

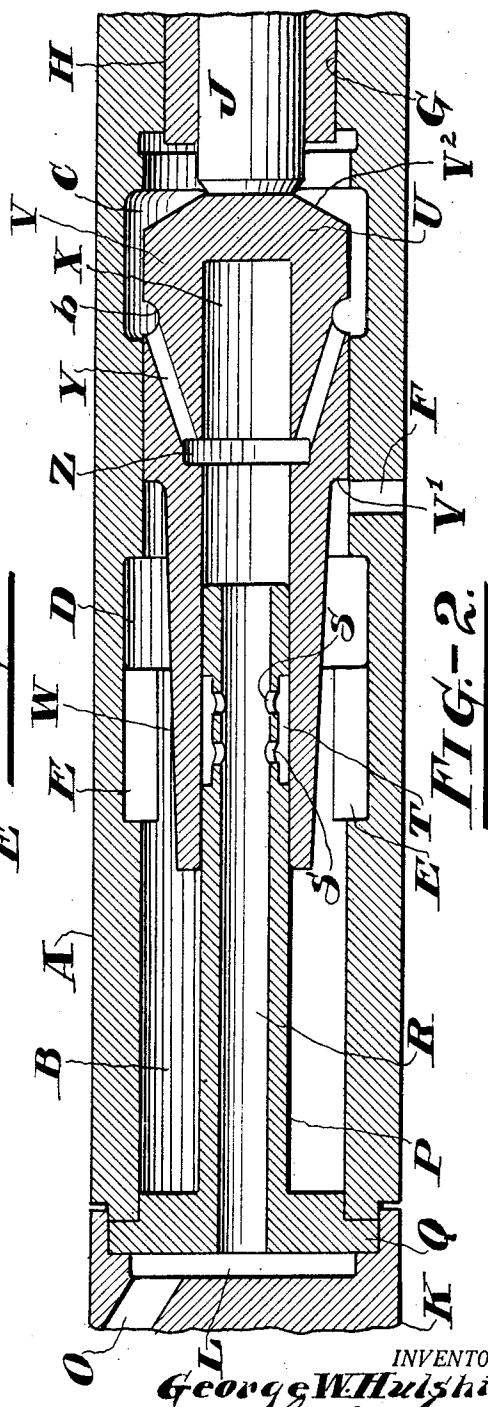
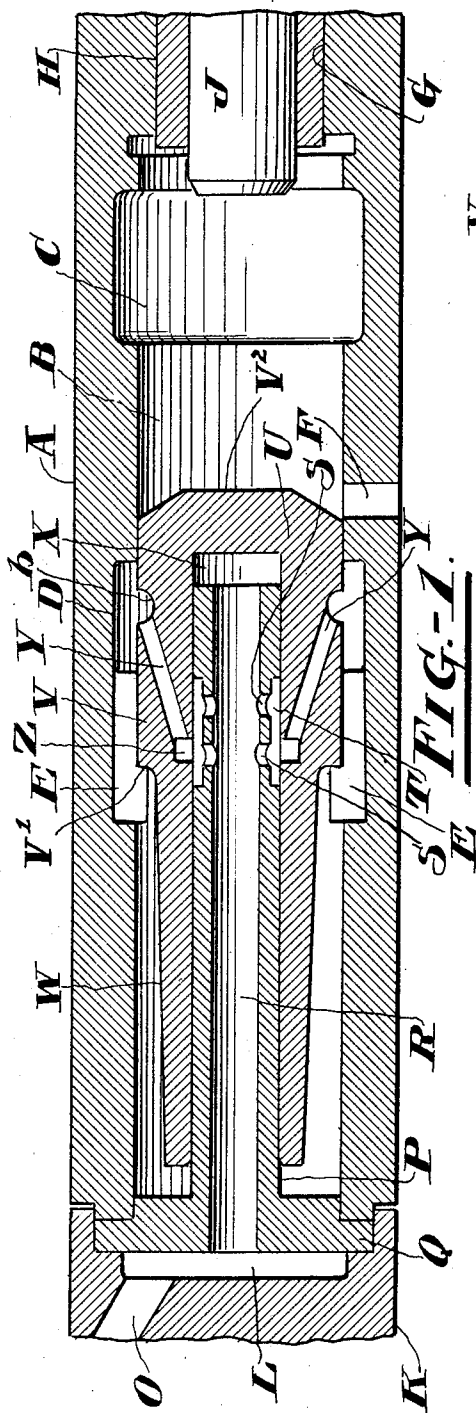
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PERCUSSIVE TOOL

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## UNITED STATES PATENT OFFICE.

