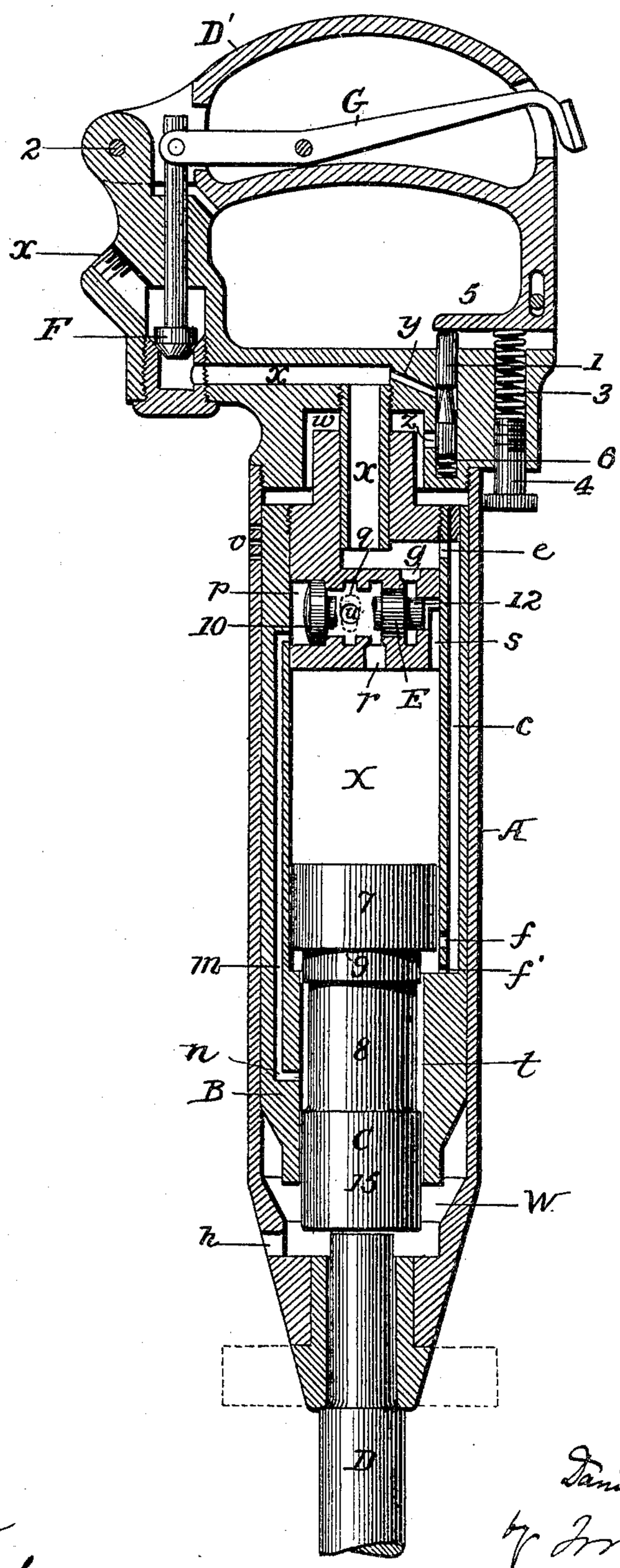
No. 622,576. Patented Apr. 4, 1899.

D. S. WAUGH.

PNEUMATIC TOOL.

(Application filed Oct. 22, 1397.)

(No Model.)



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UNITED STATES PATENT OFFICE.

DANIEL SHAW WAUGH, OF DENVER, COLORADO, ASSIGNOR OF ONE-HALF TO CHARLES H. SHAW, OF SAME PLACE.

PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 622,576, dated April 4, 1899.

Application filed October 22, 1897. Serial No. 656,067. (No model.)

To all whom it may concern:

Be it known that I, DANIEL SHAW WAUGH, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Pneumatic Tools, of which the following is a specification.

My invention relates to that class of pneumatic hammers in which a shell or frame carries a tool, to and from which the hammer is reciprocated by the pressure of air or other gas to operate the same; and my invention consists of certain means for reciprocating the hammer and readily varying its action and in certain details of construction, as fully set forth hereinafter and as shown in one form in the accompanying drawing, in which the figure represents a longitudinal section of an instrument embodying my improvements.

