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G. W. HULSHIZER

PERCUSSIVE TOOL

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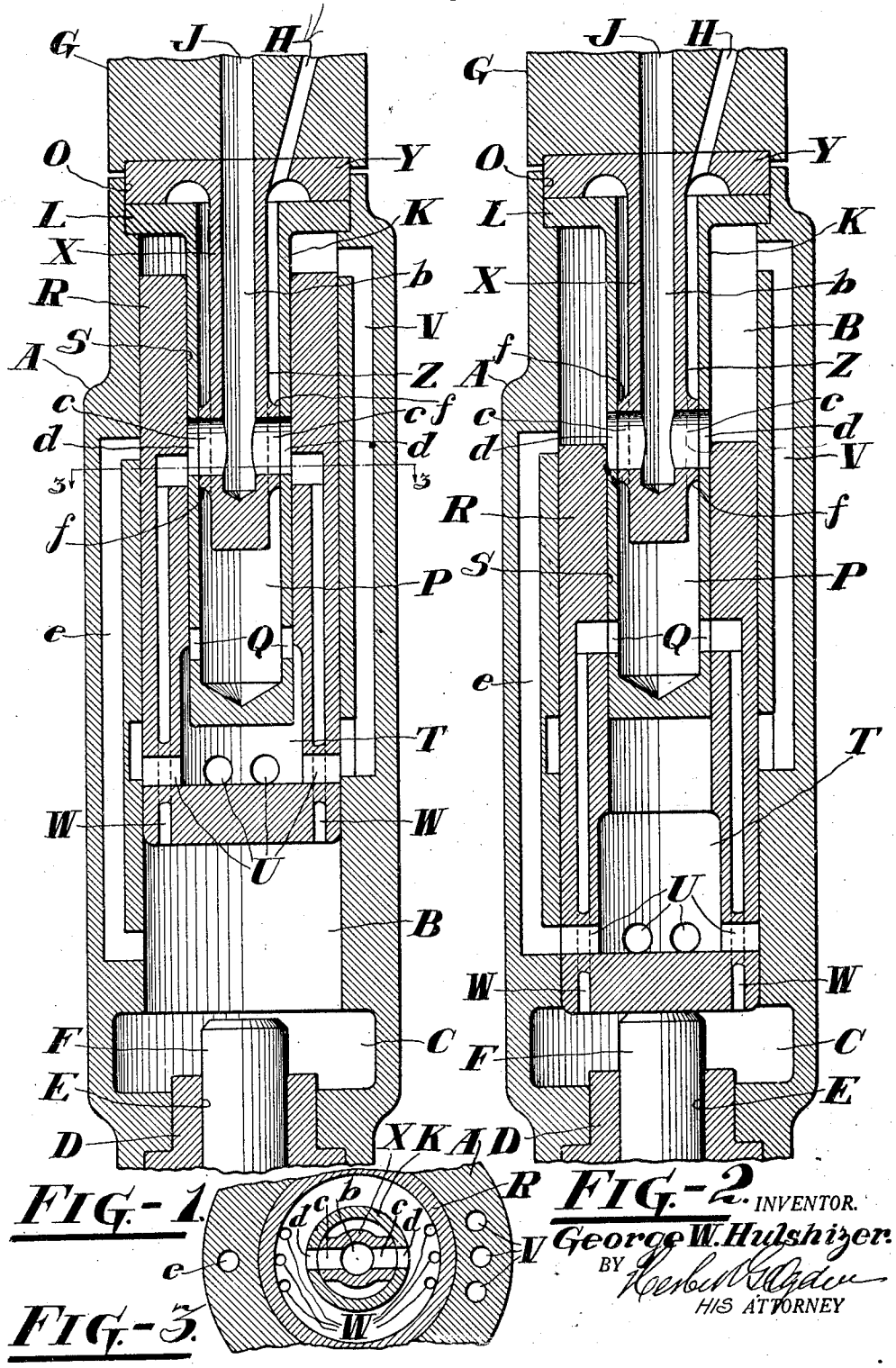


FIG.-1.

FIG.-2.

FIG.-3.

INVENTOR.
George W. Hulshizer.
BY Herbert G. Ogden
HIS ATTORNEY

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GEORGE W. HULSHIZER, OF STEWARTSVILLE, NEW JERSEY, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

PERCUSSIVE TOOL.

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This invention relates to percussive tools, but more particularly to fluid actuated percussive tools of the valveless type in which the distribution of pressure fluid to the cylinder and the exhaust of such fluid from the cylinder is effected by the piston.

