R. B. CRUMP.

PNEUMATIC HAMMER.

APPLICATION FILED OCT. 17, 1912.

1,128,416. Patented Feb. 16, 1915.

Fig. 1.

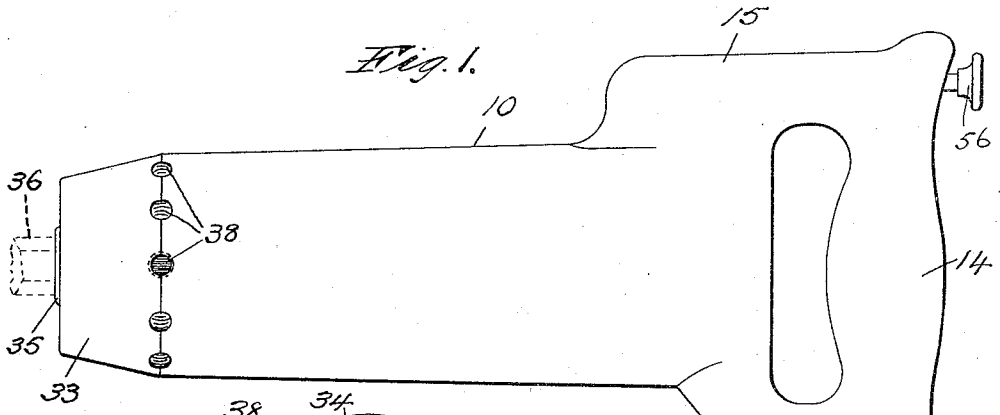


Fig. 3.

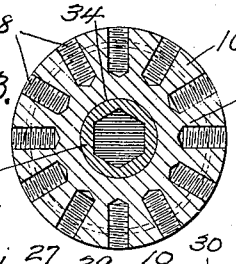


Fig. 2.

Fig. 4.

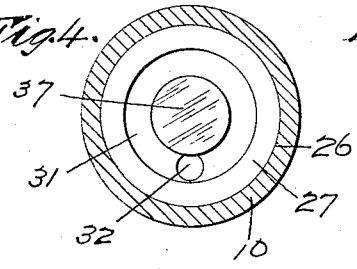
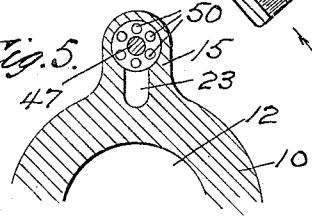


Fig. 5.



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PNEUMATIC HAMMER.

1,128,416. Specification of Letters Patent. **Patented Feb. 16, 1915.**

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To all whom it may concern:

Be it known that I, ROBERT B. CRUMP, a citizen of the United States, and a resident of New York, borough of Brooklyn, county of Kings, and State of New York, have invented a certain new and useful Improvement in Pneumatic Hammers, of which the following is a full, clear, and exact specification.

This invention relates to a class of implements adapted for use in structural work.

My invention has for its object primarily to provide a pneumatic hammer, or device designed to be used for cutting, or calking, or driving rivets, or for other purposes as occasion requires in various classes of structural work, and wherein is employed a reciprocatory plunger which is operated preferably by compressed air in a manner so that a cushion is provided for receiving and absorbing the impact resulting from the force of the blows of the plunger during its reciprocation, thus serving to overcome the intermittent shocks and consequent strain which manipulators of such implements are usually subjected to.

Other objects of the invention are to provide a form of casing and a form of plunger having an arrangement of feed passages and exhaust ports which permit the plunger to be acted upon at various points by the fluid pressure; to provide a form of valve, or throttle which serves as a means for controlling the feed of the motive agent whereby the pressure upon the plunger may be conveniently regulated so as to vary its speed; and to provide a pneumatic hammer of simple and efficient construction, and which may be made so as to be very durable.

A practical embodiment of the invention is represented in the accompanying drawing forming a part of this specification in which similar characters of reference indicate corresponding parts in all the views, the said invention being more fully described hereinafter and then pointed out in the appended claims.

