

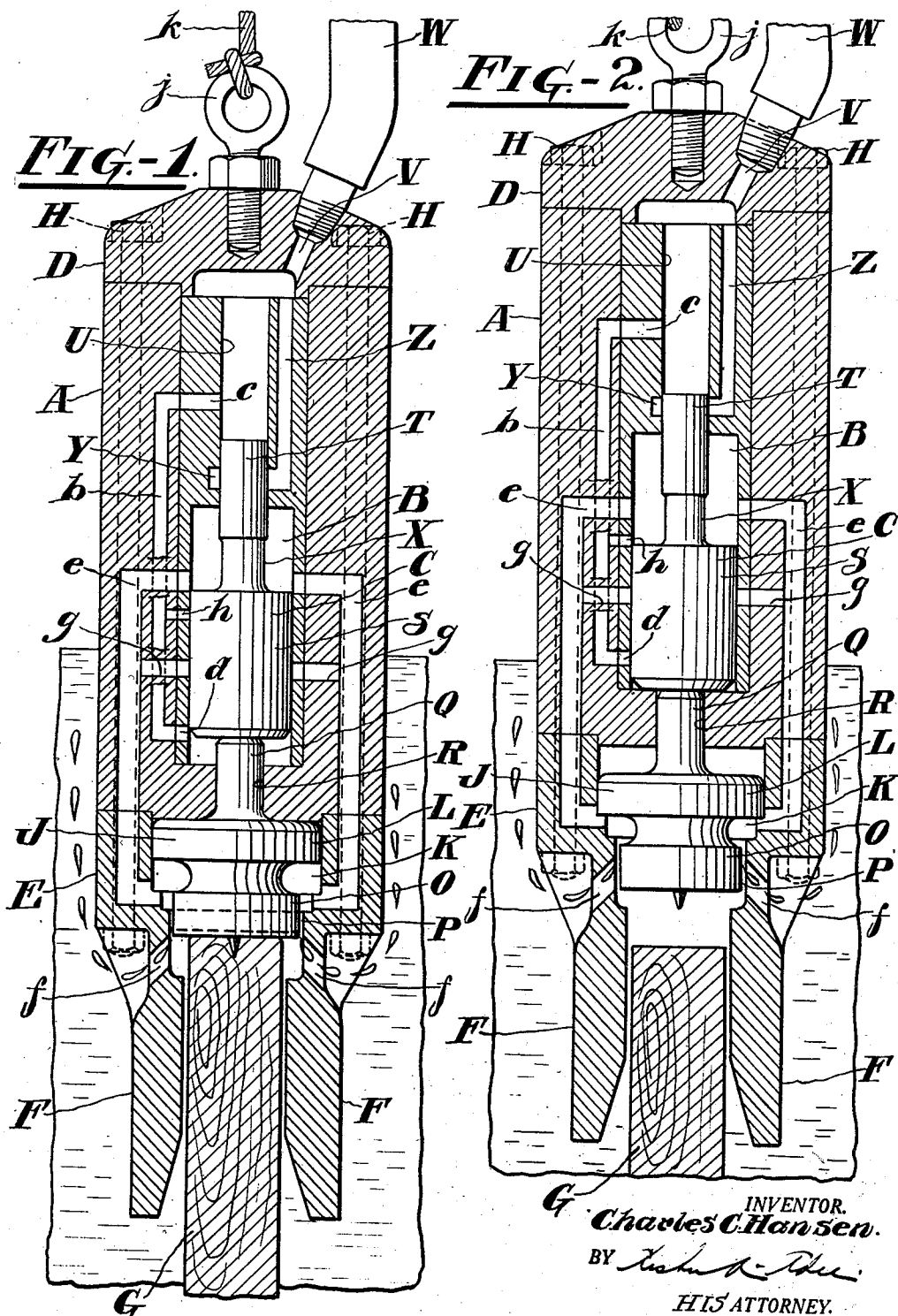
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FLUID ACTUATED PERCUSSIVE TOOL

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FLUID ACTUATED PERCUSSIVE TOOL

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This invention relates to fluid actuated percussive tools, but more particularly to tools of this type adapted to be used for submarine work.