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## PERCUSSIVE TOOL.

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This invention relates to percussive tools, but more particularly to fluid actuated percussive tools of the "valveless" type.

The objects of the invention are to obtain a powerful blow of the hammer piston against the working implement and to construct a tool which is economical in the consumption of pressure fluid.

Other objects will appear hereinafter.

The invention consists of the combination of elements and arrangement of parts having the general mode of operation substantially as hereinafter described and claimed and illustrated in the accompanying drawings, in which

Figure 1 is a longitudinal sectional view of a percussive tool constructed in accordance with the practice of the invention, showing the piston in position to admit pressure fluid to the rearward end of the cylinder, and

Figure 2 is a similar view showing the piston in position to admit pressure fluid to the other end of the cylinder.

Referring to the drawings, A designates a cylinder of a percussive tool having a piston chamber B near the front end of which is formed an annular recess C. A similar recess D is formed in the piston chamber intermediate its ends. From the recess D lead rearwardly extending passages E for conveying pressure fluid to the rearward end of the piston chamber B in a manner to be described more fully hereinafter. In this instance a free exhaust port F is formed in the cylinder A intermediate the recesses C and D. In the front end of the cylinder A is formed a bore G to receive a bushing H which, in addition to its function of forming a closure for the front end of the piston chamber B also acts as a guide for a working implement J, only the shank of which is shown projecting into the piston chamber B.

Disposed on the rearward end of the cylinder A is a back head K having a recess L in its forward face into which pressure fluid may be admitted from a suitable source of supply (not shown) through a passage O in the back head.

In accordance with the practice of the invention, an inlet plug P is disposed concentrically within the piston chamber B and has a flange Q at its rearward end which extends into the back head K for the purpose of

centralizing the inlet plug with respect to the cylinder. The back head K may be secured to the cylinder in any suitable manner. Such means may consist of the usual side bolts (not shown) but which, when drawn up tightly, will serve to clamp the flange Q of the inlet plug P firmly between the back head and the cylinder.

The inlet plug P is of substantially uniform external diameter throughout its length and has a longitudinal passage R there-through which communicates at its rearward end with the recess L. Preferably near the front end of the inlet plug P are formed ports S connected at their outer ends by passages T formed in the outer surface of the inlet plug P.

In the piston chamber B is a reciprocatory hammer piston U for delivering blows against the working implement J. The piston U in this instance comprises a head V having rearward and forward end surfaces V' and V<sup>2</sup> respectively and a rearward extension W of smaller diameter than the head and preferably of a length to extend near the rearward end of the piston chamber B when the piston is in its rearwardmost limiting position. The piston is provided with a central bore X which opens from the rearward end of the extension and is constantly exposed to pressure fluid conveyed through the passage R in the inlet plug P.

The pressure fluid for impelling the piston is conveyed through passages Y, preferably formed through the head V of the piston. The passages Y are in this instance connected at their inner ends by an internal annular groove Z and at their outer ends by an external annular groove b in the head V of the piston.

The operation of the device with the parts in the positions shown in Figure 1 is as follows: Pressure fluid admitted into the passage R from the recess L will pass through the ports S, the passages T and Y, thence through the recess D and the passages E to the rearward end of the cylinder to drive the piston U forwardly against the working implement J. As the piston proceeds on its forward stroke, the head V will overrun the exhaust port F and thereafter the air in the front end of the cylinder will be compressed. However, owing to the enlarged space pro-

vided by the recess C, such compression will not be of sufficient value to impede the progress of the piston.

