

(No Model.)

C. B. ALBREE.  
PNEUMATIC TOOL.

No. 572,324.

Patented Dec. 1, 1896.

Fig. 1.

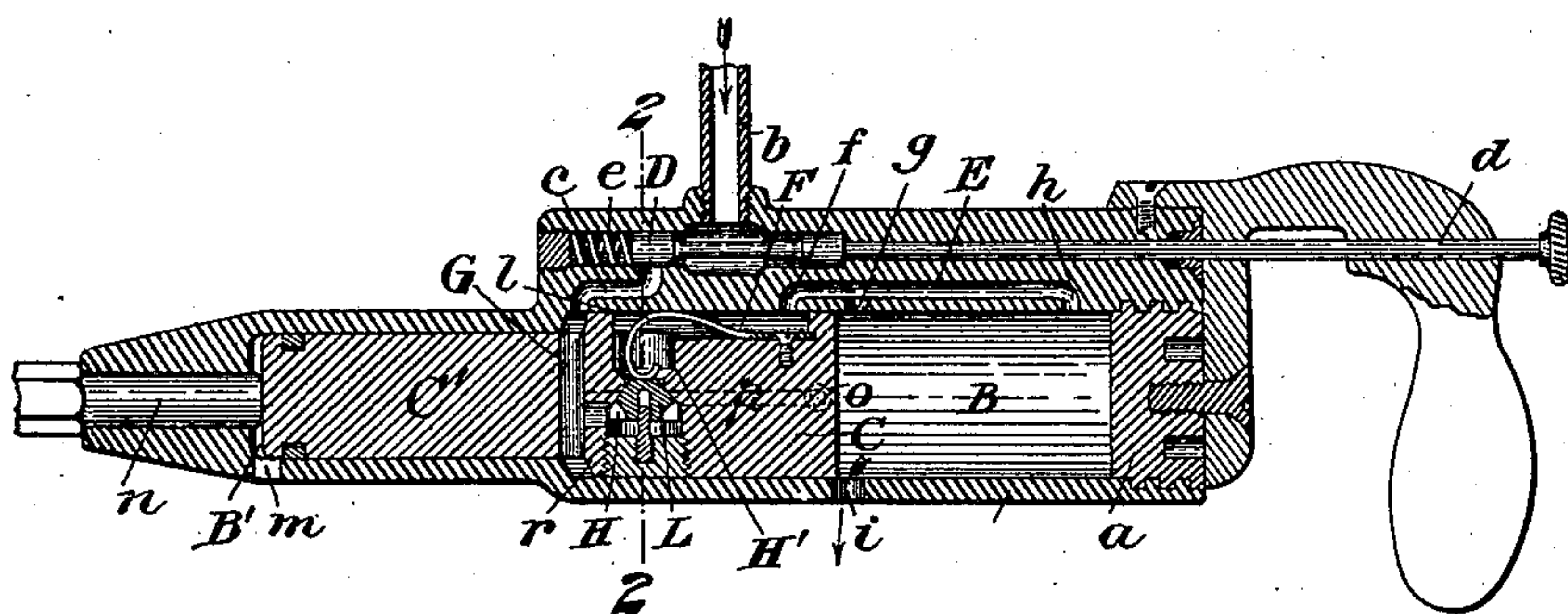


Fig. 2.