In the drawing, Figure 1 is a side elevation of one form of pneumatic hammer embodying my invention. Fig. 2 is a longitudinal vertical section through the hammer. Fig. 3 is a section taken on the line II—II of Fig. 2. Fig. 4 is a section taken on the line III—III of Fig. 2, and Fig. 5 is a section taken on the line IV—IV of Fig. 2.

The implement, or pneumatic hammer has an elongated casing 10 which is preferably circular in form, and said casing is hollow whereby a chamber 11 and a communicating chamber 12 of smaller diameter are provided therein. In one end of the casing 11 is a threaded opening 13, and upon the opposite end of said casing is a handle 14. At one end of the handle 14 and upon the portion of the wall of the casing 11 adjacent thereto, is formed an extension 15, all of which may be of any suitable shape, or size.

Transversely through the casing 10, and at the intersection thereof with the handle 14, is an inlet passage 16, and in one end of said passage is threaded a pipe, as 17, leading from any suitable source for supplying compressed air, or other motive agent under pressure for operating the hammer. Longitudinally through the extension 15 is a passage 18 which communicates with the inlet 16. At one end of the extension 15 is a recess 19 which communicates with the passage 18, and through the wall of the extension is an exhaust port 20 which is in communication with the recess 19. The wall of the opposite end of the passage 18 is threaded, at 21, and through said wall adjacent to the threaded portion is another exhaust port 22. Communicating with the passage 18 of the extension 15 and with one end of the chamber 11 of the casing 10, is a feed passage 23, and through the wall of the casing at the opposite end of said chamber is an exhaust port 24. Also through the wall of the casing 10, is a port 25 which communicates with the chamber 12 in the casing and serves alternately as an inlet for admission of air into said chamber and as an outlet therefor.

In the chambers 11 and 12 of the casing 10 is a plunger 26 adapted to be reciprocated by the pressure of the compressed air, or motive agent which is fed into the inlet 16 through the pipe 17. The plunger 26 has a neck, or body portion 26^a, and a head, or piston 27 upon one of its ends which is adapted to be reciprocated in the chamber 11 of the casing. Upon the opposite end of the neck, or body portion 26^a of the plunger is a head, or piston 28 which is adapted to be reciprocated in the smaller chamber 12. As illustrated, the body portion 26^a of the plunger as well as the piston 28 are preferably similar in circumference, and

both are of less diameter than the piston 27. The chamber 11 is thereby given an annular formation, and a concentric shoulder, as 29, is provided at the juncture of the piston 27 with the body portion of the plunger so that said shoulder will receive part of the pressure of the motive agent, as will be hereinafter more fully described. At the intersection of the body portion 26^a of the plunger and the piston 28 the plunger is reduced whereby an annular groove 30 is provided therein, and this annular groove is adapted to register with the feed passage 23 at alternate strokes of the plunger. In the surface of the end of the head, or piston 27 which is opposite to the body portion 26^a of the plunger is a concentric groove 31 for admission of air from the passage communicating therewith after the stroke, and providing communication between said concentric groove and the annular groove 30 is a feed passage 32 which is disposed on an incline through the piston 27 and the body portion, or neck 26^a, through which the air is admitted to said concentric groove 31.

In the threaded open end 13 of the casing 10 is screwed the threaded end of a chuck, or nozzle, or head 33 of the hammer proper, and said nozzle may have a tapered, or reduced free end, as shown. Through the nozzle 33, and communicating with the chamber 11 of the casing 10 is an opening 34, and tightly held in said opening is a bushing 35 which has preferably an angular, or polygonal inner periphery whereby a suitable tool as 36, for cutting, calking, or driving rivets may be snugly, but movably fitted therein. As illustrated, the annular groove 31 is of larger diameter than the opening 34 of the nozzle, and the surface of the end of the piston, or head 27 of the plunger 26 between the inner periphery of this groove is provided with a hammer seat, as 37, which contacts with the tool carried by the hammer when the plunger is reciprocated. In order to prevent the nozzle 33 from being loosened by the vibrations of the hammer when in use, in the edge of the threaded end 13 of the casing 10 and around the adjoining part of the nozzle are provided a plurality of spaced threaded bores 38, and in one or more of said bores is sunken a screw 39 to secure the parts in position. In the nozzle 33 and at an angle to one, or more of the bores 38 may be one, or more recesses 40, each of which communicates with one of the bores, and in each bore may be a movable pin 41. Between the pin 41 and the base of the bore is seated a helical spring 42 which normally serves to force the pin 41 outwardly of its recess so that when the screw in the adjoining bore is countersunken a sufficient depth the free end of the pin will be guided over the screw to secure it against becoming loose.

