

1,096,886.

L. C. BAYLES.
FLUID OPERATED PERCUSSIVE TOOL.
APPLICATION FILED JAN. 14, 1914.

Patented May 19, 1914.

2 SHEETS—SHEET 1.

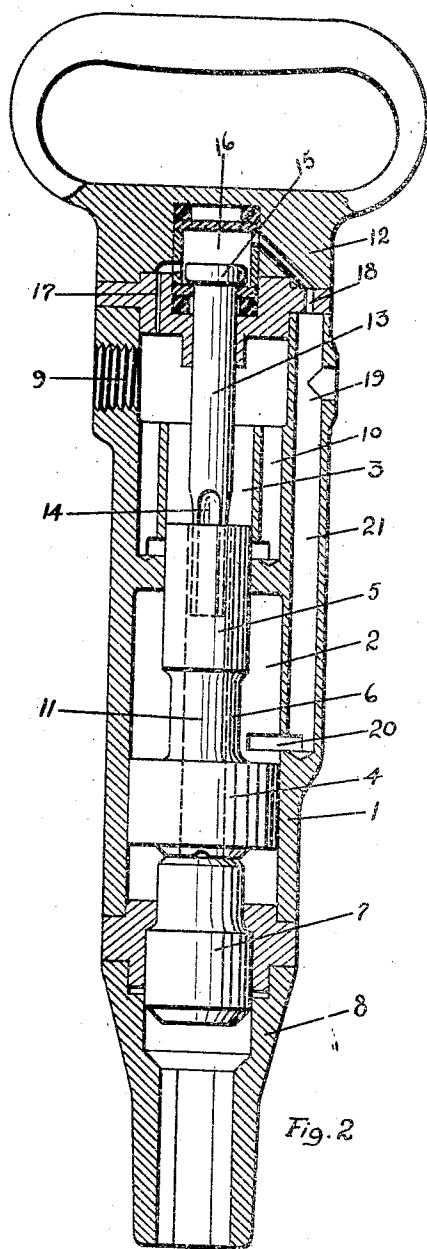


Fig. 2

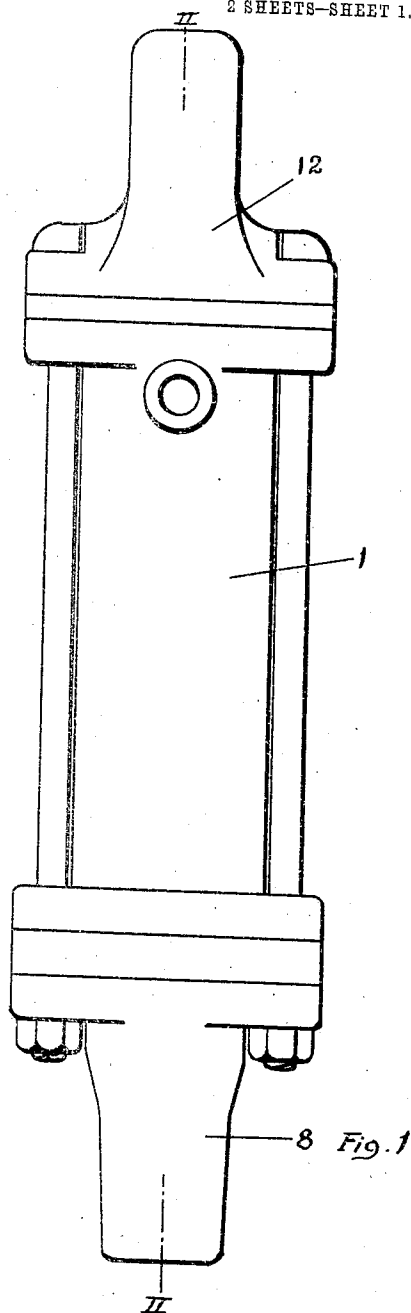


Fig. 1

WITNESSES:

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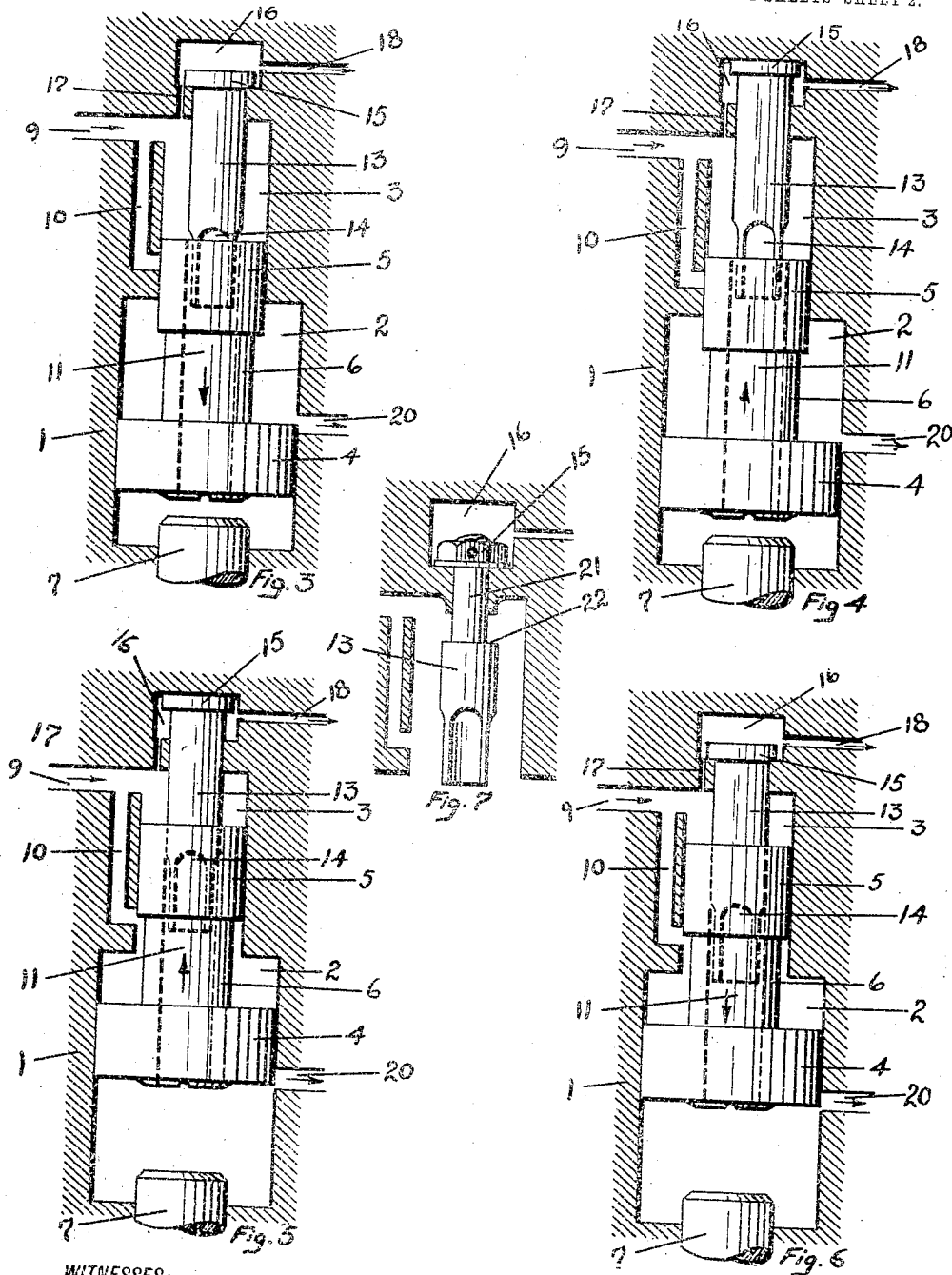
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UNITED STATES PATENT OFFICE.

LEWIS C. BAYLES, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

FLUID-OPERATED PERCUSSIVE TOOL.

1,096,886.

Specification of Letters Patent.

Patented May 19, 1914.

Application filed January 14, 1914. Serial No. 811,987.

To all whom it may concern:

Be it known that I, LEWIS C. BAYLES, a citizen of the United States, residing at Easton, in the county of Northampton and State of Pennsylvania, have invented a certain new and useful Improvement in Fluid-Operated Percussive Tools, (Case B,) of which the following is a specification.

This invention relates to fluid operated percussive tools and more particularly to the type of tool wherein one surface of the piston is exposed to constant fluid pressure for driving it in one direction while another opposed larger surface is exposed to intermittent fluid pressure for driving it in the other direction, the admission of the fluid pressure to the larger surface being controlled by the movement of the piston.

