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[54] **PRESSURE FLUID OPERATED PERCUSSION TOOL**
17 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **173/73,** 173/78, 173/137
[51] **Int. Cl.** **E21b 1/00,** E21b 5/00
[50] **Field of Search** 173/73, 78, 135, 137; 175/92

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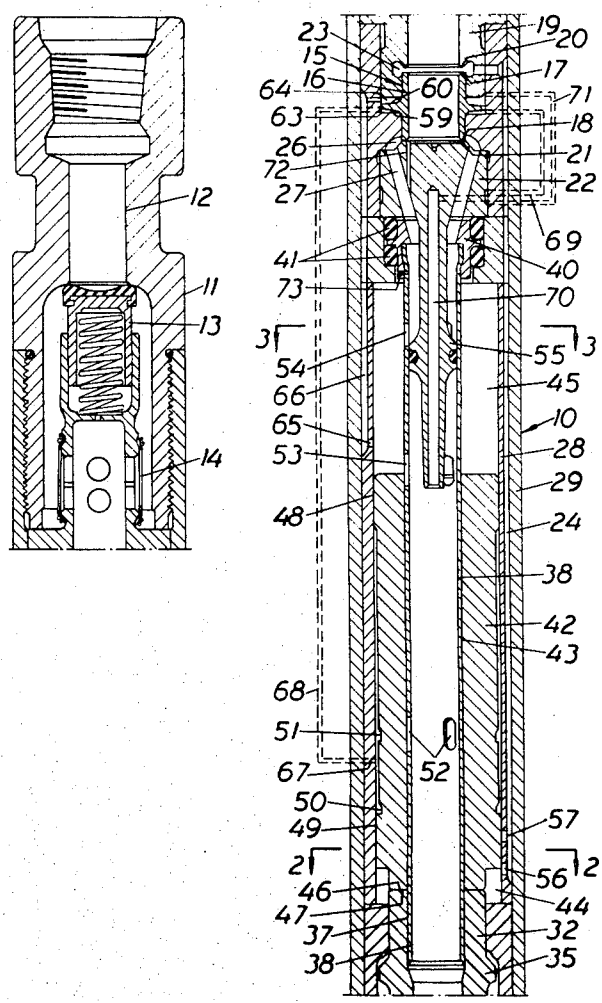
ABSTRACT: In a down-the-hole percussion drill, the exhaust power fluid is used as a flushing fluid during drilling. When the drill is suspended off bottom, the drill bit and with it the hammer piston drops into an exceptional forward position so that drilling ceases automatically and an uninterrupted blowing with fluid starts under full line pressure. The passages for supplying fluid for providing the power strokes of the hammer piston during drilling are used for conveying air for this blowing.