One object of the invention is to prevent the admission of foreign matter, such as water and entrained solids, into the tool.

Another object is to utilize the fluid exhausting from the piston chamber for this purpose.

Still another object is to enable the tool to be started and stopped without requiring the manipulation of means other than the tool itself.

Other objects of the invention and its advantages will be in part obvious and in part pointed out in the following description taken in conjunction with the accompanying drawings, in which

Figure 1 is a sectional elevation of a percussive tool constructed in accordance with the practice of the invention, and showing the position of the percussive elements during the operative period of the tool, and

Figure 2 is a similar view showing the position which the percussive parts assume during the inoperative period of the tool.

Referring more particularly to the drawings, the invention is shown, for the purpose of illustration, as being embodied in a percussive tool adapted for driving piles and similar articles which, during the course of the operation, may become submerged as may also the percussive tool used for driving it.

The percussive tool illustrated comprises a cylinder A having a piston chamber B in which is disposed a reciprocatory hammer piston C. A back head D forms a closure for the rearward end of the cylinder and at the forward end of the cylinder is a front head E having integral guide plates F at its front end to act as guides for a pile G and to maintain the tool in the correct operative position on the pile.

The back head D and the front head E may be secured to the cylinder A in any suitable and convenient manner, as for instance, by bolts H.

The working implement, which in this instance assumes the form of a striking block J,

is disposed in a bore K in the front head E and has a head L which cooperates slidably with the wall of the bore K. The striking block has a reduced forward portion O which is of somewhat smaller diameter than the forward portion of the bore K to form an annular space P about said reduced portion O.

On the rearward end of the driving block is a shank Q which projects slidably through a bore R in the front end of the cylinder A and extends normally a sufficient distance into the front end of the piston chamber B to prevent the close approach of the piston C to the front wall of said piston chamber B.

The piston C may be of a well known type having a head S to impact against the shank Q of the driving block, and said piston carries at its rearward end a stem T which extends slidably into a reduced portion U of the piston chamber B. As is customary in pistons of this type the stem T controls the distribution of pressure fluid to the piston chamber and the rearward end of said stem is constantly exposed to pressure fluid which may be conveyed into the rearward end of the piston chamber by a passage V communicating with a connection W which may lead from a source of pressure fluid supply.

Adjacent the head S of the piston and on the stem T is a reduced portion or neck X which, when the piston C approaches its rearward limiting position uncovers a port Y in the reduced portion U of the piston chamber for admitting pressure fluid rearwardly of the head S to assist that acting against the stem T for driving the piston C forwardly against the working implement. The port Y is preferably located near the front end of the reduced portion U and is constantly in communication with the pressure fluid supply through a passage Z.

The admission of pressure fluid to the front end of the piston chamber B for driving the piston C rearwardly is also effected by the stem T of the piston. Such pressure fluid is conveyed to this end of the piston chamber by a front inlet passage b which has its inlet opening or port c in the reduced portion U of the piston chamber and its outlet opening

or port d in the front end of the piston chamber B.

Preferably the outlet opening d is so located that when the working implement J lies in the upper or rearward end of the bore K the back end of the shank Q will lie substantially in the same transverse plane as the port d so that the piston C will be prevented from overrunning the said port d .

The exhaust fluid from the piston chamber B is conveyed therefrom by an exhaust passage or passages e which lead from a point rearwardly of the transverse median line of the piston chamber B to the bore K from whence the exhaust may flow through the space P and thence to the atmosphere, or to the water if submerged, between the guide plates F or through ports f in the guide plates F.

The passage or passages e provide an outlet for the exhaust fluid from only the rearward end of the piston chamber B, and in order to direct the exhaust fluid from the front end of the piston chamber through the same channels the cylinder A is further provided with an exhaust port or ports g which lead from a point forwardly of the transverse median line of the piston chamber B to the exhaust passage e . Both the exhaust passages e and the ports g are controlled by the piston C.

