H. V. HAIGHT.

FLUID OPERATED PERCUSSIVE DRILL.

APPLICATION FILED APR. 24, 1918.

1,317,874. Patented Oct. 7, 1919.

Fig. 1.

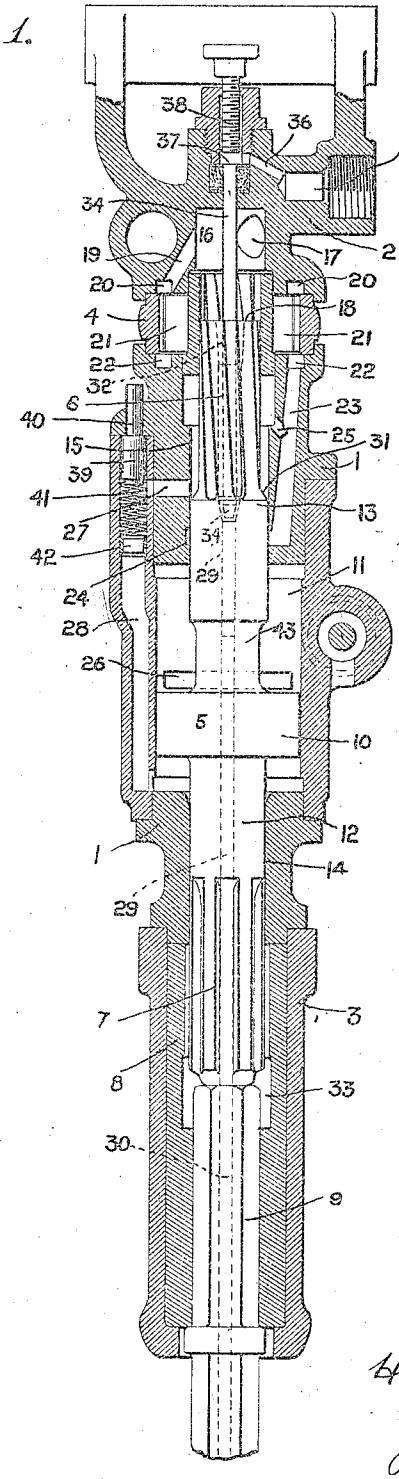
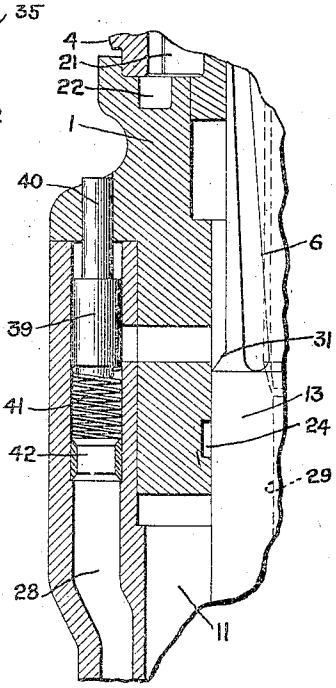


Fig. 2.



WITNESS

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FLUID-OPERATED PERCUSSIVE DRILL.

1,317,874. Specification of Letters Patent. Patented Oct. 7, 1919.

Application filed April 24, 1918. Serial No. 230,563.

To all whom it may concern:

Be it known that I, HARRY V. HAIGHT, a subject of the Crown of Great Britain, residing at Sherbrooke, in the Province of Quebec, Dominion of Canada, have invented a certain new and useful Improvement in Fluid-Operated Percussive Drills, of which the following is a specification.

This invention relates to fluid operated percussive drills, and more particularly to drills of this type which employ hollow drill steels and are arranged to divert a portion of the operating fluid, either with or without the addition of a liquid, through the drill and drill steel to the surface operated upon, for cleansing purposes.

The object of the present invention is to provide means within the drill whereby the supply of cleansing fluid which is conducted through the tool may be readily augmented when desired by the addition of a relatively large portion of fluid which normally would be used in the operation of the drill, the drill, when the supply of cleansing fluid is augmented, being partly or wholly out of operation.