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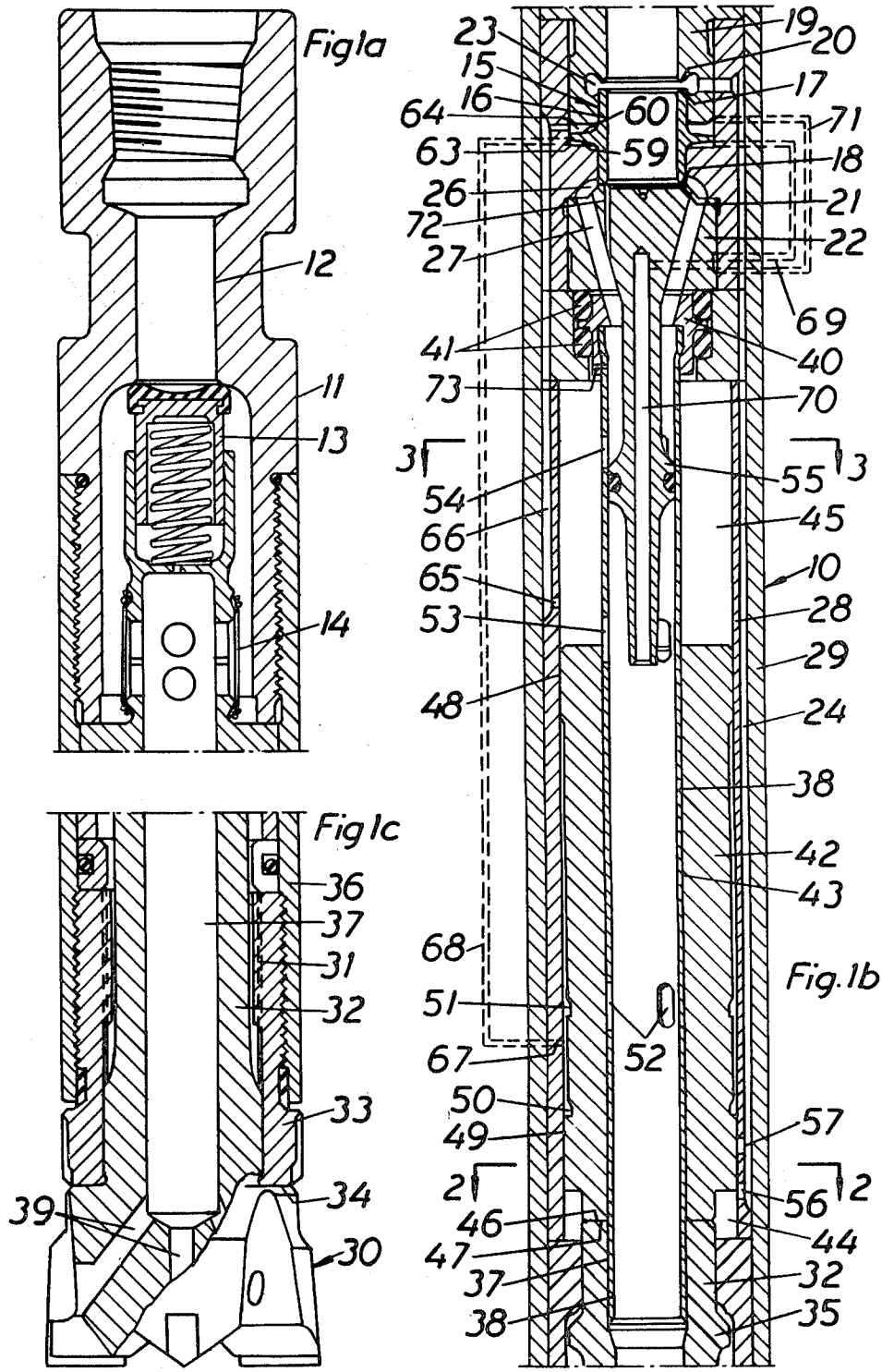

