

April 5, 1932.

G. C. PEARSON

1,852,724

FLUID OPERATED TOOL

Filed Oct. 4, 1930

5 Sheets-Sheet 1

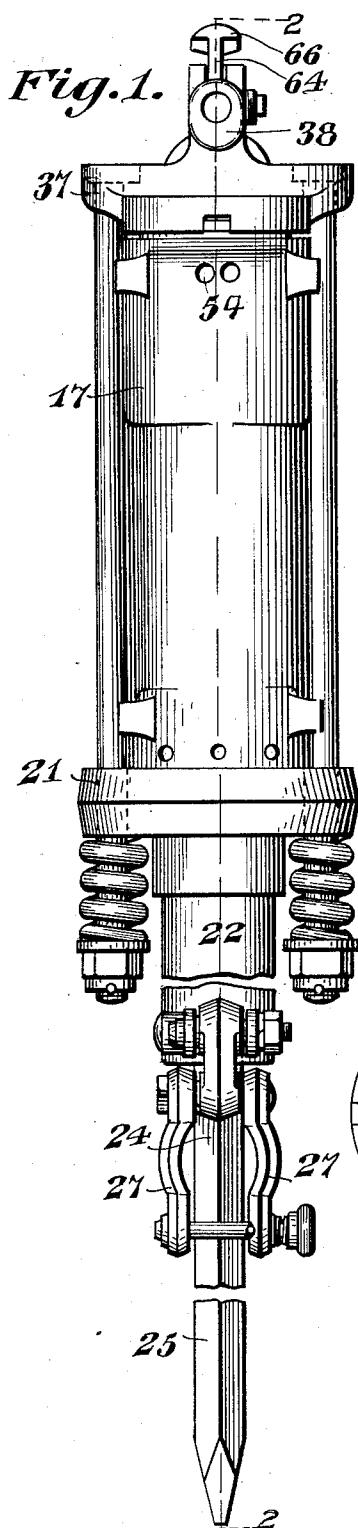


Fig. 6.

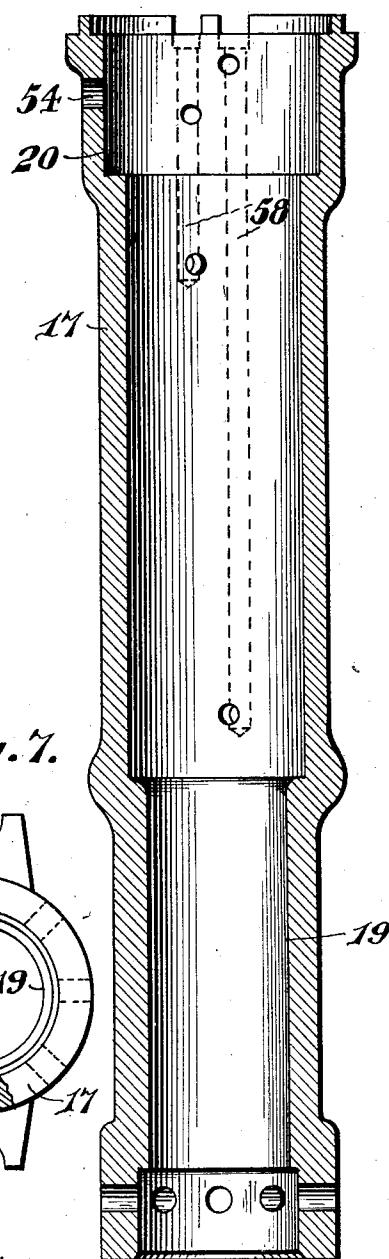
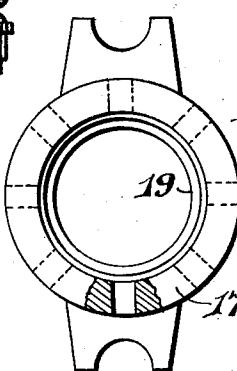


Fig. 7.



