward to hold the chisel or other working tool up to its work, so that during such time the motive fluid will be admitted to the interior of the

tube I, but as soon as pressure upon the handle is relieved it will be forced rearward and the supply of motive fluid cut off.

The interior of the tube I communicates at its forward end by a port *b* with the interior of the valve chamber in the block G, in which chamber is located the piston valve Q having heads at its opposite ends, and a middle flange, as is common in tools of this character. A passage R, Fig. 1, leads forward from the upper end of the valve chamber and opens into the piston chamber by two ports R′ R″, while a corresponding passage S leads forward from the lower end of the valve chamber and opens into the piston chamber by two ports S′ S″. The piston D is provided near its rear end with an annular groove *c* which, when the piston is at its forward limit of movement, establishes communication between the port S′ and a port *d* of an exhaust passage *d′* extending forward through the wall of the cylinder to the common exhaust T″; and near its forward end is provided with a second groove *e* which, as the piston approaches its rearward limit of movement, establishes communication between the port R″ and a second exhaust port *f* opening into the passage *d′*. Two ports T and T′ open through the right hand wall of the valve chamber, Figs. 1, 3, and 4, and communicate with the common exhaust port T″. A port U opening from the opposite side of the valve chamber communicates with the front end of a passage U′ leading to the extreme forward end of the piston chamber, shown in Fig. 2. A port V opens through the forward side of the valve chamber and communicates with the rear end of the piston chamber.

Under the foregoing construction of the parts the operation is as follows: With the valve Q in the position shown in Figs. 1 and 3 the live air inlet *b* will be in communication across the valve chamber with the port U and passage U′ leading to the front end of the piston chamber, Fig. 3, while the inlet port V at the rear end of the piston chamber will be in communication with the exhaust port T′, the piston being thus free to move rearward under the action of the motive fluid admitted to the front end of the piston chamber through the passage U′. As the piston moves rearward and nears the end of its stroke the groove *e* will place the exhaust port *f* in communication with the port R″ and passage R leading to the upper end of the valve chamber, thereby permitting the escape of the live air which has driven the valve downward, and at about the same time the front end of the piston will pass rearward of and uncover the port S″ at the front end of the passage S leading to the lower end of the valve chamber, and live air from the front end of the piston chamber be thus admitted to the lower end of the valve chamber, and the valve be moved to its upper position, Fig. 4. This shifting of the valve to upper position will place the passage U′ and port U leading to the front end of the piston chamber, in communication, across the valve chamber, with the exhaust port T, as shown in Fig. 4, thereby permitting the escape of the live air from the front end of the piston chamber, and at the same time the inlet port *b* will be placed in communication, across the valve chamber, with the port V leading into the rear end of the piston chamber, and live air be thus admitted in rear of the piston, to drive it forward again. As the piston approaches its forward limit of movement the annular groove *c* at its rear end will place the exhaust port *d* in communication with the port S′ of the passage S leading to the lower end of the valve chamber, thus permitting the escape of the live air from beneath the valve, while at the same time the extreme rear end of the piston will have passed forward of and uncovered the port R′ of the passage R leading to the upper end of the valve chamber, thereby admitting live air from the rear end of the piston chamber to the upper end of the valve chamber, to drive the valve downward again.

In the manner and by the means thus described the movements of the valve serve to alternately admit and exhaust the motive fluid at the opposite ends of the piston chamber, while the movements of the piston likewise serve to alternately admit and exhaust the motive fluid at the opposite ends of the valve chamber, to cause the mutual reciprocation of the piston and valve.

The valve block G has a central circular boss formed upon its forward side which is adapted to enter a corresponding recess in the rear end of the piston as the latter approaches the rear end of its stroke, to cause the air confined in the annular space around said boss to cushion the piston at the rear end of its stroke and prevent its striking the valve block.

It will be understood from the foregoing description that when the working tool F is placed in position and the machine pressed to its work by means of its handle L the motive fluid will be admitted to the valve chamber and piston chamber and the piston caused to rapidly reciprocate and deliver a blow to the shank of the working tool at the end of each of its forward strokes, and that when pressure upon the handle L is withdrawn the operation of the tool will automatically cease. It will also be understood that the shank of the chisel or working tool F, fitting within the tool-receiving bore in the front end of the casing A, itself forms part of the end wall of the piston

chamber against which the motive fluid admitted to the front end of said chamber acts in driving the piston rearward. By so employing the shank of the working tool the means intermediate the shank of the working tool and the front end of the piston chamber, heretofore employed for closing the latter, may be dispensed with, and the construction of the tool thereby to that extent simplified and cheapened. Furthermore, inasmuch as the shank of the working tool itself forms the means for closing the front end of the piston chamber and confining the motive fluid therein, so that the latter may drive the piston rearward, it follows that if the working tool be removed or displaced from position the front end of the piston chamber will be left open to the outer air, so that the motive fluid admitted to it can not drive the piston rearward. It therefore results that the operation of the machine will automatically cease if the working tool be at any time displaced from position, even though the throttle-valve of the tool remain open.

Having thus fully described my invention, I claim:

1. In a pneumatic hammer, the combination of a cylinder, a piston arranged to reciprocate therein, a valve located at the rear end of the cylinder for distributing the fluid pressure to and from opposite ends of the cylinder, a valve box for such tool having an extension provided with a supply passage communicating with the valve, and a movable member adapted to be connected with the source of supply and provided with a portion adapted to reciprocate upon said extension and to thereby govern its supply passage.