Serving as a means for controlling the feed of the motive agent to the casing 10 whereby the pressure upon the plunger may be conveniently regulated, in the passage 18 is a throttle 43. The throttle 43 has a cylindrical rod, or valve 44 which is movable in the passage 18, and intermediate of the ends of said rod are two spaced annular grooves 45 and 46 whereby a body portion, as 47, and two heads 48 and 49 are provided respectively at each end of the rod. The annular groove 45 is adapted to be registered with the feed passage 23 of the casing 10 and the annular groove 46 is adapted to be registered with the inlet 16. Communication is provided between the annular grooves 45 and 46 through the medium of a plurality of spaced orifices 50 formed through the body portion 47 of said rod so that when the annular grooves 45 and 46 are in register with the inlet 16 and the passage 23 the motive agent admitted through said inlet will pass through these orifices and be delivered through the annular groove 45 to the passage 23. In order to permit the valve, or rod 44 to be under the control of the operator of the hammer for convenient manipulation, in the head 48 of the rod is a recess 51, and in this recess as well as in the recess 19 of the extension 15 is seated a helical spring 52 which normally serves to force the valve, or rod in a direction toward the threaded opening 21 of the extension of the casing so that the feed passage 28 and the inlet 16 will be closed by the head 48 and the body portion 47 of the rod for cutting-off the feed of the motive agent. In the threaded opening 21 of the extension is a threaded bushing 53, and through said bushing is an opening in which is a movable slide, or pin 54 which is of sufficient length to extend into the passage 18 and beyond the outward end of the extension 15. Upon the end of the slide within the passage 18 is a head 55 which abuts against the head 49 of the valve, or rod 44, and upon the end of said slide exteriorly of the extension 15 is a push button 56 which may be screwed, or held in any suitable manner upon the slide.

When the hammer is not in operation the inlet 16 is closed against the admission of the motive agent by the valve, or rod 44 being moved by the tension of the spring 52 forcing the valve so that its head 28 and body portion 47 will close the passage 23 and said inlet, as above described.

To operate the hammer the tool is inserted in the bushing 35 of the nozzle 33 in a manner so as to force the plunger 26 back into the chambers 11 and 12 a distance approximately equal to that indicated by dotted lines 57 and 58 whereby the exhaust port 24 of the casing will be closed by the head, or piston 27 of the plunger. The annular groove 30 and the groove 32 of the plunger

will thereby be in register with the passage 23 of the casing. The button 56 is then pressed so as to force the slide 54 inwardly of the passage 18 of the extension 15, and the valve, or rod 44 will be moved against the tension of the spring 52 for registering the annular grooves 45 and 46 with the passage 23 and the inlet 16 of the casing. The motive agent will then be admitted through the annular groove 46, through the orifices 50, through the annular groove 45, and through the feed passage 23 into the chamber 11 of the casing. Part of the motive agent will be fed through the feed passage 32 of the plunger to the annular groove 31 thereof, and part of the motive agent will also pass into the chamber 11. The motive fluid is exhausted from the chamber 11 through the port 24, into the atmosphere when the forward end of the head uncovers said port on the rearward stroke. The pressure between the piston 27 and the nozzle and its tool will serve to force the plunger toward the opposite end of the casing, and the motive agent in the chamber will thereby be compressed. As the feeding of the fluid is continued the pressure in front of the piston 27 will be sufficiently overcome by the pressure in the chamber 11 to cause the plunger to be reciprocated at a speed conforming with the feed as regulated by the operation of the throttle 43, and during the reciprocation of the plunger the air admitted into the chamber 12 of the casing 10 will serve as a cushion for the piston 28 sc that all shock from the impact of the plunger will be absorbed.