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By

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5 Sheets-Sheet 2

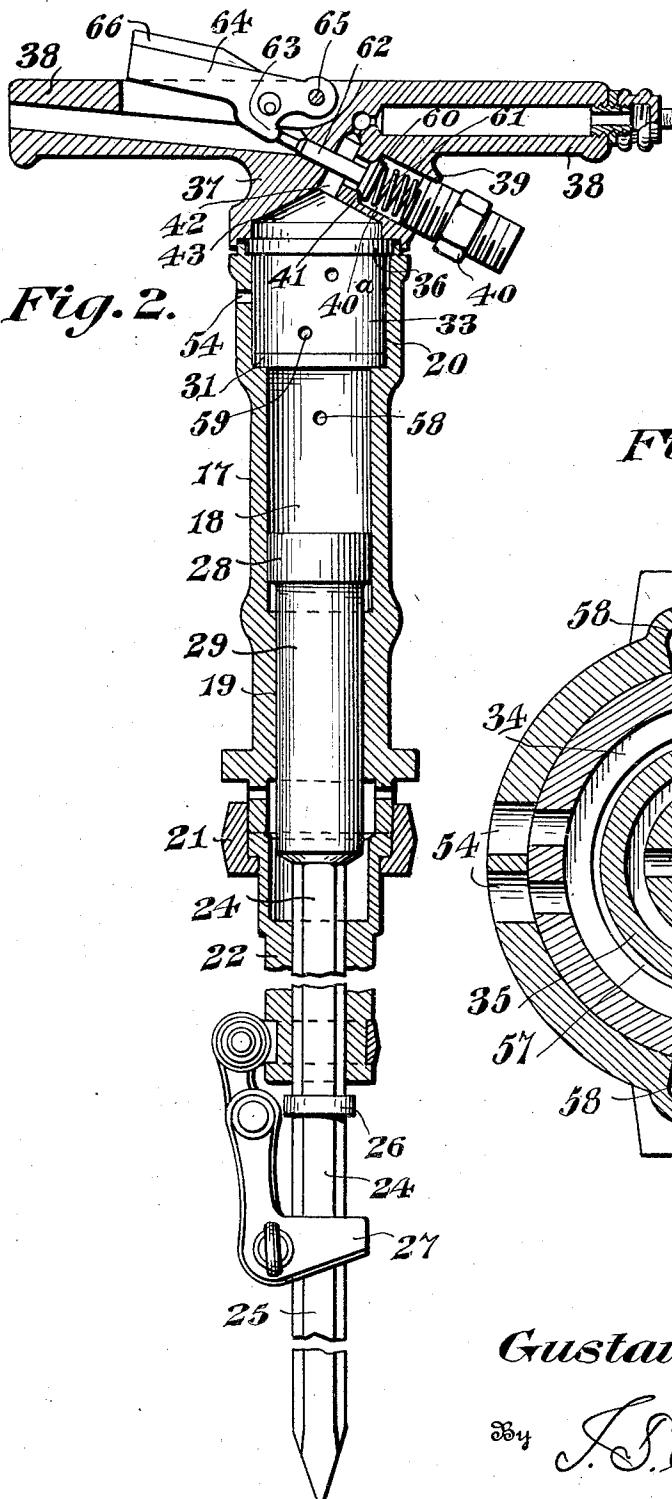
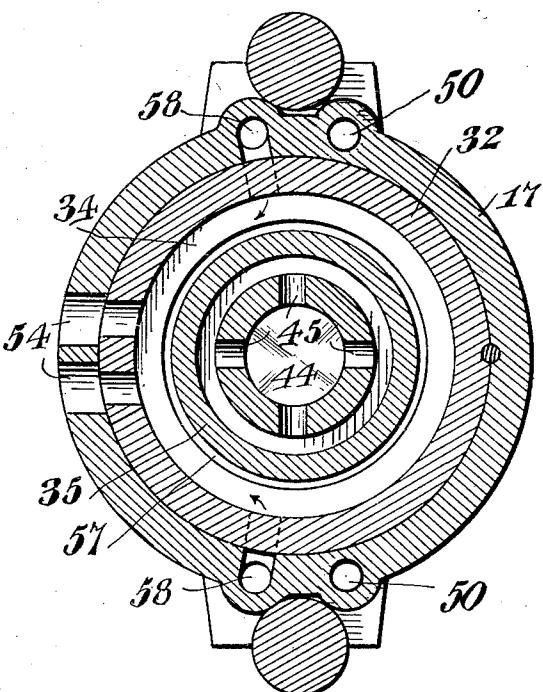


Fig. 2.

Fig. 5.