With the above object in view, and others which will be later set forth, I have devised the improvements described in the following specification and illustrated in the accompanying drawings.

In the drawings annexed hereto and forming a part hereof,

Figure 1 represents a longitudinal sectional view of a machine embodying my invention, and

Fig. 2, an enlarged diagrammatic sectional view of the mechanism for augmenting the fluid flow through the tool, with the parts in operative position.

I have shown my novel means for increasing the cleansing fluid-flow in connection with a valveless fluid operated percussive tool of the differential piston type. This tool comprises a cylinder 1, a back head portion 2 and a front head portion 3. Between the back head and cylinder is provided a pawl and ratchet mechanism 4 for the purpose of effecting the rotation of the piston 5, which piston 5 reciprocates in the cylinder 1, the rotation being accomplished by means of the engagement of the spirally fluted portion 6 of the piston with the ratchet mechanism 4, in a manner which is well known in the art. The opposite end of the piston is provided with straight flutes 7 which engage the internally fluted surface of a rotatable sleeve or chuck 8 in the front head 3, the rotative movement of the piston being by this means communicated to the chuck 8. The chuck 8 carries a drill steel 9, secured so that it will rotate with the piston as above described.

It will be seen that the piston 5 is provided with a central portion 10 of comparatively large diameter sliding in a bore 11 in the cylinder, and end portions 12 and 13, respectively, sliding in bores 14 and 15 at the forward and rearward ends of the cylinder, respectively, there being a neck portion 43 between the piston portions 10 and 13. The spirally fluted portion 6 of the piston which engages the rotating ratchet is of still less diameter than the rearward piston portion 13, and projects into a bore 16 in the back head 2.

The reciprocatory movement of the piston 5 is effected by motive fluid which enters the cylinder of the drill through an admission port 17, in communication with the motive fluid inlet of the drill (not shown). The entering fluid will exert a constant pressure at all times upon the end surface 18 of the piston which will tend to move the piston in a forward direction. A portion of this fluid is conveyed through a conduit 19 and annular passage 20 in the back head, through a passage 21 in the rotating mechanism 4, and into a further annular passage 22 in the end of the cylinder 1, wherefrom it is conveyed by means of the port 23 and annular passage 24 in the cylinder bore 15, to the cylinder bore 15 itself, and past the neck 43, where it will exert pressure upon the rearward surface of the large diameter portion 10 of the piston, to contribute toward the forward movement of the piston 5. The motive fluid will also have access to the rearward portion of the cylinder bore 15 from the port 23 by means of the smaller passage 25, whereby it also exerts pressure upon the flanged surface 31 of the smaller diameter piston portion 13.

When the piston 5 in its forward travel, propelled by the motive fluid pressure on the rearward surfaces 18 and 31 of the end portion 13 and the rearward surface of the central portion 10, reaches a point where the piston portion 13 closes the annular passage 24 at the end of the port 23, the motive

fluid conveyed through this port will cease to be supplied to the rearward surface of the piston portion 10, the fluid in the bore 11 continuing to act, by expansion, until the exhaust 26 is reached, the full pressure, however, remaining effective upon the surfaces 31 and 18. This condition will obtain with respect to the bore 15 until the piston reaches a point where the passage 27 in the cylinder is uncovered by the piston portion 13, when the fluid pressure entering the cylinder bore 15 through the passage 25 will travel through passage 27 and conduit 28 to the forward end of the cylinder bore 11, where, encountering the forward surface of the large diameter piston portion 10, which is of greater area than the combined areas of the end surfaces 18 and 31 of the piston receiving constant pressure, it will act to overcome the pressure on the aforesaid piston surfaces 18 and 31 and return the piston to its rearward position, this flow to the forward end of the piston continuing until the piston on its return movement again closes the passage 27, when the fluid in the forward end of the bore 11 will act expansively upon the forward surface of the piston portion 10 until the exhaust 26 is uncovered, when the piston will again be in position to receive pressure upon the surfaces 18 and 31, and the rearward end of the piston portion 10 for the commencement of another stroke.