Shortly before the piston delivers its blow against the working implements J, the end surface V' of the head V will uncover the exhaust port F to exhaust the fluid from the rearward end of the cylinder and the annular groove b will open into the recess C to admit pressure fluid from the bore X of the piston through the passages Y and the recess C to the front end of the cylinder to drive the piston U rearwardly. As the piston approaches the rearward end of the piston chamber, the end surface V<sup>2</sup> of the head V will uncover the exhaust port F to exhaust the fluid from the front end of the cylinder and the passages Y will again communicate with the bore R in the inlet plug to admit pressure fluid rearwardly of the piston, whereupon the piston will be driven forwardly in the manner previously described.

As will be observed, the admission of pressure fluid to the rearward end of the cylinder takes place during only a short portion of the stroke of the piston, so that the piston is impelled forwardly by the expansion of the pressure fluid. This is a very desirable feature in tools of this type as it tends to reduce the consumption of pressure fluid considerably and insures against wastage of pressure fluid. In like manner the piston is impelled rearwardly largely by the expansion of pressure fluid since communication between the passages Y and the recess C will be cut off almost immediately upon the start of the piston in a rearwardly direction.

I claim:

1. In a fluid actuated percussive tool, a cylinder having a free exhaust port intermediate its ends, a piston having end surfaces adapted to uncover the exhaust port for exhausting fluid from both ends of the cylinder and having a bore opening from its rearward end, a hollow inlet plug extending into the bore and constantly conveying pressure fluid to the bore, and a passage in the piston alternately admitting pressure fluid from the bore to one end of the cylinder and from the plug to the opposite end of the cylinder to actuate the piston.

2. In a fluid actuated percussive tool, a cylinder having a free exhaust port, a piston having end surfaces adapted to uncover the exhaust port for exhausting fluid from both ends of the cylinder and having a bore opening from its rearward end, an inlet plug extending into the bore and having a longitudinal passage constantly conveying pressure fluid into the bore, said plug also having a port, and a passage in the piston admitting

pressure fluid from the bore to one end of the cylinder and registering with the port to admit pressure fluid to the opposite end of the cylinder for actuating the piston.

3. In a fluid actuated percussive tool, a cylinder, a piston comprising a head and an extension having a bore opening from the rearward end of the extension, an exhaust port in the cylinder adapted to be uncovered by the ends of the head for exhausting fluid from both ends of the cylinder, a hollow inlet plug extending into the bore and constantly conveying pressure fluid to the bore, said inlet plug having a port controlled by the extension, and a passage in the head alternately admitting pressure fluid from the bore to one end of the cylinder and from the port to the other end of the cylinder for actuating the piston.

4. In a fluid actuated percussive tool, a cylinder having a recess at its front end, a piston comprising a head and an extension of smaller diameter having a bore opening from the rearward end of the extension, an exhaust port in the cylinder adapted to be uncovered by the ends of the head for exhausting fluid from both ends of the cylinder, an inlet plug extending into the bore and having a longitudinal passage constantly conveying pressure fluid to the bore, said inlet plug also having a port intermediate its ends controlled by the extension, and a passage in the head alternately registering with the recess for admitting pressure fluid from the bore to the front end of the cylinder to impel the piston rearwardly and with the port for admitting pressure fluid to the rearward end of the cylinder to impel the piston in a forwardly direction.

5. In a fluid actuated percussive tool, a cylinder having a front recess and an intermediate recess, a piston comprising a head and a rearward extension of smaller diameter having a bore opening from the rearward end of the extension, an exhaust port in the cylinder adapted to be uncovered by the ends of the head for exhausting fluid from both ends of the cylinder, a hollow inlet plug extending into the bore constantly conveying pressure fluid into the bore, said plug having a port near its front end controlled by the extension, and a passage in the head admitting pressure fluid from the bore into the front recess to drive the piston rearwardly and with the port and the intermediate recess for admitting pressure fluid from the inlet plug to the rearward end of the cylinder to drive the piston forwardly.

In testimony whereof I have signed this specification.

GEORGE W. HULSHIZER.