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Fig. 4

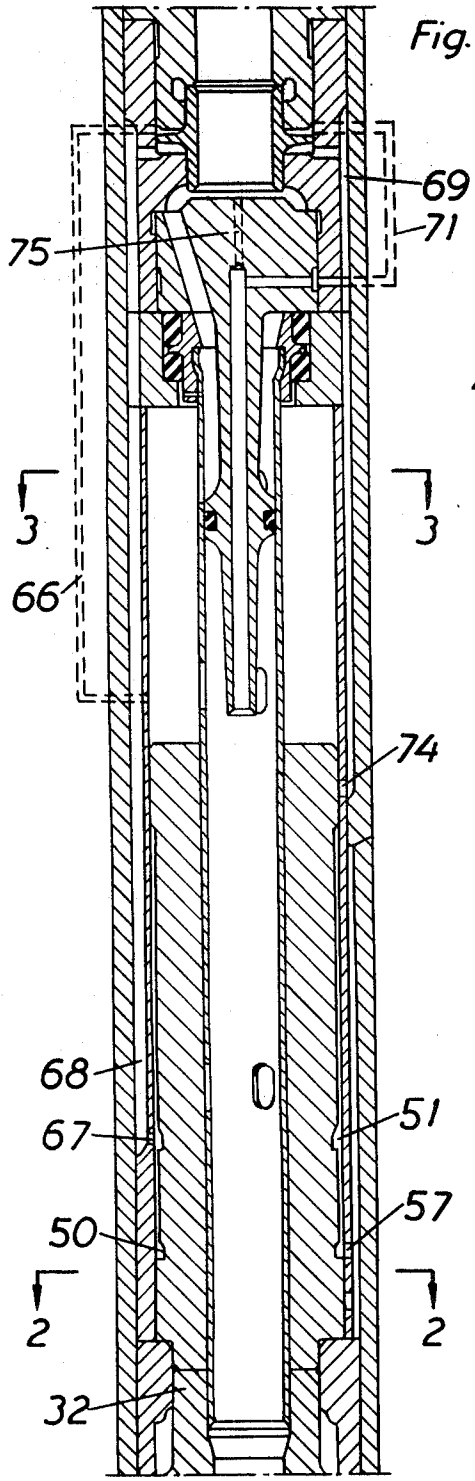


Fig. 3

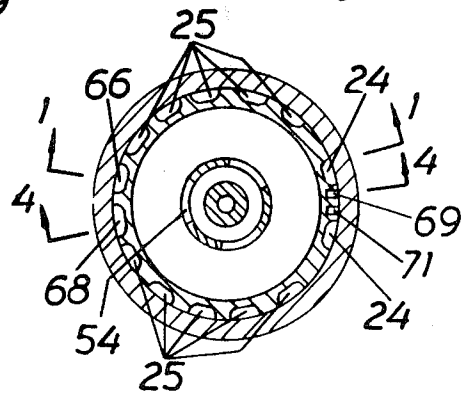
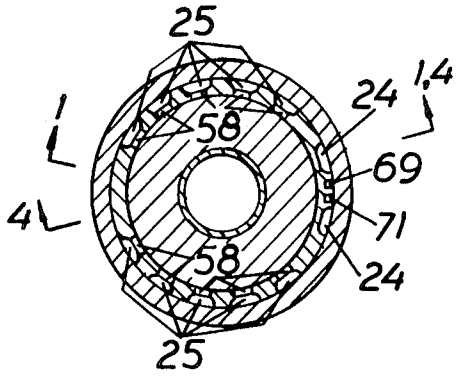


Fig. 2



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PRESSURE FLUID OPERATED PERCUSSION TOOL

This invention relates to pressure fluid operated percussion tools and more particularly to pneumatically operated percussive down-the-hole rock drills, so-called because the are adapted to be inserted into the hole being drilled. Usually, the exhaust fluid is used as a flushing fluid during drilling. It is, however, sometimes desirable that drilling be interrupted and a continuous increased flow of flushing fluid under full line pressure be provided to cleanse the bore hole from earth cutting. In a prior form of a down-the-hole drill, passages are used which are utilized exclusively for this uninterrupted flow. Since the major diameter of a down-the-hole drill is limited, these passages will reduce the area available for the hammer piston of the drill, and the percussion effect of the drill will be reduced. In another prior form, the passages for supplying fluid to provide the return strokes of the hammer piston are used also for such a continuous flow. Usually, these passages are long and have sharp knees and do not permit such a large flow as do the passages for providing the power strokes of the hammer piston. If the passages for providing the return strokes are widened, the area available for the hammer piston will be reduced.

It is an object of the invention to provide a percussion tool which will permit the introduction of a continuous and large flow of air under full line pressure into the bore hole for removing cuttings. Another object is to provide a pressure fluid operated down-the-hole percussion drill which has an improved pressure fluid distributing valve assembly.

Other objects will be obvious from the following description and claims in which a percussion tool according to the invention is described with reference to the accompanying drawings by way of example. In the drawings:

FIG. 1*a*, 1*b* and 1*c* are to be seen together as longitudinal section on the lines 1–1 in the FIGS. 2 and 3 of a down-the-hole drill, FIG. 1*a* being the upper (rear) portion of the drill, FIG. 1*b* being the middle portion, and FIG. 1*c* being the lower (forward) portion.

FIG. 2 is a cross section on the lines 2–2 in the FIGS. 1*b* and 4.

FIG. 3 is a cross section on the line 3–3 in FIGS. 1*b* and 4.

FIG. 4 is a longitudinal section of the medium portion taken partly on the line 4–4 in FIG. 3 and partly on the line 4–4 in FIG. 2.

The down-the-hole drill illustrated in the figures has a housing generally indicated with **10**. A backhead **11** of the housing is adapted to be screwed onto the lower end of a nonillustrated drill pipe. During drilling, the drill pipe transmits rotation and axial pressure to the drill and also supplies the drill with compressed air. The interior of the backhead **11** forms a portion of an air inlet passage **12** in which a spring biased one-way valve **13** is disposed. Downstream of the valve **13**, there is an annular strainer **14** and a valve assembly **15** with an annular valving element or valve **16**. This valve **16** has two annular end surfaces **17** and **18**. The interior of the valve **16** is supplied with compressed air through a portion of the air inlet passage **12** in an upper seat member **19** which has an annular seat **20**. When the valve **16** is in its lower position (FIG. 1*b*) with its end surface **18** against an annular seat **21** on a lower seat member **22**, compressed air is supplied to an annular air-distributing chamber **23** and from there to a number of passages **24**, **25**. When the valve **16** is in its upper position with the end surface **17** against the seat **20** as illustrated in FIG. **4**, compressed air is supplied to an annular air distributing chamber **26** and from there to a number of passages **27**. A tubular liner **28** forms part of the housing **10** and seals against a tubular outer housing member or casing **29** so that longitudinal grooves in the liner **28** form a number of passages among which are the passages **24**, **25**.