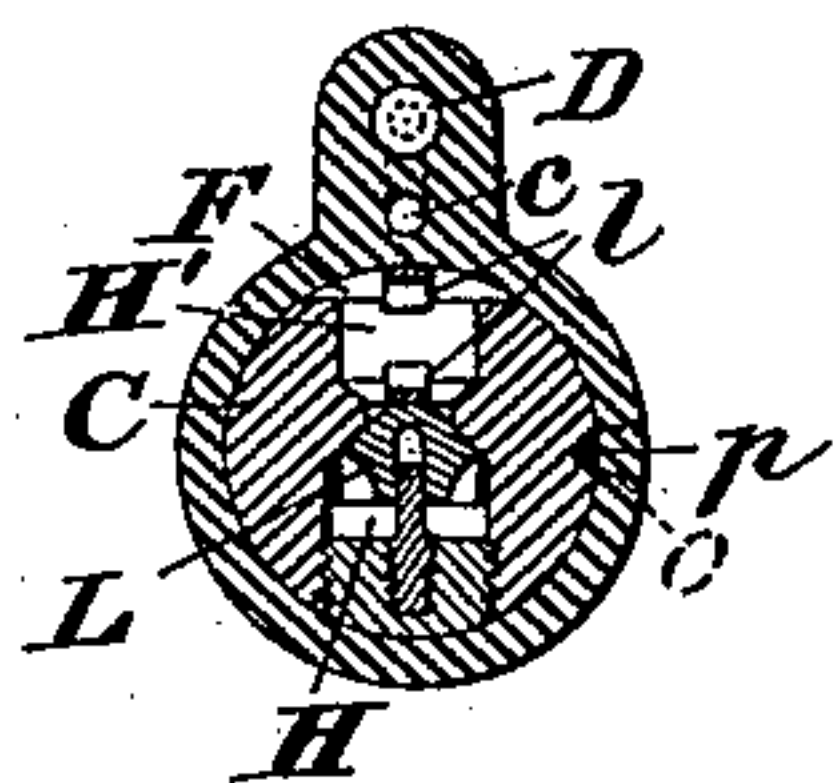


Fig. 3.