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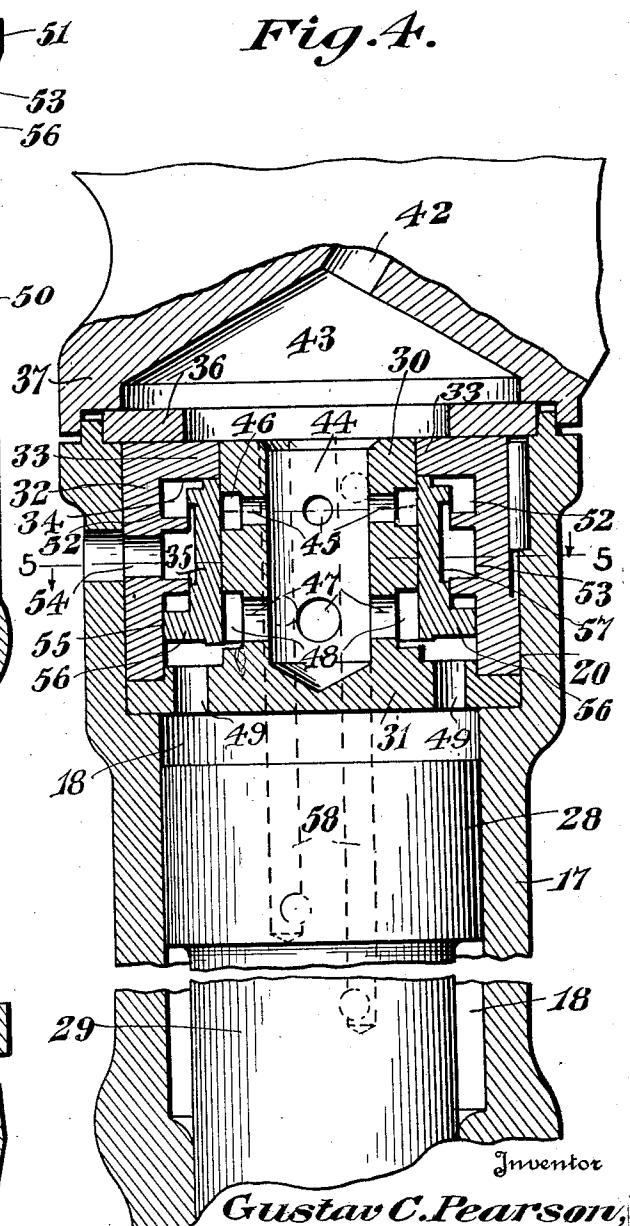
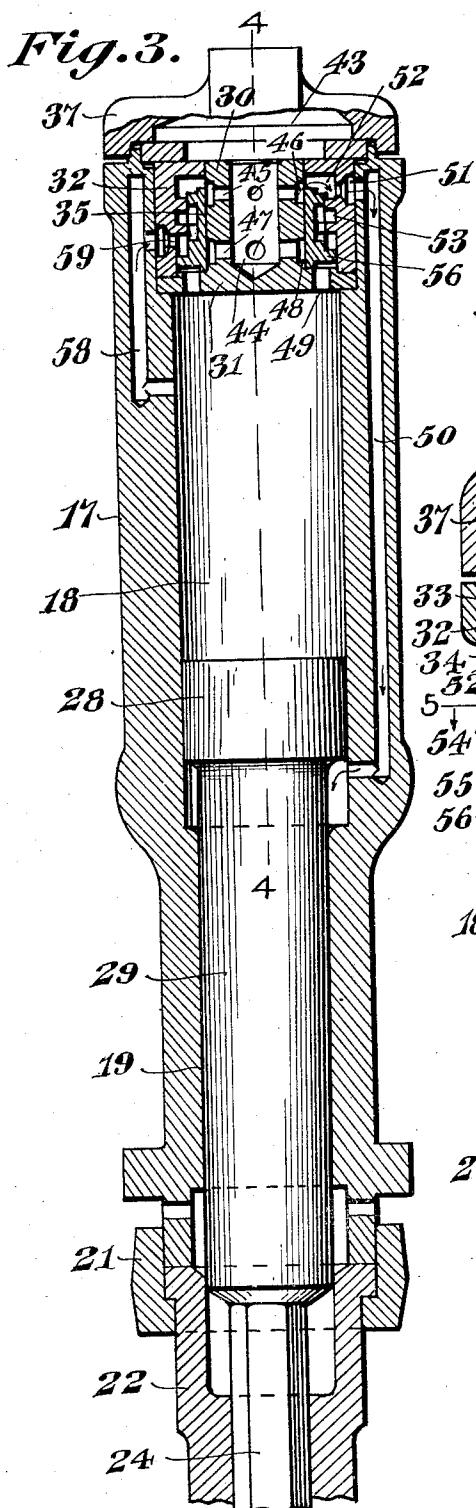
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5 Sheets-Sheet 3



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Fig.14.