There is an outer shell A and an inner shell B, which fits, but can move longitudinally in, the outer casing for two purposes—first, to carry the hammer C, supported by the inner casing, to or from the end of the tool, supported by the outer casing, thereby regulating the force of the blow, and, second, to take up the shock of the blow by the inner casing, and thus relieve the outer casing and reduce the effect of the blows upon the operator.

The tool D is of any suitable character, according to the character of the instrument, as a rock-drill, calker, dental plugger, &c., and is supported as usual, and to mechanically vary the effects of the hammer I provide a valve 1, which may be adjusted by pressure of the hand upon a handle D′ to bring a greater or less air-pressure upon the upper end of the shell B and carry the latter and the hammer C nearer to or farther from the end of the tool. Normally the parts are adjusted so that the hammer will not hit the tool unless the inner shell is carried slightly downward. The handle, valve 1, and ports may be differently arranged. As shown, there is an air-inlet channel *x* in the head of the outer shell, communicating by a branch *y* with a port *z*, controlled by the valve 1 and leading to the chamber *w* above the end of the shell B. The handle D′ is pivoted at 2 and is normally kept in its outer position by a spring 3, the pressure of which is regulated by a set-screw 4, and a finger 5 on the handle bears on the end of the valve 1, which is pressed outward by a spring 6. When pressure is brought upon the handle D′, the valve 1 is pushed in, opening the port *z* more or less and admitting air to the chamber *w*. If the inner shell is forced too far down, the air escapes from the chamber *w* by ports *v*.

The hammer C has an enlarged head 7, fitting the chamber X in the shell B, and a contracted stem 8, forming a shoulder 9, and a surrounding annular chamber *t*, and air is admitted to the chamber X from the channel *x* through a port *s*, controlled by a valve E, and exhausts through a port *r* to a port *u* in the shell B, which port *u* is opposite an elongated port *q* in the shell A.

The valve E has an enlarged head 10, fitting the enlarged part *p* of the valve-chamber, and a channel *m* in the inner shell B extends from opposite the chamber *p* to a port *u* opposite the chamber *t* around the stem of the hammer. In the shell B is also a channel *c*, which connects two ports *e f*, the port *e* communicating with the channal *x* and the port *f* communicating with that part of the chamber X below the shoulder 9 of the hammer. A small leakage-port *f′* also communicates with the channel *c* and space below the shoulder.

The projecting end 12 of the valve E not only serves to close the port *s*, but also to intersect and close a port *g*, leading from the channel *x*.

Air is admitted to the operating parts of the instrument at the will of the operator by means of a control-valve which governs a port in the channel *x* and which is connected with a lever G, pivoted in the hollow handle D′ and projecting through a hole in the same, as shown. Below the shell B is a chamber W, having an exhaust-port *h*. The parts being in the position shown, when the valve F is lifted the air passes to the channel *x* and through the port *e*, channel *c*, and port *f*, and, acting on the face of the shoulder 9, lifts the hammer slowly until the port *f* is uncovered, when it is raised more rapidly. This continues until the head of the hammer passes above the port *n*, when the air will pass from the chamber *p* to the chamber W and to the

exhaust *h*, when the pressure on the reduced end of the valve E will throw the latter to the left. The ports *g* and *s* being thus opened, the air will pass through them to the chamber X and force down the hammer, the port *n* being first closed by the part 15 of the hammer and then opened as the chamber *t* is brought to communicate with the same. The air then passes from the chamber *t*, through the port *n* and channel *m*, to the chamber *p*, and by its pressure on the enlarged head of the valve E shifts the latter to the right and closes the port *s* and cuts off the flow of air to the top of the hammer. The exhaust-port *r* is opened as the valve E is shifted to the right, so that the air passing through the channel *c* and port *f'*, acting on the reduced face of the shoulder 9, will lift the hammer until the end 15 is above the port *n*, when the air will escape from the chamber *p*, channel *m*, and port *n* to the exhaust *h*, the pressure on the head *w* of the valve E being thus removed and the valve E then being shifted to the left by the pressure of air which is always upon the reduced end. It will be seen therefore that there is always a pressure on the reduced end tending to shift the valve in one direction and that by providing the valve with a larger area at the opposite end this pressure may be overcome to shift the valve in the opposite direction. I thus secure the proper movements of the valve without the necessity of two sets of ports and valves for controlling the flow of air to both ends and without using any springs. I am also enabled to regulate the force of the blows with nicety merely by varying the pressure on the handle or otherwise shifting the valve 1 or its equivalent so as to vary the position of the inner shell, which carries the hammer, in respect to the outer shell or frame carrying the tool.