In order to arrest the movement of the piston C during such times when the tool is in the inoperative position with respect to the work, the cylinder A is provided with a leak port h which may lead from the front inlet passage b into the piston chamber at a point intermediate the exhaust passage e and the exhaust port g . The leak port h is preferably so located that during the normal operation of the tool it will remain constantly covered by the piston C.

In order to enable the tool to be readily shifted from one position to another, an eye-bolt j may be threaded into the back head D and to said eye-bolt may be attached a cable k or similar means whereby the tool may be raised and lowered or shifted laterally on the work.

The operation of the device is as follows: Let it be assumed that the tool is about to be lowered to rest on the end of a submerged pile for driving it into the soil and let it further be assumed that the piston chamber has been placed in communication with the pressure fluid supply. Under these conditions the pressure fluid acting against the rearward end of the stem T will drive the piston C forwardly against the front wall of the piston chamber. The piston may readily assume this position since then the working implement will occupy its lowermost limiting position so that the shank Q of the working implement will be withdrawn from the piston chamber.

With the piston in this position the outlet opening or port d of the inlet passage b will be covered by the piston so that no pressure fluid may then flow into the front end of the piston chamber. Also in this position of the piston the leak port h will be uncovered so that pressure fluid may then flow directly from the inlet passage b through the leak port h into the piston chamber B to act against the rearward end of the piston C for holding it in its foremost position. Such fluid will then flow through the exhaust passage e into the bore K and thence through the space P to form an annular jet about the reduced portion O of the working implement for preventing the admission of water into the bore.

As the tool is lowered into position and the working implement contacts with the pile G, the weight of the tool will overcome the pressure acting against the rearward end of the piston and the shank Q will move the piston C rearwardly in the piston chamber to cover the leak port h . Upon continued lowering of the tool the port d of the inlet passage b will be uncovered by the piston so that pressure fluid will flow into the front end of the piston chamber to set the piston in operation.

During the normal operation of the piston the pressure fluid utilized for actuating it will flow through the exhaust passage or passages e into the bore K and thence through the space P of the water surrounding the tool. In this way the exhaust fluid will prevent the admission of water into the bore during the operation of the tool.

After the pile G has been driven the described depth, the tool may again be raised and the parts will assume the positions illustrated in Figure 2. The piston C will then again occupy the foremost extreme position in the piston chamber and pressure fluid will flow through the leak port h and through the channels connecting it with the bore K and thence along the reduced portion O to exclude water from the bore during the time the tool is being transferred from one site to another.

I claim:

1. In a fluid actuated percussive tool, the combination of a cylinder having a piston chamber and pressure fluid distributing mechanism in constant communication with a source of fluid supply, said cylinder having inlet passages for introducing pressure fluid into the piston chamber, a hammer piston in the cylinder controlling the outlet opening of one inlet passage and thus the idle and operating periods of the tool, a front head having a bore, means in the bore adapted to be actuated by the hammer piston, and passages for introducing fluid from the piston chamber into the bore to prevent the entrance of foreign matter into the bore during both the operating and idle periods of the tool.

2. In a fluid actuated percussive tool, the

combination of a cylinder having a piston chamber and pressure fluid distributing mechanism in constant communication with a source of fluid supply, said cylinder having inlet passages for introducing pressure fluid into the piston chamber, a hammer piston in the cylinder controlling the outlet opening of one inlet passage and being adapted to cover said inlet passage and thereby discontinue the operation of the tool, a front head having a bore, means in the bore adapted to be actuated by the hammer piston, an exhaust passage for conveying exhaust fluid from the piston chamber into the bore to prevent entrance of foreign matter into the bore, and a leak port in the cylinder to supply pressure fluid to the bore for preventing the entrance of foreign matter into the bore during the idle period of the tool.