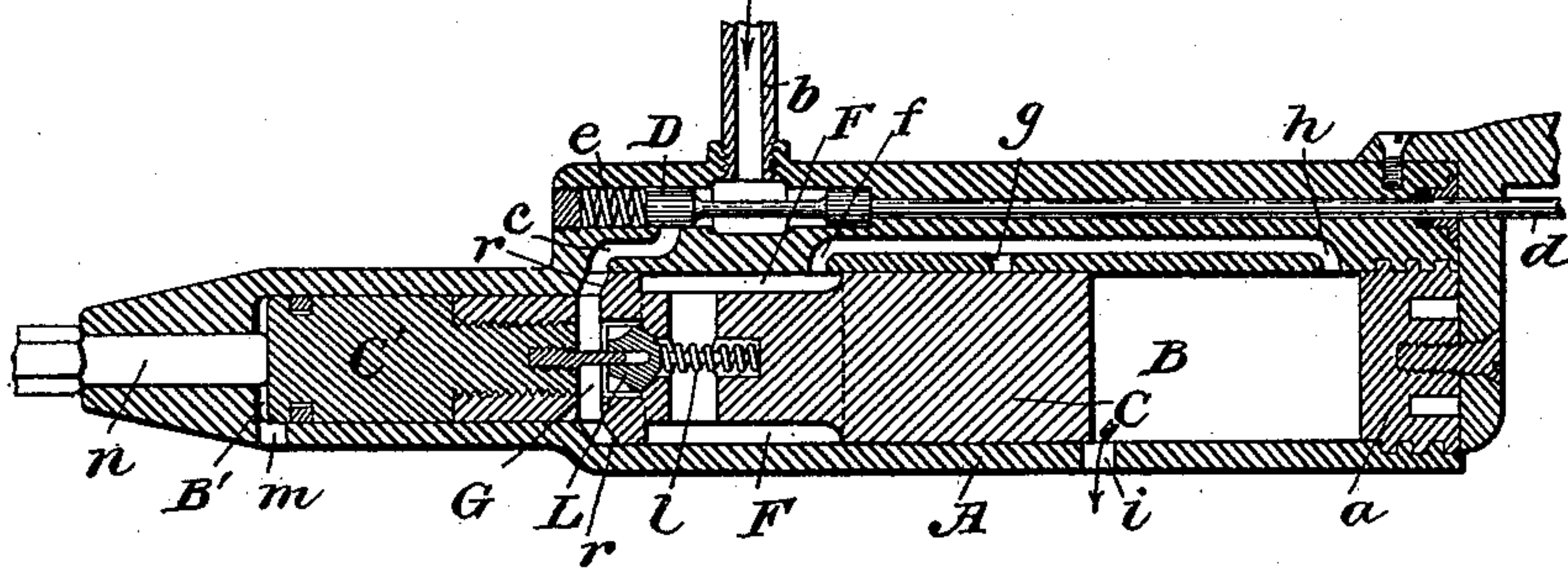
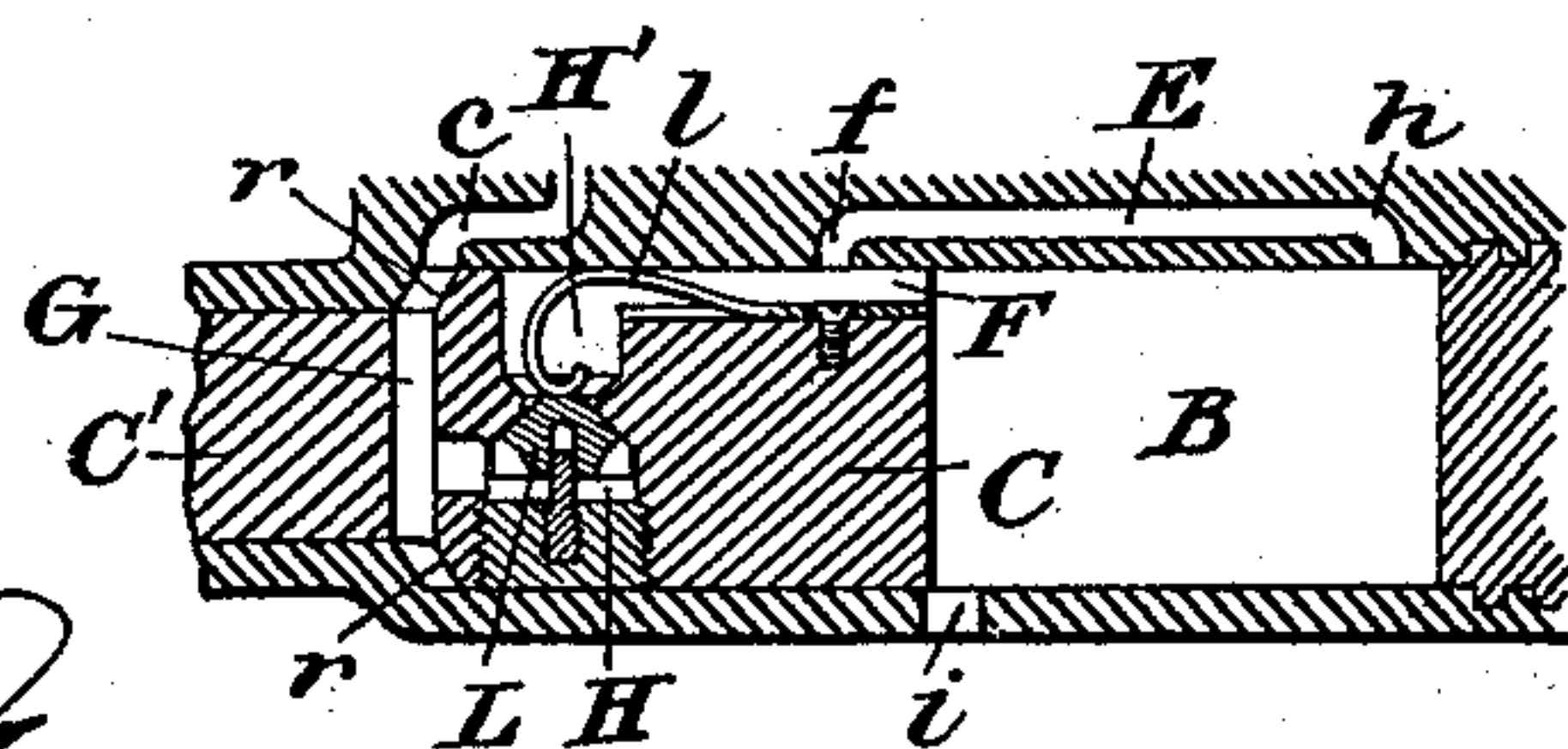


Fig. 4.