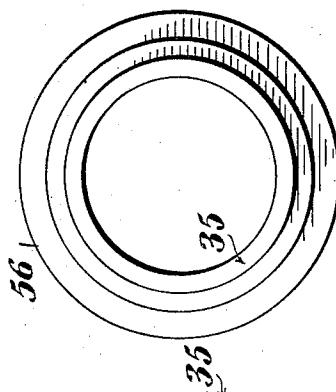


Fig.13.

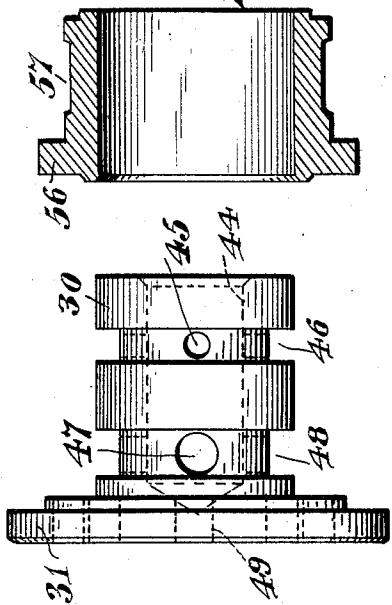


Fig.9.

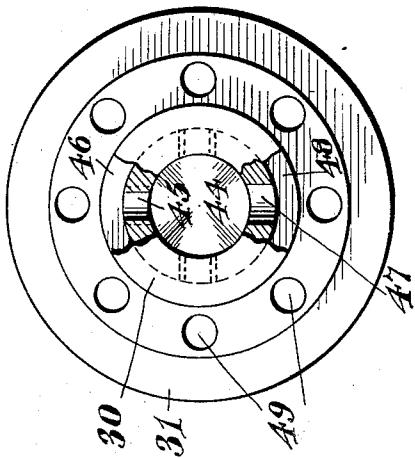


Fig.12.

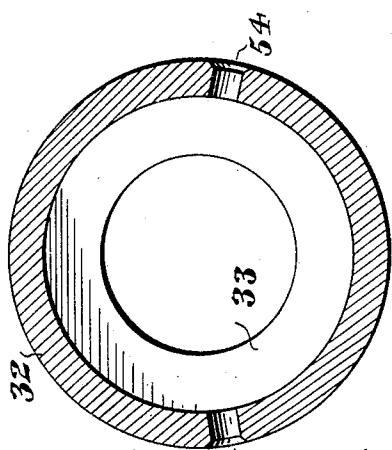


Fig.11.

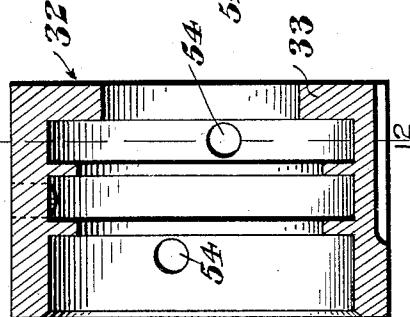
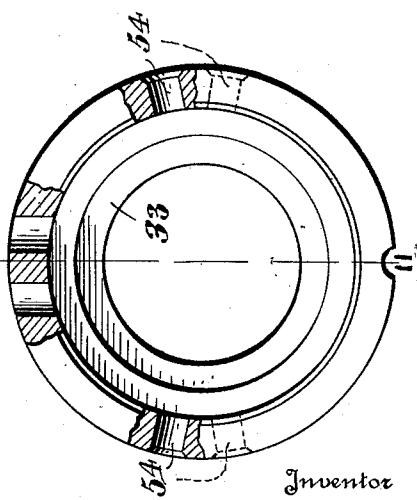


Fig.10.



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Fig. 15.