At the forward downwardly end of the drill there is a drill bit **30** (FIG. 1*c*). The drill bit **30** has a splined portion **31** on its shank **32** cooperating with a splined portion of a bit holding sleeve **33** so that rotation between the bit **30** and the housing **10** is prevented, but axial movement, permitted. The drill bit **30** is slidable between a retracted drilling position in which an annular shoulder of the drill bit abuts the forward end surface of the sleeve **33** and a forward position in which a flange **35** on the shank **32** abuts a split retainer ring **36**. The bit **30** has a central longitudinal bore **37** into which an exhaust tube **38** extends with its forward end with a sliding fit to provide a passage from the exhaust tube to the bore in the bit. Flushing passages **39** lead from the bore **37** to the forward end of the bit **30**. The exhaust tube **38** has a flanged member **40** at its upper end and is fastened by means of this flange member which is clamped between two elastic rings **41**.

A hammer piston **42** with an axial bore **43** is reciprocable in the liner **28** and divides the working cylinder **44**, **45**—formed by the liner—into a forward working chamber **44** in front of the hammer piston **42** and a rear working chamber **45** has the back of the hammer piston **42**. The hammer piston **42** has a forward striking surface **46** with which it strikes the end surface **47**—the anvil surface —of the shank **32**. AT each end, the hammer piston **42** has a cylindrical surface **48**, **49** in a sliding fit with the liner **28**. Between these two sliding surfaces **48**, **49**, the external diameter of the hammer piston **42** is preferably about 0.2 mm less than the diameter at the sliding surfaces **48**, **49**. There are also two deeper annular grooves **50**, **51** in the piston. Although, in the figures, the entire bore **43** in the piston is shown in a sliding fit with the exhaust tube **38**, the middle portion of the hammer piston may have an internal diameter slightly larger than the internal diameter of the end portions.

There are forward **52** and rear **53** exhaust ports in the exhaust tube **38** so disposed that the hammer piston **42** opens the rear ports **53** to exhaust air from the rear working chamber **45** when in forward positions but shuts these ports off in other positions, and opens the forward ports **52** to exhaust air from the forward working chamber **44** when in rear positions but shuts these ports off when in other positions.

The passages **27** lead into the rear (upper) end of the exhaust tube **38**, and supply ports **54** connect the interior of the exhaust tube **38** with the rear working chamber **45**. The valve **16** and the supply ports **54** are bypassed by narrow passages **72**, **73** which ensures starting in case the hammer piston **42** covers the supply ports **54** before starting as may be the case when drilling upward directed holes. The lower seat member **22** extends into the exhaust tube **38** and has a portion **55** which shuts off the tube **38** between the supply ports **54** and the rear exhaust ports **53**. The passages **24**, **25** lead to ports **56**, **57**, **58** in the forward portion of the linear **28**. The two passages **24** lead to start ports **56** and to connection ports **57** and the passages **25** lead to main ports **58**.

The valve **16** has a flange with two piston surfaces **59**, **60**. The flange **59**, **60** divides a chamber **63**, **64**, in which it slides with a sliding fit, into a first control chamber **63** and a second control chamber **64**. A control port **65** and a control passage **66** (illustrated in a section in FIG. 1*b* and schematically by dotted lines in FIG. 4) connect the upper control chamber **64** with the rear working chamber **45** when the hammer piston **42** holds this control port **65** open. Another control port **67** and another control passage **68** (illustrated in a section in FIG. **4** and schematically by dotted lines in FIG. 1*b*) connect the lower control chamber **63** with a forward working chamber **44** when the hammer piston **42** holds this control port **67** open.

The control chamber **63** is vented to the exhaust tube **38** by means of a venting passage **69** (illustrated in a section in FIG. **4** and schematically by dotted lines in FIG. 1*b*) and a central passage **70** in the extended portion of the lower seat member **22**. The control chamber **64** is vented by means of a similar venting passage **71** (illustrated in a cross section in FIG. **3** and schematically by dotted lines in FIGS. 1*b*, **4**) and the passage **70**. The venting passages **69**, **71** are narrower than the control ports and passages **65**—**68**. The lower seat member **22** is extended below the exhaust ports **53**, and some suction in the passage **70** will result from the air exhausted through these ports **53**. If this extension of the seat member **22** is omitted,

this exhaust air may have a detrimental effect on the venting of the control chambers **63, 64**. Direct venting of the control chambers **63, 64** to the outside of the casing **29** is avoided because mud and dirt would easily clog in the venting passage and because, when the drive air is off and the drill is in a water filled hole, water and mud would completely fill the drill notwithstanding the one-way valve **13** is closed. The venting passage **69** is used also for venting the space between the liner **28** and the smaller diametered middle portion of the hammer piston **42** by means of a port **74**. This venting is essential for the operation when there are increased clearance gaps between the sliding surfaces **48, 49** and the liner **28** because of wear.