It will thus be seen that the piston is moved forwardly by constant pressure upon two surfaces and intermittent pressure upon one surface, and rearwardly by intermittent pressure upon one surface alone, whereby the tool obtains a powerful sustained forward operating stroke, and a less powerful return stroke. This construction does not form the essential feature of novelty of the present invention, however. For a further and detailed description and illustration thereof reference is had to Patent No. 1,278,237, granted September 10th, 1918, to F. M. Slater.

For the purpose of directing the cleansing fluid through the drill, the piston 5 is provided with a central longitudinal bore 29 which communicates with a similar bore 30 in the drill steel 9. The end of the bore 29 adjacent to the piston end surface 18 is chambered to a somewhat larger tapering diameter, the air entering this chambered portion 32 from the constantly supplied back head bore 16 and traveling through the piston to the chamber 33 in the drill chuck 8 adjacent to the head of the drill steel 9.

In drills of this type it is generally desirable that the cleansing agent be an admixture of motive fluid with a liquid, such as water, and to provide for the necessary liquid flow, a water tube 34 is secured in the back head 2 projecting into the cylinder of the drill and into the chamber 32 and bore 29 in the piston, this water tube being of a diameter slightly less than the piston bore 29, so that the piston surrounding it has free movement therealong. Water or other liquid is supplied to the water tube 34 from a water inlet 35 in the back head 2, the liquid being conveyed through a passage 36 and thence to the head 37 of the tube. The end of the tube adjacent to the head 37 is provided with a suitable packing to prevent the ingress of water to the bore 16, and a screw plug 38 threaded into the end of the back head over the end of the water tube, serves to close off the flow of water through the tube when desired.

Should it be desired to make up the tool as a dry tool, that is, one not being provided with a water tube, the part 34 may be made solid instead of hollow, and, by means of the screw 38, may be advanced or retracted within the tool to vary the amount of air provided for cleansing purposes. This regulation of the cleansing air supply is accomplished by selecting a suitable diameter for the part 34 so that when the piston 5 is in the rear part of the cylinder the part 34 fits closely the restricted diameter of the hole extending through the piston and allows air to pass through the piston only when it is in the forward portion of its stroke, the length of time during which air can pass being controlled by means of advancing and retracting the part 34 to cut off the supply at an earlier point in the rearward stroke.

The chamber 33 in the chuck 8 serves to facilitate a constant flow of motive fluid or motive fluid and liquid combined, irrespective of the reciprocation of the piston. Thus, it will be seen that a constant flow of the cleansing agent will be maintained during the operation of the drill.

However, it is frequently desirable to increase the flow of motive fluid through the drill steel, either with or without a corresponding increase in the liquid flow, and to accomplish this I provide for the addition of a relatively large portion of the motive fluid normally used in the operation of the drill. This is done by checking the flow of motive fluid normally intermittently conveyed through the conduit 28 to return the piston to its rearward position, and through the port 23 to act on the rearward face of the large diameter piston portion, so that the fluid will, instead, pass into the piston bore 29 and through the drill steel 9.

For checking the flow of fluid through the conduit 28, for the purpose, and in the manner, just described, I provide in the conduit 28 a manually operable plunger valve, which is arranged to close the passage 27 through which the motive fluid enters the conduit 28. This valve comprises a body portion 39 and a plunger portion 40 which projects through the cylindrical wall 1 of

the tool to the outside thereof. The valve is normally maintained in inoperative position by means of a compressive spring 41 which is secured in a spring seat 42 in the conduit 28 and engages the inner end of the valve body portion 39. When it is desired to close off the flow of fluid through the conduit 28 for the purpose above set forth, the operator of the drill simply depresses the plunger 40, which will render the valve operative to prevent the flow of any motive fluid beyond the passage 27. If desired, a separate cam lever may be set in the cylinder wall 1 to engage the valve plunger portion 40 for securing a more positive and facile operation thereof.