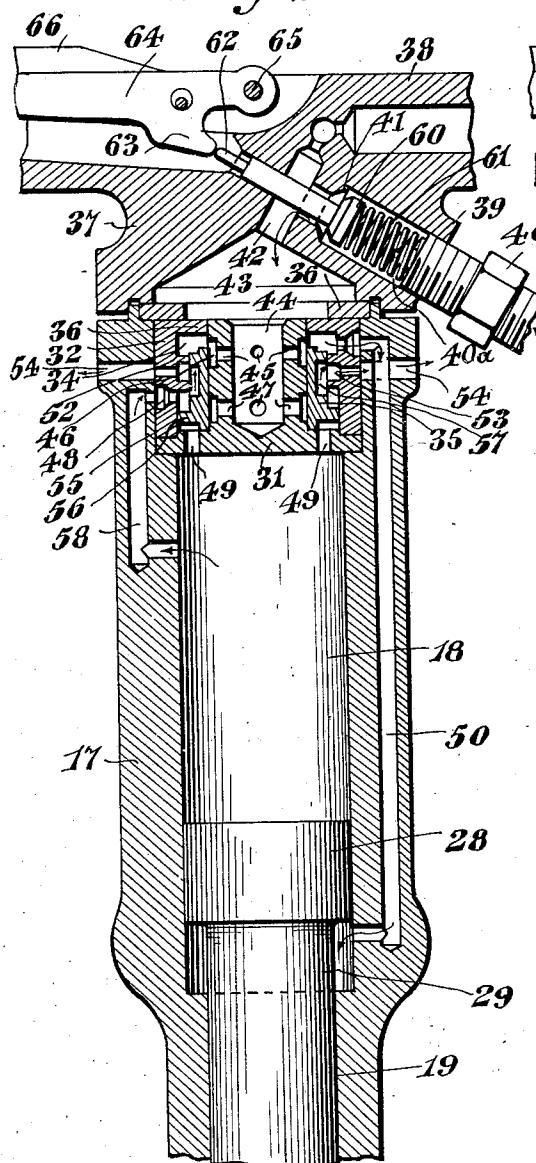
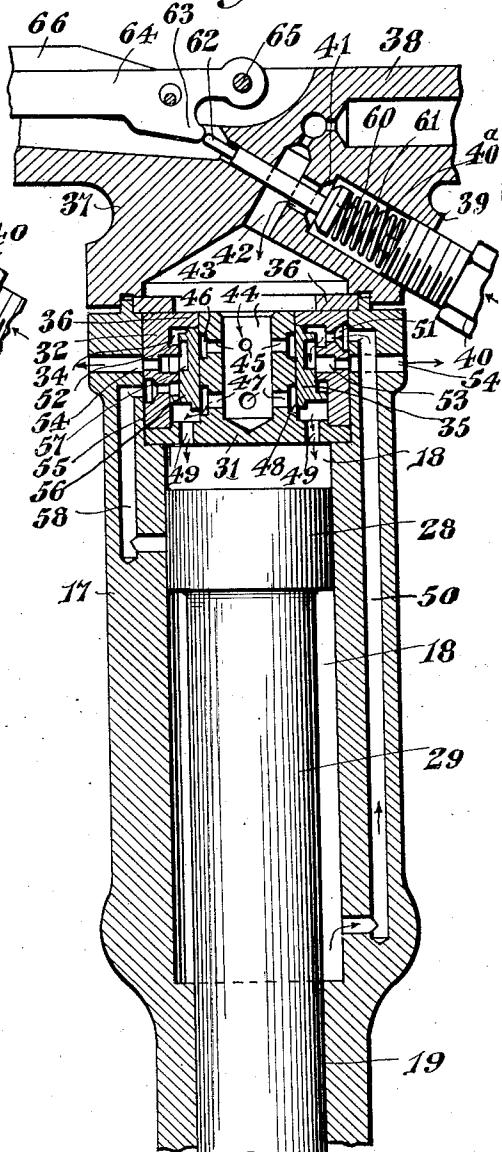


Fig. 16.



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UNITED STATES PATENT OFFICE

GUSTAV C. PEARSON, OF DENVER, COLORADO, ASSIGNOR TO GARDNER-DENVER COMPANY, OF DENVER, COLORADO, A CORPORATION OF DELAWARE

FLUID OPERATED TOOL

Application filed October 4, 1930. Serial No. 486,306.