The object of this invention is to provide a means whereby, although the admission to the larger surface of the piston takes place near the end of the piston stroke under constant pressure, this admission is continued through a larger portion of the return piston stroke, the closing of the passage conveying fluid to the larger surface being delayed during the return stroke. With this object in view, a mechanism has been devised practical embodiments of which are shown in the accompanying drawings in which:

Figure 1 shows an elevation of the exterior of the tool, Fig. 2, a longitudinal section taken on the line II—II of Fig. 1, Figs. 3 to 6, diagrammatic views showing the piston and controlling valve in various positions, and Fig. 7, a detail showing a modified form of controlling valve.

The tool is shown in the drawings as a drill comprising a cylinder 1 in which is a bore of two diameters forming a larger forward cylinder chamber 2 and a smaller rearward cylinder chamber 3. In the cylinder 1 reciprocates a piston comprising a head 4 fitting the larger cylinder chamber and a shank 5 fitting the smaller cylinder chamber, between which is a reduced portion or neck 6. The head 4 of the piston strikes on an anvil block 7 which in turn actuates a drill steel, not shown, which is loosely inserted in the bore of the cylinder head 8. Air is admitted to the rear end of the smaller cylinder chamber 3 through an inlet passage 9 so that a constant fluid pressure is always exerted, during the operation of the tool on

The rear face of the cylinder head 4 is also exposed to fluid pressure during a portion of the forward stroke of the piston through passages 10 which lead from the rear end of the small cylinder chamber 3 through ports in the side of this chamber 3 so placed as to be connected with the rear end of the larger bore 2 by the neck 6 of the piston when the piston is at or near the end of its stroke.

Extending from one end of the piston to the other is a bore 11 which serves as a passage to convey fluid from the constantly supplied rear end of the cylinder to the forward end. Reciprocally mounted in the back head 12 of the drill is a valve 13 which is in the form of a rod projecting for a considerable distance into the cylinder and sliding into the bore 11 of the piston. The rearward portion of this valve 13 fits closely into the bore 11 and prevents any fluid from passing therethrough into the forward end of the cylinder; in the forward end of the valve 13 however are a series of depressions or grooves 14 which are uncovered by the rear end of the piston shank 5 near the forward end of its forward stroke and admit fluid from the rear end of the cylinder to the bore 11 and hence to the forward end of the cylinder. The rear end of the valve 13 is provided with a head 15 which slides in a chamber 16 and limits the reciprocating movement of the valve 13. To this chamber 16 a small leak passage 17 leads from the rear end of the cylinder whereas a larger passage 18 leads to the atmosphere through the exhaust port 19, a constant reduced pressure being therefore continually maintained in the chamber 16. Exhaust from the forward end of the cylinder and also from the rearward portion of the larger cylinder chamber which is also intermittently supplied is afforded through the exhaust port 20, which is placed at about the center of the larger cylinder chamber and exhausts by a passage 21 to atmosphere through the port 19.

The operation of the tool can be easily seen from Figs. 3 to 6. In Fig. 3 the parts are shown as the piston is just nearing the end of its forward stroke and the rear end of the shank has just uncovered the grooves 14 in the valve 13. Fluid will then be admitted to the forward end of the cylinder checking the forward movement of the pis-

admission of fluid to the passage 11 also exposes the forward end of the valve 13 to the full admission pressure of the fluid. As the pressure in the chamber 16 on the head of the valve 13 is less than this admission pressure, by reason of the fact that passage 18 is larger than the passage 17, the valve 13 will be moved rearwardly at some time during the period when the piston is in the forward part of the cylinder, it being immaterial exactly when. This position of the parts is shown in Fig. 4. In these positions it can be seen also that any pressure in the rear end of the larger chamber 2 is free to exhaust through the exhaust port 20. By reason of the rearward movement of the valve 13 it will be seen that the passage 11 is given a greater efficient length for admission through the rearward stroke of the piston and that therefore although the admission of fluid to the forward end of the cylinder does not commence until the piston has nearly reached the forward end of its stroke. The shutting off of the admission to the forward end of the cylinder is delayed on its return stroke until the piston has traveled an additional distance equal to the movement of the valve 13. When the piston on its return stroke reaches the position shown in Fig. 5 admission to the front end of the cylinder through the passage 11 has been closed and the exhaust port 20 opened by the front face of the piston so that the forward end of the cylinder is exhausted. This relieves the pressure on the front end of the valve 13 and the constant reduced pressure in the chamber 16 against the head 15 of the valve returns it to the position shown in Fig. 6. The piston is then free to move forward again, its forward movement being accomplished not only by the constant pressure on the shank 5 but also by the pressure of fluid on the rear face of the piston head 4 which is admitted as shown in Figs. 5 and 6 to the rear end of the larger cylinder chamber 2 by way of passages 10 and the neck 6 of the piston.