2. In a pneumatic hammer, the combination of a cylinder, a piston arranged to reciprocate therein, a valve located at the rear end of the cylinder for distributing the fluid pressure to and from opposite ends of the cylinder, a valve box for such tool having an extension provided with a supply passage communicating with the valve, and a grasping handle adapted to be connected with the source of supply and provided with a socket portion adapted to reciprocate upon said extension and to thereby govern its supply passage.

3. In a pneumatic hammer, the combination of a cylinder, a piston arranged to reciprocate therein, a valve located at the rear end of the cylinder for distributing the fluid pressure to and from opposite ends of the cylinder, a valve box for such tool having an extension provided with a supply passage communicating with the valve, and a grasping handle adapted to be connected with the source of supply and provided with a socket portion adapted to reciprocate upon said extension and to thereby govern its supply passage, said socket portion having a passage extending to its front end for the supply of live fluid pressure from the source of supply for normally holding said handle outwardly with a yielding pressure and thereby cutting off the supply of fluid pressure to the valve.

4. In a pneumatic hammer, the combination of the casing A, the valve block G located in the rear end thereof and having the rearwardly extending tube I, the cylindrical nut H screwed into the rear end of the casing S, the handle L having the cylindrical extension K surrounding the tube I between the latter and the nut H and movable longitudinally thereof, said handle being provided with an inlet port N, and the tube I being provided with a port a' communicating with the port N when the handle is in one position, and also with a port b opening into the valve chamber, substantially as described.

5. In a pneumatic hammer, the combination of the casing A, the valve block G fitting in the rear end thereof and having the rearwardly extending tube I, the nut H screwed into the rear end of the casing A, the handle L having the forward extension K surrounding the tube I within the nut H, means for holding the handle in place while permitting slight longitudinal movement of it upon the tube I, means for normally pressing the handle rearward thereon to its limit of movement, an inlet port N in the handle, a port a' in the tube U communicating with the port N when the handle is in forward position, and a port b between the interior of the tube I and the valve chamber, substantially as described.

6. In a pneumatic hammer, the combination of the tube I secured to the body of the tool, the handle L having the extension K fitting around and adapted to slide longitudinally upon the tube I, a pressure chamber, as P, between the body of the tool and the front end of the handle extension K, a port for admitting the motive fluid to such chamber, to press the handle rearward, and an inlet port opened by forward movement of the handle to admit motive fluid to the interior of the tube I and thence to the valve chamber, for the purpose described.

7. In a pneumatic hammer, the combination of the tube I secured to the body of the tool, the handle L having the forward extension K fitting around and adapted to slide upon the tube I, an inlet port N in the handle L, a port a' in the tube I communicating with the port N when the handle is in forward position, a port b between the tube I and valve chamber, and a port O between the inlet port N and a pressure chamber P at the front end of the handle extension K,

for admitting motive fluid to said chamber to press the handle rearward, substantially as described.

8. In a pneumatic hammer, the combination of the casing A, the valve block G fitting in the rear end thereof and having the rearwardly extending tube I, the nut H screwed into the rear end of the casing A, the handle L having the extension K surrounding and adapted to slide upon the tube I between the latter and the nut H, the screw M passing through the nut H and entering the longitudinal recess in the extension K, the inlet port N in the handle L communicating with the annular groove *a*, the ports *a'* in the tube I communicating with the groove *a* when the handle is in forward position, the port O between the inlet port N and the chamber P at the front end of the extension K and the port *b* between the tube I and valve chamber, substantially as and for the purpose described.

9. A pneumatic hammer provided at its front end with a tool-receiving bore which opens into the front end of the piston chamber proper and is adapted to receive and at such end wall of the piston chamber be closed by the collarless cylindrical shank of the slidingly removable chisel or other working tool, and having a passage for admitting the motive fluid to the front end of said piston chamber, whereby the shank of the working tool is made to form part of the end wall of the piston chamber against which the motive fluid acts to drive the piston rearward.

10. A pneumatic hammer having a piston chamber whose front end is partly closed by an annular shoulder surrounding an opening adapted to receive and make fluid-tight engagement with the collarless cylindrical shank of the removable working tool, and having a passage for admitting the motive fluid to the front end of said chamber, whereby the shank of the tool is made to form part of the end wall of the chamber against which the motive fluid acts to drive the piston rearward.

11. A pneumatic hammer provided at its front end with a tool-receiving bore which opens into the front end of the piston chamber proper and is adapted to receive and at such end wall of the piston chamber be closed by the collarless cylindrical shank of the slidingly removable chisel or other working tool, a solid piston reciprocating in the piston chamber, and a passage leading forward through the cylinder wall for admitting the motive fluid to the front end of the piston chamber; substantially as and for the purpose described.

12. A pneumatic hammer having a piston chamber whose front end is partly closed by an annular shoulder surrounding an opening adapted to receive and make fluid-tight engagement with the collarless cylindrical shank of the slidingly removable working tool, a solid piston reciprocating in the piston chamber, and a passage leading forward through the cylinder wall for admitting the motive fluid to the front end of said chamber; substantially as and for the purpose described.

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