Meanwhile, the constant pressure of the motive fluid will still be effective upon the end 18 of the piston, and this will maintain the piston in its forward position so that the forward end of the piston will remain in engagement with the drill steel 9. The advantage of this is that the resultant increased flow of fluid through the piston will find ready and immediate access to the bore of the drill steel, so that the danger of leakage of water past the end of the piston and into the forward bore 11 of the drill and consequent deleterious effects upon the drill parts and operation of the tool, will be eliminated.

It is believed that the construction and operation of my improved device will be clear from the above description, and it is to be understood that while the present showing and description illustrates only one specific embodiment of this invention, other forms and modifications are included within the spirit and scope of the same, as expressed in the claims appended hereto.

What I claim is:

1. In a fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, said piston having a large surface area for driving it in one direction, a portion of which is supplied with constant motive fluid pressure, and a smaller surface area supplied with intermittent pressure for driving it in the other direction, and means for checking said intermittent pressure supply whereby it enters the piston to augment the flow of motive fluid therethrough.

2. In a fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, said piston having a large surface area for driving it in one direction, a portion of which is supplied with constant motive fluid pressure and a smaller surface area supplied with intermittent pressure for driving it in the opposite direction, and manually controlled means for checking said intermittent pressure supply whereby it enters the piston to augment the flow of motive fluid therethrough.

3. In a fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, conduit means for supplying motive fluid at constant pressure to a portion of its rear surface area to operate said piston in one direction, conduit means for intermittently conveying motive fluid to operate said piston in the opposite direction, and means for rendering said second conduit means ineffective whereby the fluid normally traversing said second conduit means enters the piston to augment the flow of fluid therethrough.

4. In a fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, conduit means for supplying motive fluid at constant pressure to a portion of its rear surface area to operate said piston in one direction, conduit means for intermittently conveying motive fluid to operate said piston in the opposite direction, and manually operated means for rendering said second conduit means ineffective whereby the fluid normally traversing said second conduit means enters the piston to augment the flow of fluid therethrough.

5. In a valveless fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, means for conveying fluid to opposite ends of said piston to operate the same, and means for checking the supply of fluid to one of said ends whereby the motive fluid remains effective upon the opposite end, the checked fluid entering the piston to augment the normal flow therethrough.

6. In a valveless fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, means for conveying fluid to opposite ends of said piston to operate the same, and manually controlled means for checking the supply of fluid to one of said ends whereby the motive fluid remains effective upon the opposite end, the checked fluid entering the piston to augment the normal flow therethrough.

7. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, means for supplying motive fluid at constant pressure to a portion of the surface area of one end to operate said piston in one direction, a conduit for conveying motive fluid to operate said piston in the opposite direction, the said conduit being effective during a portion of the stroke of said piston, and means in said conduit for rendering the same ineffective whereby said constant pressure means remain operative and the supply of fluid normally traversing said conduit is directed through the piston to augment the flow of fluid therethrough.

8. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, means for supplying motive fluid at constant pressure to a portion of the surface area of one end to operate said piston in one direction, a conduit

for conveying motive fluid to operate said piston in the opposite direction, the said conduit being effective during a portion of the stroke of said piston, and manually operated means in said conduit for rendering the same ineffective whereby said constant pressure means remain operative and the supply of fluid normally traversing said conduit is directed through the piston to augment the flow of fluid therethrough.

9. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, means for supplying motive fluid to operate said piston in one direction, a conduit for conveying motive fluid to operate said piston in the opposite direction, the said conduit being effective during a portion of the stroke of said piston, and means in said conduit for rendering the same ineffective whereby said first named means remain operative and the supply of fluid normally traversing said conduit is directed through the piston to augment the flow of fluid therethrough.

10. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, means for supplying motive fluid to operate said piston in one direction, a conduit for conveying motive fluid to operate said piston in the opposite direction, the said conduit being effective during a portion of the stroke of said piston, and manually controlled means in said conduit for rendering the same ineffective whereby said first named means remain operative and the supply of fluid normally traversing said conduit is directed through the piston to augment the flow of fluid therethrough.

11. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, the said piston being actuated by constant pressure upon a portion of the surface area of one end on its operative stroke and by intermittent pressure on its return stroke, and means for preventing said return stroke and directing said intermittent pressure flow through the piston whereby the piston remains in its forward position and the flow of fluid therethrough is augmented.

12. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, the said piston being actuated by constant pressure upon a portion of the surface area of one end on its operative stroke and by intermittent pressure on its return stroke, and manually controlled means for preventing said return stroke and directing said intermittent pressure flow through the piston whereby the piston remains in its forward position and the flow of fluid therethrough is augmented.

13. In a fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, said piston being operated by a constant motive fluid pressure supply upon a portion of the surface area of one end on its operative stroke and by an intermittent pressure supply on its return stroke, and means for checking said intermittent pressure supply whereby the checked fluid enters the piston to augment the flow of motive fluid therethrough.

14. In a fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, said piston being operated by a constant motive fluid pressure supply upon a portion of the surface area of one end on its operative stroke and by an intermittent pressure supply on its return stroke, and manually operated means for checking said intermittent pressure supply whereby the checked fluid enters the piston to augment the flow of motive fluid therethrough.

15. In a fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, conduit means for supplying motive fluid at constant pressure to a portion of the surface area of one end to operate said piston on its working stroke, conduit means for intermittently conveying motive fluid to operate said piston on its return stroke, and means for rendering said second conduit means ineffective whereby the fluid normally traversing said second conduit means enters the piston to augment the normal flow of fluid therethrough.

16. In a fluid operated percussive tool, a piston, means for conveying motive fluid therethrough, conduit means for supplying motive fluid at constant pressure to a portion of the surface area of one end to operate said piston on its working stroke, conduit means for intermittently conveying motive fluid to operate said piston on its return stroke, and manually controlled means for rendering said second conduit means ineffective whereby the fluid normally traversing said second conduit means enters the piston to augment the normal flow of fluid therethrough.

17. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, means for supplying motive fluid at constant pressure to a portion of the surface area of one end to operate said piston on its working stroke, a conduit for conveying motive fluid to operate said piston on its return stroke, the said conduit being effective during a portion of the stroke of said piston, and means in said conduit for rendering the same ineffective whereby said constant pressure means remain operative and the fluid normally traversing said conduit enters the piston to augment the normal flow of fluid therethrough.

18. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, means for supplying

motive fluid at constant pressure to a portion of the effective surface of one end to operate said piston on its working stroke, a conduit for conveying motive fluid to operate said piston on its return stroke, the said conduit being effective during a portion of the stroke of said piston, and manually controlled means in said conduit for rendering the same ineffective whereby said constant pressure means remain operative and the fluid normally traversing said conduit enters the piston to augment the normal flow of fluid therethrough.

19. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, means for supplying motive fluid to operate said piston on its working stroke, a conduit for conveying motive fluid to operate said piston on its return stroke, the said conduit being effective during a portion of the reciprocation of said piston, and means in said conduit for rendering the same ineffective whereby said first named means remain operative and the fluid normally traversing said conduit enters the piston to augment the normal flow of fluid therethrough.

20. In a fluid operated percussive tool, a differential piston, means for conveying motive fluid therethrough, means for supplying motive fluid to operate said piston on its working stroke, a conduit for conveying motive fluid to operate said piston on its return stroke, the said conduit being effective during a portion of the reciprocation of said piston, and manually controlled means in said conduit for rendering the same ineffective whereby said first named means remain operative and the fluid normally traversing said conduit enters the piston to augment the normal flow of fluid therethrough.

In testimony whereof, I have hereunto set my hand.

HARRY V. HAIGHT.