The present invention has relation more particularly to a hammer tool for automatically striking a single blow; a succession of blows requiring the manual operation of a control by the operator of the tool. It is particularly adapted for breaking up small bodies of ore or the like, permitting its removal from mines. It is the usual practice to deliver the material to a "grizzly" or screen through which it passes to the mine car. Obviously rocks or lumps of a size too great to pass through the screen or grizzly will lodge therein and it is the custom for a workman to break these chunks with a sledge hammer into pieces small enough to pass through the screen. The present invention is applicable for this purpose of breaking the rock and it has been found it will strike a much harder blow than can be delivered by a sledge, and without the manual labor necessary to operate the latter. It is, of course, useful in other relations.

The principal object, therefore, of the present invention is to provide a novel and effective tool of this character and for such purposes as above outlined.

A further and important object is to provide a novel, simple and effective distributing valve mechanism peculiarly useful for the defined purposes, but also applicable quite generally to fluid actuated tools.

In the accompanying drawings Figure 1 is a view in elevation of the preferred embodiment of the invention.

Figure 2 is a longitudinal sectional view on the line 2-2 of the Figure 1 showing the valve chest in elevation.

Figure 3 is a longitudinal sectional view at right angles to Figure 2, on an enlarged scale and including in the section the distributing valve.

Figure 4 is a sectional view on the line 4-4 of Figure 3.

Figure 5 is a sectional view on the line 5-5 of Figure 4.

Figure 6 is a longitudinal sectional view through the cylinder member alone.

Figure 7 is a lower end view of the same.

Figure 8 is a view in rear elevation of the plug member.

Figure 9 is a side elevation of the same.

Figure 10 is an end view of the valve chest, parts being broken away.

Figure 11 is a longitudinal sectional view on the line 11-11 of Figure 10.

Figure 12 is a sectional view on the line 12-12 of Figure 11.

Figure 13 is a longitudinal sectional view through the distributing valve.

Figure 14 is an end elevation of said valve.

Figure 15 is a longitudinal sectional view through the tool, diagrammatic in its character and illustrating the relation of the parts on the initiation of operation of the tool.

Figure 16 is a view similar to Figure 15 but showing the tool when the piston is at the beginning of its working or downward structure.

In the embodiment disclosed a cylinder member is employed that is in the form of a barrel 17. This barrel has a longitudinal bore that forms a piston chamber 18. The front end of said bore is reduced as shown at 19, while the rear end portion of the bore is enlarged or counter-bored as shown at 20. Coupled to the front end of the barrel 17 by a collar 21 is a chuck 22 designed to receive the hexagonal or other shaped shank 24 of a breaking steel or tool 25. As shown this steel has a collar 26 located behind a tool retainer 27 which allows the tool or steel to have a limited longitudinal movement in the chuck while preventing its complete disengagement therefrom.

A piston 28 is mounted to reciprocate in the piston chamber 18 and has a forward reduced hammer extension 29 operating in the portion 19 of the barrel, said hammer extension being adapted to strike the rear end or shank 24 of the breaking steel.

The counter-bore 20 contains a distributing valve. A cylindrical plug forming a valve support and designated 30 is located longitudinally in the counter-bore and is of smaller diameter than the same. This plug has at its lower end a flange or head 31 that snugly fits into the lower end of the counter-bore 20. Fitted into said counter-bore above the flange 31 and bearing against its margin is a valve chest sleeve 32 which extends to the

rear end of the counter-bore. The internal diameter of this chest is greater than the external diameter of the plug 30 except at its upper end where said chest has an internal flange 33 snugly fitted to the upper end of the plug 30. The space formed between the plug and chest constitutes a valve chamber 34. In this chamber is a reciprocatory tubular distributing valve 35 sliding on the plug 30 and on the interior of the chest. 5
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distributing ports 49, so that the motive fluid which enters the bore 44 of the plug 30 now gains access to the upper end of the piston chamber 18 and operating on the upper end of the piston drives it downwardly on its working stroke. The fluid in advance of the piston escapes through the distributing passageway 50, ports 51, grooves 52, 57, and 53 to the exhaust port 54 and thence to atmosphere—all as indicated in Figure 16. When the piston 28 delivers its blow, the piston chamber 18 above it is, of course, filled with live air or other active motive fluid. The piston stops and cannot return because of this pressure upon it. Nor can the distributing valve 35 drop because this same pressure is still against its lower end including the area of the flange 56. The tool, therefore, becomes non-active. The operator now permits the throttle valve 60 to close by releasing the grip 66. When this occurs the live motive fluid is cut off from the distributing valve chamber and as the fluid under pressure in the upper end of the piston chamber 18 leaks out, the pressure therein becomes reduced so that the distributing valve 35 becomes unsupported and drops by gravity to its lowermost position. The operator can now reopen the throttle valve 60 and the above described operation will be repeated.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim, is:

1. In a fluid operated tool, the combination with a cylinder member having a piston chamber and a reciprocating piston operating in the chamber, of means including an automatic distributing valve for distributing fluid alternately to the piston chamber on opposite sides of the piston, said means automatically stalling the valve and thereby the piston at the completion of each reciprocation, and a manual valve for controlling the motive fluid supply to the distributing means.

2. In a fluid operated tool, the combination with a cylinder member adapted to be maintained in a generally upright position and having a longitudinally disposed piston chamber and a reciprocating piston operating in the chamber, of means including an automatic distributing valve for distributing fluid alternately to the piston chamber on opposite sides of the piston, said means automatically stalling the valve and thereby the piston at the completion of each downward stroke, and a manual valve for controlling

the motive fluid supply to the distributing means.

3. In a fluid operated tool, the combination with a cylinder member having a piston chamber and a piston that reciprocates in the chamber, of a distributing valve chamber, distributing passageways leading from the valve chamber to the piston chamber on opposite sides of the piston, an exhaust passageway leading from the valve chamber, a motive fluid supply passageway leading to the valve chamber, a throttle valve controlling the supply passageway, and an automatic distributing valve in the valve chamber for alternately allowing communication between the supply passageway and the distributing passageways and for connecting one of the distributing passageways to the exhaust passageway while withholding at all times communication between the other distributing passageway and the exhaust to maintain pressure in the piston chamber and against one end of the piston to thereby hold the piston until the throttle valve is closed.

4. In a fluid operated tool, the combination with a cylinder member having a piston chamber and a piston that reciprocates in the chamber, of a distributing valve chamber, distributing passageways leading from the valve chamber to the piston chamber on opposite sides of the piston, an exhaust passageway leading from the valve chamber, a motive fluid supply passageway leading to the valve chamber, a throttle valve controlling the supply passageway and an automatic distributing valve in the valve chamber for alternately allowing communication between the supply passageway and the distributing passageways and for connecting one of the distributing passageways to the exhaust passageway while withholding at all times communication between the other distributing passageway and the exhaust to maintain pressure in the piston chamber and against one end of the piston to thereby hold the piston until the throttle valve is closed, said valve having a pressure face open at all times to the end of the piston chamber in which pressure is thus maintained and such pressure acting on the face to hold the valve against further automatic movement and prevent further distribution of the fluid until the throttle valve is closed and again opened.

5. In a fluid operated tool, the combination with a cylinder member having a piston chamber and a piston that reciprocates in the chamber, said cylinder being maintained substantially vertical during the operation of the tool, a distributing valve chamber, distributing passageways leading from the valve chamber to the piston chamber on opposite sides of the piston, an exhaust passageway leading from the valve chamber, a motive fluid supply passageway

leading to the valve chamber, a throttle valve controlling the supply passageway, and an automatic distributing valve in the valve chamber for alternately allowing communication between the supply passageway and the distributing passageways and for connecting one of the distributing passageways to the exhaust passageway while withholding at all times communication between the other distributing passageway and the exhaust to maintain pressure in the piston chamber and against the upper end of the piston to thereby hold the piston in its lowermost position until the throttle valve is closed.

6. In a fluid operated tool, the combination with a cylinder member having a piston chamber and a piston that reciprocates in the chamber, said cylinder being maintained substantially vertical during the operation of the tool, a distributing valve chamber, distributing passageways leading from the valve chamber to the piston chamber on opposite sides of the piston, an exhaust passageway leading from the valve chamber, a motive fluid supply passageway leading to the valve chamber, a throttle valve controlling the supply passageway, and an automatic distributing valve in the valve chamber for alternately allowing communication between the supply passageway and the distributing passageways and for connecting one of the distributing passageways to the exhaust passageway while withholding at all times communication between the other distributing passageway and the exhaust to maintain pressure in the piston chamber and against the upper end of the piston to thereby hold the piston in its lowermost position until the throttle valve is closed, said valve having a pressure face open at all times to the end of the piston chamber in which pressure is thus maintained and such pressure acting on the face to hold the valve against further automatic movement and prevent further distributing of the fluid until the throttle valve is closed and again opened.