In operation, the drill is suspended at the end of the nonillustrated drill pipe and air is supplied to the backhead **11** of the drill through the drill pipe. During drilling, the drill is rotated by means of external rotation means rotating the drill pipe, and axial pressure is supplied to the drill so that the drill bit is pressed against the bottom of the hole. The drill bit is, therefore, in its retracted position —the drilling position —as illustrated in the figures **1***b*, **1***c*.

In FIG. **1***b*, the hammer piston is illustrated at the moment of a power stroke (forward stroke) when it strikes the anvil surface **47** of the bit **30**. The hammer piston **42** rebounds and, thus, the bit **30** limits the power stroke of the hammer piston. The valve **16** has the position illustrated in FIG. **1***b* and compressed air is supplied through the passages **24, 25** and the ports **56, 57, 58** into the forward working chamber **44** so as to return hammer piston **42**.

As will be described, the valve **16** remains in its position until the hammer piston **42** uncovers the control port **67** during its return stroke and compressed air is supplied from the forward working chamber **44** to the control chamber **63** so that the air pressure upon the piston surface **59** moves the valve into the position illustrated in FIG. **4**.

The high pressure in the control passage **68** is of short duration because just after the control port **67** has been uncovered, the exhaust ports **52** are also uncovered by the hammer piston. Because of the air pressure upon the end surface **18**, however, the valve **16** remains in its position of FIG. **4** until the control port **65** is uncovered during the following power stroke. Compressed air is now, at this stage of the return stroke, supplied to the rear working chamber **45** through the passages **27** and the inlet ports **54**. However, the hammer piston **42** proceeds in its return movement because of its momentum until it covers the inlet ports **54** and the air in the closed cushion chamber, now formed at the rear of the hammer piston **42**, stops the hammer piston and urges it forwards because of the stored energy. The port **54** is again uncovered, and the compressed air supplied to the rear working chamber **45** accelerates the hammer piston.

Before the hammer piston **42** strucks the bit, it uncovers the control port **65**, and the high pressure from the rear working chamber **45**, transmitted through the control passage **66** to the control chamber **64**, influences the piston surface **60** to shift the valve **16** into the position illustrated in FIG. **1**.

The pressure rise in the control chamber **64** is very short lasting because the hammer piston also uncovers the exhaust ports **53**, but, when the valve **16** once has shifted into this position, it remains there because of the air pressure upon the end surface **17** until there is another pressure pulse through the control passage **68**.

Whenever during drilling, the drill is raised off the bottom of the borehole or the bit advances much faster than the drill pipe, the bit **30** drops until the retainer ring **36** prevents additional downward movement. When the bit **30** drops, the hammer piston **42** tends to overtravel its normal forward stroke limit which is defined by the anvil surface **47** of the bit **30** in the retracted position. When the hammer overtravels, the groove **51** will be in communication with the control port **67** at the same time as the groove **50** is in communication with the connection ports **57** (FIG. **4**) . Since the valve **16** shortly before has taken up its position of FIG. **1** when the port **65** was uncovered, there is compressed air in the passages **24**, and the two grooves **50, 51** and the clearance space in between the grooves transmit compressed air from the passages **24** to the control passage **68**, and so the valve **16** shifts back to the position of FIG. **4**. Now, compressed air blows through the passages **27**, the ports **54**, the rear working chamber **45**, the ports **53**, the exhaust tube **38**, the passage **37** in the bit, and the flushing passages **39**. Since the control port **65** is uncovered, the air pressure in the rear working chamber now tends to shift the valve **16**. However, as soon as the valve **16** moves only a little from its seat **20**, compressed air is supplied to the passages **24** and from there via the grooves **50, 51** in the hammer piston to the control passage **68**, and the valve **16** returns to its seat **20**. This movement of the valve **11** will take place for instance once every second. Thus, there is an uninterrupted hard air blow which cleanses the bore hole from cuttings and mud.