In the foregoing description, I have embodied the preferred form of my invention, but I do not wish to be understood as limiting myself thereto, as I am aware that modifications may be made therein without departing from the principle, or sacrificing any of the advantages of this invention, therefore I reserve to myself the right to make such changes as fairly fall within the scope thereof.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. In a pneumatic hammer, in combination, a casing having an inlet near its rear end, and having two communicating chambers therein, one for fluid pressure in the front part, and the other in its rear part for containing air, said casing having a front head in the front chamber, and said casing having two ports, one leading into each of the chambers, an extension on the wall of the casing, and having a passage therethrough, said passage communicating with the inlet and the front chamber of the casing for the transmission of fluid pressure, a plunger within the casing, said plunger having two spaced pistons, one reciprocable in each of the chambers, and the piston in the front chamber having a recess in its surface which is opposed to the front head, means adapted to transmit the fluid pressure from the front chamber to the recess of said piston, and means serving to permit the feed of the fluid pressure to the front chamber to be regulated by the operator of the hammer.

2. In a pneumatic hammer, in combination, a casing having an inlet at its rear end, and two communicating chambers therein, one for fluid pressure in its front part, and the other for air pressure in its rear part, said casing having a front head in the front chamber, and said casing having two ports, one leading into each of the chambers, and said casing having a passage provided therein communicating with the inlet and the front chamber of the casing for the transmission of fluid pressure, and two spaced connected pistons, one reciprocable in each of the chambers, said pistons being integrally constructed, and the piston in the front chamber having a recess in its surface which is opposed to the front head, means adapted to transmit the fluid pressure from the front chamber to the recess in said piston to form a cushion, and means for regulating the feed of the fluid pressure in the front chamber so as to be controlled by the operator of the hammer.

3. In a pneumatic hammer, a motor comprising a casing having two communicating chambers, an inlet communicating with the front chamber, and having a part also communicating with each chamber, said casing having a front head in the front chamber, and said front chamber being of greater diameter than the rear chamber, said front chamber being adapted to contain fluid under pressure, and said rear chamber being adapted to contain air, a plunger comprising two integrally formed spaced pistons, a neck connecting said pistons and integral therewith, one piston being of greater diameter than the other, and being positioned in the front chamber, said piston having a recess in its front surface which is opposed to the front head, a passage leading through the neck of said piston whereby fluid under pressure is admitted to said chamber to provide a cushion for said piston, an annular channel communicating with said passage, said channel being adapted to admit fluid under pressure from the inlet passage of the casing, said rear piston being of a diameter equal to the shaft of the front piston, whereby the shaft of the front piston telescopically fits in the rear chamber, and serves as a piston, said rear piston having a recess in its end surface adapted to receive air to serve as a cushion, and means for regulating the feed of the fluid pressure in the front to be controlled by the operator.

4. In a pneumatic hammer, comprising a casing containing a cylindrical chamber divided into two parts of substantially equal lengths and having a front chamber and a rear chamber, said casing having a front head in the front chamber, an inlet substantially midway of the chamber, and leading into the smaller chamber adjacent to the larger chamber, said casing having a port leading from the larger chamber and a smaller port leading from the smaller chamber and a plunger comprising a cylindrical portion fitted within the larger chamber, and serving as a piston reciprocable in said larger chamber, and a smaller cylindrical portion concentric with the large portion, whereby a shoulder is formed at the juncture of the larger portion with the smaller portion, and an annular space is provided between the smaller portion and the wall of the large chamber, said smaller portion being of a length and size whereby the free end part thereof is fitted into the smaller chamber, and serves as a piston reciprocable in the smaller chamber, said smaller portion having an annular channel formed therein adjacent to its free end so as to communicate with said annular space when the plunger is at the limit of its forward movement, whereby communication with the inlet port and said annular space is provided at the time the piston reaches this position, said plunger having a passage leading from said annular channel to the head of the large piston, and said large piston having a recess in the head surface opposed to the front head, and communicating with the said passage, and means for feeding air to the inlet passage, adapted to be regulated by the operator of the hammer.

This specification signed and witnessed this sixteenth day of October A. D. 1912.

ROBERT B. CRUMP.

Witnesses:
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