WITNESSES

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# UNITED STATES PATENT OFFICE.

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## PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 572,324, dated December 1, 1896.

Application filed May 15, 1896. Serial No. 591,638. (No model.)

*To all whom it may concern:*

Be it known that I, CHESTER B. ALBREE, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Pneumatic Tools, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a longitudinal section of my improved mechanism. Fig. 2 is a cross-section on line 2 2, and Figs. 3 and 4 are longitudinal sections of modified forms.

My invention relates to that class of pneumatic or steam reciprocating motors or tools known as the "valveless" tools, in which the piston itself operates as the controlling-valve to govern the admission and exhaust of pressure, and it is designed to afford an increase in the efficiency of the motor or tool without a corresponding increase in the pneumatic or steam pressure required. The mechanism hereinafter described that is used for containing and actuating the piston is of a type well known and in general use, and the specific form shown in the accompanying drawings may be varied without departure from my invention.

In the drawings, A indicates the body of the machine, having a cylinder B B', provided with a removable head a.

C C' is the piston, the two parts of which are of unequal diameters.

D is an inlet-valve controlling the admission of steam or air under pressure through supply-pipe b to inlet-port c. It is provided with suitable means for opening and closing, (herein represented by a rod d and closing-spring e.)

f g h are ports in cylinder B, connected by a by-pass E, and i is the exhaust-port, so placed in relation to the piston C that it is uncovered thereby only at the end of the outward or working stroke.

F is a passage or recess in piston C of a length sufficient to uncover and connect with port f when the piston is at the end of its outward or working stroke.

r is an annular shoulder at the end of the piston C, upon which the pressure is exerted in its inward stroke. The piston C has a valve-chamber H H' communicating through

a port G with the exterior of the piston at the shoulder r, and having therein a valve L, preferably of the puppet type, adapted to close the passage between the parts H and H' of the chamber in the piston and normally retained in an open position by the pressure of a spring l.

m is an air-vent in the outer portion of the chamber B', which serves to prevent the formation of an air-cushion.

n indicates the shank of the tool inserted in its proper position.

o is a pin projecting inwardly from the cylinder B, adjustable by means of its threaded portion, which fits in a corresponding slot p in piston C (indicated in Fig. 1 by broken lines) and serves as a guide to preserve the relation of passage F to the ports f g h, as indicated.

In Fig. 3 I show a modification in which the chamber F of Fig. 1 is an annular recess in the circumference of the piston C, whereby the necessity of the guiding-pin and slot is avoided, and in Fig. 4 I show yet another modification in which port g is omitted, and passage F of Fig. 1 connects directly with cylinder B by means of an opening through the face of piston C.

The operation is as follows: Steam or air under pressure is admitted through the inlet-pipe b, by means of valve D, to port c and exerting a pressure on shoulder r of the piston C causes it to recede from the position as shown in Figs. 1, 3, and 4. At the same time pressure is exerted upon valve L through passage G and chamber H, overcoming the pressure of spring l, and the pressure in chambers B E and passage F being practically neutral causes said valve L to close, thus preventing any communication between port c and passage F and through port f with chamber B. When the shoulder r of the piston has passed port f, pressure is instantly exerted therethrough to the passage E and through port h to the cylinder B and upon the entire surface of the face of the piston C, thus causing a reversal of its motion. By reason of port g pressure is exerted through chamber H' and passage F upon valve L, and being equal and balanced upon both sides of said valve allows it to be moved into an open position by the spring l, thus permitting com-



munication between inlet-port *c* and passage F after the shoulder *r* has passed port *f* on the outward or working stroke of the piston. There is communication, therefore, between  
 5 inlet-port *c* and cylinder B in the rear of the piston throughout the entire outward or working stroke. As the piston reaches the end of this stroke it uncovers the exhaust-  
 10 port *i*, and by reducing the pressure in the cylinder B causes a corresponding reduction of pressure on the valve L, thereby causing said valve to close by reason of the constant pressure through the passage G. The piston and the valve L are then in their original  
 15 positions and the operation as above described is repeated.