When the bit **30** is again pressed towards its retracted position, the connection ports **57** are closed off by the forward sliding surface **49** of the hammer piston. Thus, the air pressure in the passage **66** from the rear working chamber **45** shifts the valve into the position of FIG. **1***b*. Then, when the start ports **56** into the forward working chamber **44** are uncovered, air is supplied to this chamber **44** and the hammer piston returns; that is to say, drilling restarts automatically.

The connection ports **57** may be disposed at the same height as the control port **67**. In this case the sliding surface **49** extends to the groove **51**, and the groove **50** is omitted.

An increased flushing may be desirable for drilling in soft rocks. For this purpose, a bypass passage **75** may be provided in the lower seat member **22** as illustrated by dashed lines in FIG. **4**.

It is to be understood that the invention may be varied in many other ways within the scope of the claims.

WE CLAIM:

1. In a pressure fluid operated percussion tool, an elongated hollow housing, means for connecting said housing at its rear end to a source of pressure fluid, a fluid-distributing valve assembly at said rear end of the housing, a hollow member of the housing forming a working cylinder for the pressure fluid, a hammer piston reciprocable in said working cylinder under the influence of said pressure fluid, a rear working chamber in the working cylinder at the back of said hammer piston, a forward working chamber in the working cylinder in front of the hammer piston, means in the forward end of said housing for receiving and retaining an anvil and bit means but permitting the anvil and bit means to move axially between a forward and a retracted position, said hammer piston being arranged to strike the rear end of the anvil and bit means when the anvil and bit means is in the retracted position, a first exhaust passage means from the forward working chamber connected with passage means for conveying fluid to the forward end of the anvil and bit means, said first exhaust passage means being open when the hammer piston is in rear positions but closed when the hammer piston is in forward positions, second exhaust passage means from the rear working chamber connected with said passage means for conveying fluid to the forward end of the anvil and bit means, said second exhaust passage means being open when the hammer piston is in forward positions but closed when the hammer piston is in rear positions, first distributing passage means leading from the valve assembly to the rear working chamber, second distributing passage means leading from said valve assembly to said forward working chamber, a valving element of said valve assembly having a first position in which it supplies pressure fluid to said first distributing passage means and a second position in which it supplies pressure fluid to said second distributing passage means, a piston surface element disposed in a control chamber and adapted to urge the valving element into said first position when said control chamber is pressurized, and means adapted to connect the control chamber with the second distributing passage means when the hammer piston overtravels its normal forward stroke limiting position when

the anvil and bit means is in its forward position so that said control chamber is pressurized by fluid from said second distributing passage means when said overtravel has taken place and the valve member supplies a flow of fluid directly into said second exhaust passage means through said first distributing passage means and said rear working chamber

2. A tool as claimed in claim 1 in which said means adapted to connect said control chamber with said second distributing passage means comprises a control passage having an orifice into the working cylinder, an orifice of said second distributing passage means into the working cylinder, and a recess in said hammer piston adapted to provide a passage between said two orifices when the hammer piston is in said position forwardly of its normal forward stroke limiting position.

3. A tool as claimed in claim 2 in which said recess in the hammer piston comprises two annular grooves connected by means of an annular clearance gap between the jammer piston and said hollow member.

4. A tool as claimed in claim 1 in which said control chamber is continuously vented through a venting passage which is restricted compared with said means adapted to connect the control chamber with said second distributing passage means.

5. A drill as claimed in claim 1 in which a one-way valve is arranged in said inlet passage which is supplied with pressure fluid from the drill pipe at the rear end of the housing.