As shown in the drawings, the parts occupy substantially their normal positions, and when the valve 1 is open and compressed fluid is admitted to the chamber *w* the pressure of such fluid upon the end of the shell B will force it toward the inner end of the casing to a greater or less extent, depending, of course, upon the volume of fluid admitted to the chamber *w*. The hammer C is then forced downward into contact with the end of the shell D by the admission of fluid under pressure into the chamber X, and the reaction of the fluid in the chamber X upon the outer end of the shell D will cause the shell to be restored to its normal position, the air in the chamber *w* being compressed in consequence.

It will be evident that the proportions and construction of the shells or casings, valves, and arrangement of channels may be greatly varied and the same action of the parts secured. I do not, therefore, limit myself to the precise forms and arrangements of the parts shown. It will also be evident that some of the features set forth may be used when there is no inner shell movable within an outer shell, and I therefore do not limit myself to an instrument in which an inner movable shell is employed, since

What I claim is—

1. An instrument comprising an outer shell carrying a tool, an inner shell free to move longitudinally within the outer shell, a reciprocating hammer within the inner shell having a piston-head, valve-controlled passages for admitting fluid under pressure upon opposite sides of the piston-head, and a valve-controlled passage for admitting fluid under pressure to a chamber at one end of the inner shell for moving it within the outer shell, substantially as described.

2. An instrument comprising an outer shell carrying a tool and provided at one end with a restricted exhaust-port, an inner shell free to move longitudinally within the outer shell and provided with a reciprocating hammer, and a valve-controlled passage through which fluid under pressure is admitted to a normally-closed chamber at one end of the inner shell, substantially as described.

3. An instrument provided with an outer shell or frame carrying a tool, and an inner shell, loose within the outer one, carrying a hammer, means for applying air with varying pressure to the outer end of the inner casing, a valve controlling the flow of air into a chamber above the inner shell, and a handle movably connected with the outer shell, and an air-controlling valve connected to be shifted by pressure on the handle, substantially as described.

4. An instrument comprising an outer shell carrying a tool and an inner shell free to move longitudinally within the outer shell and carrying a reciprocating hammer adapted to cooperate with the tool and a valve-controlled passage through which a fluid under pressure is introduced into a normally-closed chamber between the ends of the inner and outer shells, substantially as described.

5. The combination of the inner and outer shells, tool and hammer, valve 1 controlling the flow of air to the end of the inner shell, handle D movably connected to the outer shell and with the valve 1, and a spring-bearing for the handle and means of adjusting the tension thereof, substantially as described.

6. The combination of an outer shell carrying a tool and provided at one end with an exhaust chamber and port, an inner shell longitudinally movable within the outer shell and provided with a reciprocating hammer adapted to be projected into the exhaust-chamber and to coöperate with the tool, and valve-controlled passages for directing a fluid under pressure to reciprocate the hammer, substantially as described.

7. The combination of an outer shell and an inner shell movable within the outer shell having a piston-hammer adapted to reciprocate therein, a valve-controlled passage leading to one end of the inner shell, inlet and exhaust passages leading to and from the opposite end of the shell respectively and a sin-

gle valve adapted to control both said inlet and exhaust passages, substantially as described.

8. The combination of an outer shell, an inner shell movable therein, and having a piston-hammer adapted to reciprocate therein, a valve-controlled passage leading to one end of the inner shell and communicating with a source of supply of fluid under pressure, inlet and exhaust passages leading to and from the opposite end of the shell respectively, a valve having an enlarged and a reduced end adapted to control both said inlet and exhaust passages, and a passage adapted to be controlled by the hammer, which passage leads from the chamber of the shell to one side of the enlarged end of the valve, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DANIEL SHAW WAUGH.

Witnesses:
LOUIS A. FRANCE,
JOHN C. KAUFMAN.