In Fig. 3 I show a modification of the device in which the valve L is set in a position lengthwise of the piston instead of being  
 20 transverse, as in Fig. 1, and in which the passage F extends entirely around the piston. In Fig. 4 I show a modification wherein the necessity of using the port *g* is obviated by causing passage F to connect directly with  
 25 cylinder B. Many other changes may be made without departure from my invention as defined in the claims.

The advantages of my improvement will be appreciated by those skilled in the art to  
 30 which it relates. Its parts are few in number, simple in construction, durable, and in operation entirely automatic.

Hitherto in the operation of motors of the class to which my invention relates there  
 35 has been and must of necessity be a loss of power in the outward or working stroke. The pressure upon the shoulder *r* or forward end of the piston necessary to produce the return motion of the piston is constant, and  
 40 while in the ordinary style of tool when the said shoulder of the piston has passed the port *f* in its inward stroke the full pressure is admitted through port *f* to the cylinder B and permits the exertion of the full pressure  
 45 upon the larger surface of the piston, it is almost instantly cut off through the closing of the port *f* on the outward stroke of the piston, and the force of said stroke thereafter depends upon that proportion of the pressure  
 50 due to the expansion of the steam or air in the cylinder B in excess of the constant pressure on the other end of the piston that tends to retard the stroke.

By the use of my invention this loss in the  
 55 outward or working stroke is entirely removed, since the pressure upon each side of valve L is equal, after the opening of port *f*, to the pressure by the passage of shoulder *r* in the inward stroke of the piston and remains  
 60 open during the outward stroke by reason of this equality of pressure thereon remaining constant. There is therefore a free passage for the steam or air from the inlet *c* to the cylinder B back of the piston during the entire

outward or working stroke, or until the opening of the exhaust-port *i*. 65

The apparatus may be used for actuating rock-drills, for hand chipping or calking tools, and for any other purpose where a rapid reciprocating motion is desired. 70

I claim—

1. A reciprocating tool having a cylinder and piston, an exhaust-port, a port adapted to be uncovered at the end of the instroke of the piston to admit fluid-pressure to the rear  
 75 of the piston and to cause its initial outstroke, a passage through the piston to admit fluid-pressure to the rear of the piston after the beginning of the outstroke, and a valve which controls said port and is closed automatically  
 80 when the pressure at the rear of the piston is reduced by exhaustion.

2. A reciprocating tool having a cylinder and piston, an exhaust-port, a port adapted to be uncovered during the instroke of the  
 85 piston to admit fluid-pressure to the rear of the piston and to cause its initial outstroke, a passage through the piston to admit fluid-pressure to the rear of the piston thereafter, and a valve which controls said port and is  
 90 closed automatically when the pressure at the rear of the piston is reduced by exhaustion, said valve being subjected on one side to the closing pressure from the cylinder at the outer end of the piston and on the other side to the  
 95 pressure from the inner end thereof.

3. A reciprocating tool having a cylinder and piston, an exhaust-port, a port adapted to be uncovered during the instroke of the  
 100 piston to admit fluid-pressure to the rear of the piston and to cause its initial outstroke, a chamber H, H' in the piston, a passage F adapted to register with a port leading to the rear portion of the cylinder, a check-valve in  
 105 said passage, and a valve-controlled port admitting fluid to the forward portion of the cylinder.

4. A reciprocating tool having a cylinder and piston, the effective area of the piston exposed to pressure being greater at the rear  
 110 end than at the forward end, and a pressure-inlet port, admitting constant fluid-pressure to the smaller end of the piston, an exhaust-port, a port adapted to be uncovered during the instroke of the piston to admit fluid-pres-  
 115 sure to the rear of the piston and to cause its initial-outstroke, a passage through the piston to admit fluid-pressure to the rear of the piston thereafter, and a valve which controls said port and is closed automatically when  
 120 the pressure at the rear of the piston is reduced by exhaustion.

In testimony whereof I have hereunto set my hand.

CHESTER B. ALBREE.

Witnesses:

THOMAS W. BAKEWELL,  
 G. I. HOLDSHIP.