7. In a fluid operated tool, the combination with a cylinder member having a longitudinally disposed piston chamber and a longitudinally disposed valve chamber, the rear end of the former having direct connection with the front end of the latter, said cylinder being maintained substantially vertical during the operation of the tool, a reciprocating piston in the piston chamber, a distributing passageway leading from the valve chamber to the front end of the piston chamber, exhaust permitting means leading from the valve chamber, an exhaust passageway leading from the rear end of the piston chamber to the valve chamber, and a motive fluid supply passageway opening into the valve chamber, a throttle valve controlling the supply passageway, and an auto-

matic distributing valve in the valve chamber that is movable to a position to open the distributing passageway to the front end of the piston chamber and close the exhaust passageway from the rear end of the piston chamber and is also movable to a position to open the connection between the latter's rear end and the valve chamber and close said exhaust passageway from the rear end, said distributing valve having a pressure surface that is operated on by the motive fluid to hold the valve in its latter position and stop the piston at the bottom of its stroke.

8. In a fluid operated tool, the combination with a cylinder member having a longitudinally disposed piston chamber, a valve chamber and a reciprocating piston in the piston chamber, said cylinder being maintained substantially vertical during the operation of the tool, means for supplying motive fluid to the valve chamber, distributing passageways leading from the valve chamber to the piston chamber on opposite sides of the piston, and a distributing valve in the valve chamber for alternately directing motive fluid from the supply passageway to the distributing passageways, said valve having a pressure face operated on by motive fluid when introduced into the upper end of the piston chamber to hold the distributing valve in raised position as long as the motive fluid is supplied to the supply passageway by the open throttle valve, and thereby hold the piston at the bottom of its downward stroke under the influence of said motive fluid, and said valve gravitating to its lower position to admit motive fluid to the lower end of the piston chamber when the throttle valve is closed and motive fluid is thereby cut off from the valve chamber.

9. In a fluid operated tool, the combination with a cylinder member having a piston chamber and a piston operating therein, a valve chamber and distributing passageways leading from the valve chamber at spaced points to the piston chamber on opposite sides of the piston therein, of a plug extending into the piston chamber and having a motive fluid supply bore and lateral outlets at different points for respectively delivering motive fluid to the distributing passageways, and a distributing valve in the valve chamber and slideable on the plug to alternately establish and cut off communication between the ports and distributing passageways.

10. In a fluid operated tool, the combination with a cylinder member having a longitudinal bore, the front end portion of which constitutes a piston chamber, of a plug located in the rear end of the bore and of less diameter than the same, forming a distributing valve chamber, said plug having a supporting flange, forming a wall between the two chambers, said plug having a motive fluid supply bore with lateral ports opening

through the peripheral wall at different distances from the ends of the plug, the flange of the plug having a port outside the plug forming a distributing passageway to the 5 rear end of the piston chamber, said cylinder member also having a distributing passageway between the rear portion of the valve chamber and the front portion of the piston chamber, and a tubular valve that reciprocates on the plug and alternately closes the lateral ports therethrough.

11. In a fluid operated tool, the combination with a cylinder member having a longitudinal bore, the front portion of which constitutes a piston chamber, the rear portion of said bore being enlarged, of a plug in said enlarged portion and of less diameter than the same, the front end of said plug having a flange that substantially fits the front end of 15 the enlarged portion, a valve chest sleeve fitted into the enlarged portion of the bore behind the flange and having a bore of greater diameter than the plug, said flange having a port therethrough outside the plug for directing 20 motive fluid to the rear end of the piston chamber, a distributing passageway leading from the rear portion of the valve chest to the front portion of the piston chamber, said plug having a motive fluid supply bore and 25 lateral ports opening through the plug within in the front and rear portions of the valve chest, and a tubular valve that is mounted to reciprocate in the plug and alternately open and close the lateral ports to thereby alter- 30 nately supply and cut off the motive fluid to the flange port and to the distributing pas- 35 sageway.

In testimony whereof, I affix my signature.
GUSTAV C. PEARSON.

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