6. A pressure fluid operated percussion tool comprising an elongated hollow housing, means for connecting said housing at its rear end to a source of pressure fluid, a pressure fluid distributing valve assembly at the rear end of the housing, a hollow member in the housing forming a working cylinder for the pressure fluid, a hammer piston with a longitudinal channel reciprocable in the working cylinder under the influence of the pressure fluid, a rear working chamber in the working cylinder at the back of the hammer piston, a forward working chamber in the working cylinder in front of the hammer piston, means in the forward end of said housing for receiving and retaining a shank means of a drill bit but permitting said shank means to move axially between a forward and a retracted position, said hammer piston being arranged to strike the shank means when the shank is in the retracted position but overtravel to a forward flushing position when the shank is in the forward position, an exhaust tube closed at its rear end portion extending through the hammer piston with a sliding fit to the channel in the piston and into a channel in said shank means so as to provide a fluid passage for conveying flushing fluid to the forward end of the bit, hammer piston-controlled exhaust ports in said tube leading from the rear working chamber into the tube and from the forward working chamber into the tube, first passage means from the valve assembly to said rear working chamber, second passage means assembly positioned externally of the working cylinder and leading from said valve to said forward working chamber, said exhaust ports from the rear working chamber being open when the piston is in a forward position but closed when the piston is in rear positions and said exhaust ports from the working chamber being open when the piston is in a rear position but closed when the piston is in forward positions, and a valving element of the valve assembly having a first position in which it supplies pressure fluid to said first passage means and a second position in which it supplies pressure fluid to said second passage means, said tool being characterized by the combination that a control part in the hollow member opening into the working cylinder is connected with a piston surface of the valving element through a control passage means, said piston surface being adapted to urge the valving element into said first position when influenced by pressure fluid from the control port, said control port being disposed so as to be closed by the piston at the forward portion of the forward strokes during drilling but open to a recess in the piston when the piston is in its forward flushing position, and a port in the hollow member connecting said second passage means and the working cylinder being disposed so as to be open to said recess when the piston is in its flushing position.

7. A tool as claimed in claim 6 in which said control passage means is continuously vented through a venting passage which is restricted compared with the control passage means.

8. A tool as claimed in claim 7 in which said venting passage ends in the exhaust tube.

9. A pressure fluid operated down-the-hole percussion drill including an elongated hollow housing adapted for removable attachment to the forward end of a drill pipe, an inlet passage at the rear end of the housing supplied with pressure fluid from the drill pipe, a liner in the housing forming a working cylinder for the pressure fluid, a hammer piston having a central longitudinal channel reciprocable in said working cylinder under the influence of said pressure fluid, a rear working chamber in the working cylinder at the back of the hammer piston, a forward working chamber in the working cylinder in front of the hammer piston, means in the forward end of said housing for receiving and retaining the shank means of a drill bit but permitting said shank means to move axially between a forward and a retracted position, said hammer piston being arranged to strike the shank means when the shank is in a retracted position but overtravel to a forward flushing position when the shank is in the forward position, an exhaust tube extending through the hammer piston with a sliding fit to said channel in the hammer piston and into a channel in said shank means so as to provide a fluid passage for conveying flushing fluid to the forward end of the bit, first exhaust port means in said exhaust tube leading from the rear working chamber into the tube and positioned to be uncovered by the piston when the piston is in forward positions but covered when the piston is in rear positions, second exhaust port means in the exhaust tube leading from the forward working chamber into the tube and positioned to be uncovered by the piston when the piston is in rear positions but covered when the piston is in forward positions, inlet port means in the exhaust tube at the back of said first exhaust ports leading from the interior of the tube into the rear working chamber, said exhaust tube being closed by a closing member at a location between the first exhaust ports and said inlet ports, means forming a cylindrical valve chamber and including two opposed valve seats, an annular distributing valve reciprocable in said valve chamber between a first position against one of the seats in which it opens the first distributing passage means from the interior of the valve to the interior of the exhaust tube at the rear of said closing member and a second position against the other of the seats in which it opens a second distributing passage means from the interior of the valve to the forward working chamber, the interior of said valve being continuously supplied with pressure fluid from said inlet passage, a first valve throwing surface on the distributing valve disposed in a first control chamber and activated by pressure fluid in the first control chamber for moving the valve to the first position, a second valve throwing surface on the distributing valve disposed in a second control chamber and activated by pressure fluid in said second control chamber for moving the valve to its second position, a first control passage between said first control chamber, and a first hammer piston-controlled control port in the liner opening into the forward working chamber, a second control passage between said second control chamber and a second hammer piston-controlled central port in the liner opening into the rear working chamber, said tool being characterized by the combination that said first hammer piston-controlled control port is disposed so as to be closed by the hammer piston at the forward portion of the forward strokes thereof during drilling but open to a recess in the hammer piston when said hammer piston is in its forward flushing position and a port in the liner connecting said second passage means, the working cylinder being disposed so as to be open to said recess in the hammer piston when the piston is in its forward flushing position.

10. A drill as claimed in claim 9 in which said control chambers are vented through venting passages which are restricted compared with said control passages and said control ports.

11. A drill as claimed in claim 9 in which said control chambers are vented to the exhaust tube by means of venting passages.

12. A drill as claimed in claim 11 in which said venting passages are connected to a passage through said closing member, which passage extends as a pipelike element to end forwardly of said rear exhaust ports.

13. A drill as claimed in claim 9 in which said valve throwing surfaces are the opposed piston surfaces of an annular flange of the valve.