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

Other objects will appear hereinafter, and to all of these ends 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 an elevation in section 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,

Figure 2 is a view similar to Figure 1 showing the piston in the other extreme position, and

Figure 3 is a transverse view taken through Figure 1 on the line 3—3 looking in the direction indicated by the arrows.

Referring to the drawings, A designates a cylinder of a percussive tool having a piston chamber B which opens at its front end into a pocket C. The front end of the piston chamber B may be sealed in any suitable manner. In the drawings a bushing D is indicated for this purpose and said bushing also has a bore E for the reception of a working implement, only the shank F of which is shown.

At the rearward end of the cylinder A is located a back head G which may be secured to the cylinder A by means of the usual side bolts (not shown) and has a passage H which conveys pressure fluid from a suitable source of supply to the tool. The back head G is further provided with an exhaust port J which may lead to the rearward end of the tool for exhausting fluid to the atmosphere.

In accordance with the present invention, an inlet plug K is disposed concentrically within the piston chamber B and has a flange L at its rearward end seated in a bore O at the rearward end of the piston chamber B. The inlet plug K has a central passage P which extends to a point near the front end of said plug. Ports Q are preferably formed at the front end of the passage P for the eduction of pressure fluid from the said passage.

In the piston chamber B is a reciprocatory hammer piston R for delivering blows against the working implement F. The piston R in this instance is of uniform external diameter and has a central bore S which cooperates slidably with the outer surface of the inlet plug K, and which bore terminates at its front end in a chamber T of somewhat larger diameter than the bore S.

Preferably at the front end of the chamber T are formed radial ports U for admitting pressure fluid from said chamber into an inlet passage V leading to the rearward end of the cylinder A.

Formed in the piston R are a plurality of passages W which, when the piston occupies its extreme forward position, register at the rearward ends with the supply ports Q. The passages W open at their front ends into the front end of the piston chamber B to admit pressure fluid thereto for impelling the piston R rearwardly.

Suitable means are provided for exhausting the fluid utilized for actuating the piston from the ends of the piston chamber B. These means in the present instance consist of an exhaust plug X disposed concentrically with respect to the inlet plug K into which it extends. The exhaust plug X, like the inlet plug K, also has a lateral flange Y which seats on the flange L of the inlet plug K with its forward face and at its rearward end is seated in the back head G for centralizing the said back head with respect to the cylinder A. The diameter of the stem Z of the exhaust plug X is somewhat smaller than that of the passage P to permit a free flow of pressure fluid through the passage P to the front end thereof.

In the exhaust plug X is formed a longitudinal passage *b* which registers with the passage J in the back head G and extends to a point near the front end of the plug X. Preferably adjacent the front end of the passage *b* are formed exhaust ports *c* which register with ports *d* in the inlet plug K, said ports *c* and *d* being controlled by the piston R.

A suitable escape for pressure fluid from

the chamber T is provided in the form of a passage *e* which leads from a point near the front end of the piston chamber B rearwardly and opens into the chamber B at a point substantially in the same transverse plane as the exhaust ports *c* and *d*.

As will be observed, the stem Z of the exhaust plug X is provided with suitable bosses *f* adjacent the exhaust ports *c* to seal the said exhaust ports *c* against communication with the passage P. The outer ends of the bosses *f* will thus lie snugly against the wall of the passage P and tend to stiffen the inlet plug K against the effects of vibration.

The operation of the device is as follows: With the piston in its extreme rearward position illustrated in Figure 1, pressure fluid may pass through the ports Q into the chamber T, thence through the ports U in the piston and the inlet passages V into the rearward end of the cylinder. Such pressure fluid admitted into the rearward end of the cylinder, together with the fluid in the chamber T, will impel the piston forwardly to strike against the working implement F. As the piston R approaches its extreme forward position, the rearward end of the piston will uncover the exhaust ports *d* to permit the exhaust of pressure fluid from the rearward end of the cylinder through the said exhaust ports *d* and the passage *b* to the atmosphere. At the same time the ports U in the piston will be in registry with the passage *e* and the pressure fluid in the chamber T will then be exhausted through these channels into the rearward end of the cylinder and, passing over the rearward end of the piston, will flow through the passage *b* to the atmosphere, together with the exhaust fluid from the rearward end of the cylinder.

Moving of the piston into the forward position described will carry the rearward ends of the passages W into registry with the supply ports Q, thus permitting a supply of pressure fluid to flow into the pocket C to act against the front surface of the piston for reversing the travel of the piston. Such pressure fluid in the front end of the cylinder by expanding will move the piston again to its initial position. In this position the rearward ends of the passages W will be in registry with the exhaust ports *d* and the fluid in the front end of the cylinder may then exhaust through the said passages W, the ports *d* and the passage *b* to the atmosphere, thus completing the cycle of operations.