In Fig. 7 is shown a modified form of the valve 13 which is provided with a reduced stem 21 which passes through the back head of the cylinder, the chamber 16 being open to atmosphere so that there is no pressure on the head 15. The rear surface of the shoulder 22 is less than the forward end of the valve so that when pressure is exerted on the forward end of the valve the valve will move rearwardly while when the pressure is exhausted from the forward end of the valve the valve will move forwardly by reason of the pressure on the shoulder 22, in both forms there being a less effective pressure area tending to move the valve forward than that to move it rearward.

It is to be understood that the present showing and description discloses only cer-

tain specified modifications of my invention and other forms and modifications are included in the spirit and scope of the invention as expressed in the claims.

What I claim is:

1. In a percussive tool, a cylinder, a piston, means for constantly admitting fluid to one end of the cylinder, a passage leading from said constant pressure end of said cylinder to the opposite end of the cylinder and arranged to be opened by the movement of the piston near the end of its stroke, and a valve controlling said passage, said valve moving to delay the closing of said passage by said piston on its return stroke.
2. In a percussive tool, a cylinder, a piston having differential pressure areas, means for admitting constant fluid pressure to one end of the cylinder, to be exerted on the smaller piston area, a passage for conveying fluid from the constant pressure end of the cylinder to the opposite end of the cylinder, said passage being opened by the piston near the end of its stroke, and a valve for increasing the effective length of said passage on the return stroke of said piston, to delay the closing of said passage.
3. In a percussive drill, a cylinder, a piston, means for constantly admitting pressure to one end of the cylinder, a passage for admitting fluid to the other end, a valve for controlling the period of admission through said passage, said valve having an operating surface exposed to the pressure of the fluid in said passage, and an opening controlled by the movement of the piston for admitting fluid to said passage near the end of its stroke under constant pressure, the pressure of said fluid serving to move said valve to lengthen the admission period through said passage during the return of said piston.
4. In a percussive tool, a cylinder, a piston, means for constantly admitting pressure to one end of the cylinder, a passage for intermittently admitting fluid to the other end, a valve for controlling the period of admission through said passage, said valve having an operating surface exposed to the pressure of the fluid in said passage and a less effective opposed operating surface exposed to constant pressure, an opening controlled by the movement of the piston for admitting fluid to said passage near the end of its stroke under constant pressure, the pressure of said fluid serving to move said valve to lengthen the admission period through said passage during the return of said piston, and exhaust means for the intermittently supplied cylinder end.
5. In a percussive tool, a cylinder of two diameters, a piston of two diameters therein, having two small pressure areas for driving it in one direction and one larger area for driving it in the other direction, means

for constantly admitting fluid pressure to the cylinder against one of said smaller surfaces, means for intermittently admitting pressure to the other of said smaller surfaces, a passage from said constant pressure portion of the cylinder for admitting fluid against the larger piston surface, said passage being opened and closed by the movement of the piston, and a valve for increasing the effective length of said passage to delay the closing thereof by said piston during its return stroke.

6. In a percussive tool, a cylinder, a piston, means for constantly admitting fluid pressure to one end of the cylinder, a passage through the piston to the other end of the cylinder, and a valve projecting into said passage, said valve being of a length to permit the admission of fluid into the other end of the cylinder through said passage near the end of the constant pressure stroke of the piston, and being arranged to move rearwardly to open said passage for a longer period during the return stroke.

7. In a percussive tool, a cylinder, a pis-

ton, a passage for constantly admitting fluid pressure to one end of the cylinder, a bore through said piston for admitting fluid to the other end of the cylinder, a valve sliding in the end of the cylinder casing and projecting into said piston bore to close said bore for a portion of the piston stroke, fluid being admitted to the bore near the end of the constant pressure stroke, a pressure surface on said valve exposed to the pressure in said bore, and serving to move said valve rearwardly to delay the closing of said bore on the return stroke of the piston, a less effective constant pressure area on said valve to move it forwardly, and means to exhaust the intermittently supplied end of the cylinder, near the end of the return piston stroke.

In testimony whereof, I have hereunto set my hand.

LEWIS C. BAYLES.

Witnesses:

V. M. SLATER,

RUSSELL H. WILHELM.