14. In a pressure fluid operated down-the-hole percussion drill, an elongated housing adapted to be removably attached to the forward end of a drill pipe, an inlet passage at the rear end of the housing supplied with pressure fluid from the drill pipe, a one-way valve in said inlet passage, a hollow member in the housing forming a working cylinder for the pressure fluid, means in the forward end of the housing for receiving and retaining an anvil and drill bit means, a hammer piston reciprocable in said working cylinder under the influence of the pressure fluid, a rear working chamber in the working cylinder at the back of the hammer piston, a forward working chamber in the working cylinder in front of the hammer piston, an exhaust passage adapted to be in communication with said rear working chamber when the piston is in forward positions and in communication with the forward working chamber when the piston is in rear positions, means forming a cylindrical valve chamber and including two opposed valve seats, an annular distributing valve reciprocable in said valve chamber between a first position against one of the seats in which it opens the first distributing passage means from the interior of the valve to the rear working chamber and a second position against the other of the seats in which it opens the second distributing passage means from the interior of the valve to the forward working chamber, the interior of said valve being continuously supplied with pressure fluid from said inlet passage, a first valve throwing surface on the distributing valve disposed in a first control chamber and activated by pressure fluid in said first control chamber to move the valve to its first position, a second valve throwing surface on the distributing valve disposed in a second control chamber and activated by pressure fluid in said second control chamber to move the valve to its second position, a first control passage between said first control chamber and a first hammer piston-controlled control port in the hollow member open into the forward working chamber, a second control passage between said second control chamber and a second hammer piston-controlled control port in the hollow member open into the rear working cylinder, a venting passage from said first control chamber venting to said exhaust passage, and a venting passage from said second control chamber communicating with the exhaust passage.

15. A drill as claimed in claim 14 in which said venting passages are restricted compared with the control passages and control ports.

16. In a pressure fluid operated down-the-hole percussion drill, an elongated hollow housing adapted for removable attachment to the forward end of a drill pipe, an inlet passage at the rear end of the housing supplied with pressure fluid from the drill pipe, a liner in the housing forming a working cylinder for the pressure fluid, a hammer piston with a central longitudinal channel reciprocable in said working cylinder under the influence of said pressure fluid, a rear working chamber in the working cylinder at the back of said hammer piston, a forward working chamber in the working cylinder in front of the hammer piston, means in the forward end of said housing for receiving and retaining a shank means of a drill bit, said hammer piston being arranged to strike said shank means, an exhaust tube extending through said hammer piston with a sliding fit to said channel in the hammer piston and into a channel in said shank means so as to provide a fluid passage for conveying flushing fluid to the forward end of the bit, first exhaust port means in said exhaust tube leading from the rear working chamber into the tube and positioned to be uncovered by the piston when the piston is in its forward positions but covered when the piston is in its rear positions, second exhaust port means in the exhaust tube leading from the forward working chamber into the tube and positioned to be uncovered by the piston when the piston is in rear positions but covered when the piston is in forward positions, inlet port means in the exhaust tube at the back of said first exhaust ports leading from the interior of the tube into the rear working chamber, an element extending into the exhaust tube from the rear end thereof and ending forwardly of said rear exhaust ports, a closing element on said element blocking the exhaust tube at a location between the first exhaust ports and said inlet ports, a longitudinal passage through said element, means forming a cylindrical valve chamber and including two opposed valve seats, an annular distributing valve reciprocable in said valve chamber between a first position against one of the seats in which it opens first distributing passage means from the interior of the valve to the interior of the exhaust tube at the rear of said closing member and a second position against the other of the seats in which it opens second distributing passage means from the interior of the valve to the forward working chamber, the interior of said valve being continuously supplied with pressure fluid from said inlet passage, a first valve throwing surface on the distributing valve disposed in a first control chamber and activated by pressure fluid in said first control chamber for moving the valve to its first position, a second valve throwing surface on the distributing valve disposed in a second control chamber and activated by pressure fluid in said second control chamber for moving the valve to its second position, a first control passage between said first control chamber and a first hammer piston-controlled control port in the liner opening into the forward working chamber, a second control passage between the second control chamber and a second hammer piston-controlled port in the liner opening into the rear working chamber, a venting passage from said first control chamber, and a venting passage from said second control chamber, said venting passages being connected to said longitudinal passages in the element which extends into the exhaust tube.

17. A drill according to claim 16 wherein said venting passages are restricted in comparison with the control passages and the control ports.