As will be observed the exterior of the cylinder A is of substantially cylindrical shape, thus enabling the tool to be disposed in a pipe or other similar device whereby it may be guided and supported. This, as well as the method of exhausting the fluid from the cylinder, is particularly advantageous when a tool of the type described is used for submarine drilling or for other similar work in which it is essential that precautions be taken to prevent the admission of water or foreign matter into the drill.

Although the inlet passage H and the exhaust passage J extend only to a point slightly rearwardly of the percussive element of the tool, it will readily be understood that these passages may be extended to any suitable point rearwardly of the tool, either through the body of the tool or through suitable connections leading thereto.

I claim:

1. A fluid actuated percussive tool, comprising a cylinder having an inlet passage leading to one end thereof, a reciprocatory piston in the cylinder having a chamber, a hollow inlet plug extending into the chamber constantly associated with a supply of pressure fluid, said inlet plug and piston having ports communicable for intermittently admitting pressure fluid into the chamber and through the inlet passage to one end of the cylinder, passages in the piston for conveying pressure fluid to the other end of the cylinder, and a hollow exhaust plug in the inlet plug for conveying exhaust fluid from the cylinder.

2. A fluid actuated percussive tool, comprising a cylinder having an inlet passage leading to one end thereof, a piston in the cylinder having a chamber, a hollow inlet plug extending into the chamber intermittently admitting pressure fluid into the chamber and through the inlet passage for actuating the piston in one direction, passages in the piston intermittently registering with the inlet plug for supplying pressure fluid to the other end of the cylinder for actuating the piston in the opposite direction.

3. A fluid actuated percussive tool, comprising a cylinder having an inlet passage leading to one end thereof, a piston in the cylinder having a chamber, a hollow inlet plug extending into the chamber intermittently admitting pressure fluid into the chamber and through the inlet passage for actuating the piston in one direction, passages in the piston intermittently registering with the inlet plug for supplying pressure fluid to the other end of the cylinder for actuating the piston in the opposite direction, and a hollow exhaust plug in the inlet plug for conveying exhaust fluid from the cylinder.

4. A fluid actuated percussive tool, comprising a cylinder having an inlet passage leading to one end thereof, a piston in the cylinder having a chamber, a hollow inlet plug extending into the chamber intermittently admitting pressure fluid through the chamber into the inlet passage for actuating the piston in one direction, passages in the piston intermittently registering with the inlet plug for supplying pressure fluid to the other end of the cylinder for actuating the piston in the opposite direction, a hollow exhaust plug in

the inlet plug for conveying exhaust fluid from the cylinder, and a passage in the cylinder for conveying exhaust fluid from the chamber to the discharge plug.

5. A fluid actuated percussive tool, comprising a cylinder having an inlet passage leading to one end thereof, a reciprocatory piston in the cylinder having a chamber, a hollow inlet plug extending into the chamber having supply ports for intermittently admitting pressure fluid into the chamber, ports in the piston adapted to register with the chamber and the inlet passage to admit pressure fluid to one end of the cylinder, a hollow exhaust plug in the inlet plug, and a passage in the piston registering with the supply ports for admitting pressure fluid to the other end of the cylinder and with the exhaust plug for exhausting such fluid to the atmosphere.

6. A fluid actuated percussive tool, comprising a cylinder having an inlet passage leading to one end thereof, a reciprocatory piston in the cylinder having a chamber, a hollow inlet plug extending into the chamber having supply ports for intermittently admitting pressure fluid into the chamber, ports in the piston affording communication between the chamber and the inlet passage to admit pressure fluid to one end of the cylinder, a hollow exhaust plug in the inlet plug, passages in the piston registering with the supply ports for admitting pressure fluid to the other end of the cylinder and with the exhaust plug for exhausting such fluid to the atmosphere, and a passage in the cylinder for conveying exhaust fluid from the chamber to the exhaust plug.

7. A fluid actuated percussive tool, comprising a cylinder having an inlet passage leading to the rearward end thereof, a reciprocatory piston in the cylinder having a chamber, a hollow inlet plug extending into the chamber having supply ports for intermittently admitting pressure fluid into the chamber, ports in the piston affording communication between the chamber and the inlet passage for admitting pressure fluid to the rearward end of the cylinder, a hollow exhaust plug in the inlet plug having exhaust ports controlled by the piston, passages in the piston registering with the supply ports for admitting pressure fluid to the front end of the cylinder and with the exhaust ports for exhausting such fluid from the front end of the cylinder, and a passage in the cylinder for conveying exhaust fluid from the chamber to the exhaust plug.

In testimony whereof I have signed this specification.

GEORGE W. HULSHIZER.