3. In a fluid actuated percussive tool, the combination of a cylinder having a piston chamber and pressure fluid distributing mechanism in constant communication with a source of fluid supply, said cylinder having inlet passages for introducing pressure fluid into the piston chamber, a hammer piston in the cylinder controlling the outlet opening of one inlet passage and being adapted to cover said inlet passage and thereby discontinue the operation of the tool, a front head having a bore, means in the bore adapted to be actuated by the hammer piston and having a portion of smaller diameter than the bore, an exhaust passage for conveying exhaust fluid from the piston chamber into the bore to form an annulus of exhaust fluid around the reduced portion for preventing the entrance of foreign matter into the bore, and a leak port in the cylinder to supply pressure fluid to the bore for preventing the entrance of foreign matter into the bore during the idle period of the tool.

4. In a fluid actuated percussive tool, the combination of a cylinder having a piston chamber and pressure fluid distributing mechanism in constant communication with a source of fluid supply, said cylinder having ports and passages for introducing pressure fluid into the piston chamber, a hammer piston in the cylinder controlling the outlet opening of one inlet passage and being adapted to cover said inlet passage and thereby discontinue the operation of the tool, a front head having a bore, means therein adapted to be actuated by the hammer piston and cooperating with the bore to form a space around said means, an exhaust passage for conveying exhaust fluid from the piston chamber into the said space to prevent the entrance of foreign matter into the bore, and a leak port in the cylinder to supply pressure fluid to the bore for preventing the entrance of foreign matter into the bore during the idle period of the tool.

5. In a fluid actuated percussive tool, the

combination of a cylinder having a piston chamber and a hammer piston therein, said cylinder having ports and passages including a front inlet passage for introducing pressure fluid into the piston chamber, a front head having a bore, a working implement in the bore and normally limiting the forward movement of the hammer piston to prevent said hammer piston from overrunning the inlet passage, said working implement having a guiding portion and a reduced portion of smaller diameter than the bore, an exhaust passage for conveying exhaust fluid from the piston chamber into the bore adjacent the reduced portion to prevent the entrance of foreign matter into the bore, and a leak port in the cylinder for admitting pressure fluid into the piston chamber to hold the piston in fixed position over the inlet passage upon retraction of the working implement and to supply pressure fluid to the exhaust passage and the bore for preventing the entrance of foreign matter into the bore during the idle period of the tool.

6. In a fluid actuated percussive tool, the combination of a cylinder having a piston chamber and a hammer piston therein, said cylinder having ports and passages including a front inlet passage for introducing pressure fluid into the piston chamber, a front head having a bore, a working implement in the bore and having a shank portion extending into the piston chamber to normally prevent the hammer piston from overrunning the inlet passage, said working implement having a guiding portion and a forward reduced portion of smaller diameter than the bore, an exhaust passage for conveying exhaust fluid from the piston chamber into the bore adjacent the reduced portion to prevent the entrance of foreign matter into the bore during the operation of the tool, and a leak port leading from the front inlet passage into the piston chamber to hold the piston in fixed position over the inlet passage upon retraction of the shank and to supply pressure fluid to the exhaust passage and the bore for preventing the entrance of foreign matter into the bore during the idle period of the tool.

7. A fluid actuated percussive tool, comprising a cylinder having inlet and exhaust passages and a piston chamber, a front inlet port for conveying pressure fluid from the inlet passage to the piston chamber, a hammer piston in the piston chamber covering said inlet port during the idle period of the tool, and a leak port in the cylinder for conveying pressure fluid from said inlet passage to the exhaust during the said idle period and preventing thereby the entrance of foreign matter into the tool.

8. A fluid actuated percussive tool, comprising a cylinder having inlet and exhaust passages and a piston chamber, a front inlet port for conveying pressure fluid from the

inlet passage to the piston chamber, a hammer piston in the piston chamber covering said inlet port during the idle period of the tool, a leak port in the cylinder for conveying pressure fluid from said inlet passage to the exhaust during the said idle period and preventing thereby the entrance of foreign matter into the tool, means limiting the forward movement of the piston during normal operation of the tool and preventing said piston from overrunning the inlet port, said limiting of the piston movement causing it to cover the leak port, and an exhaust port for conveying exhaust fluid from the piston chamber to the exhaust passage during said normal operation and preventing thereby the entrance of foreign matter into the tool.

In testimony whereof I have signed this specification.

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