

D. S. WAUGH.
MOTOR.
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1,314,288.

Patented Aug. 26, 1919.

Fig. 1.

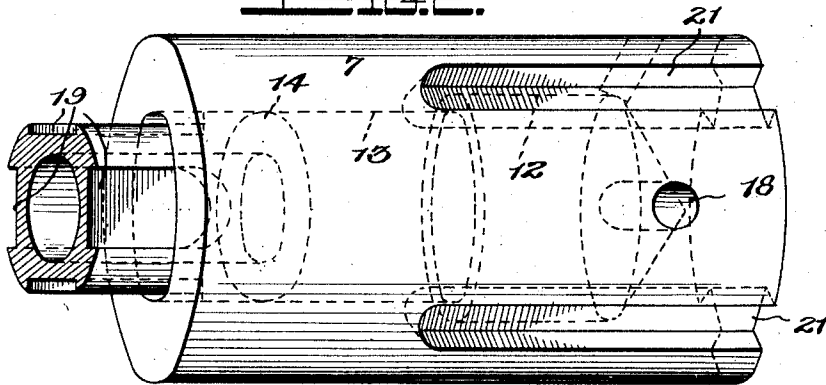
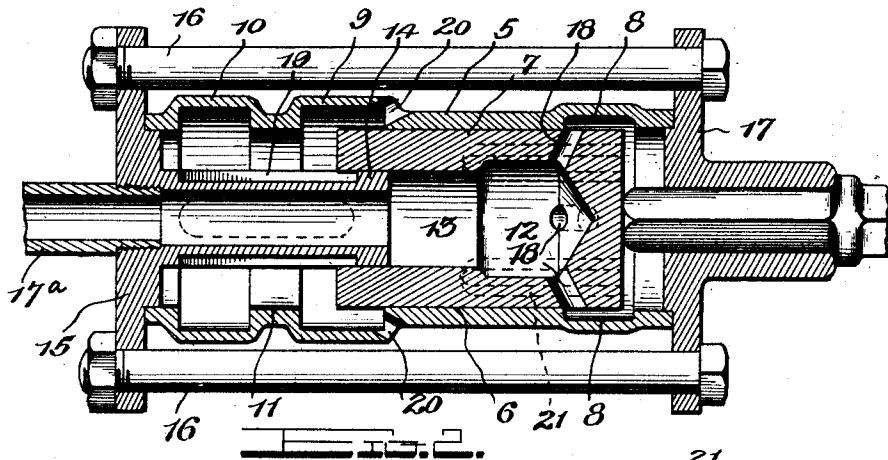
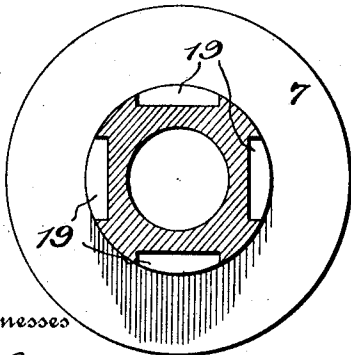


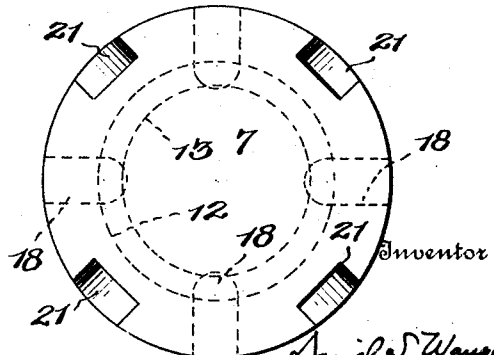
Fig. 3.



Witnesses

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Fig. 4.



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UNITED STATES PATENT OFFICE.

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MOTOR.

1,314,288.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, DANIEL S. WAUGH, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented new and useful Improvements in Motors, of which the following is a specification.

The present invention relates to motors of the valveless type, particularly intended for use in hammer drills, though not necessarily limited thereto.

The object is to provide a structure that will deliver a powerful working blow, and will be economical in the amount of motive fluid used.

An embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a longitudinal sectional view through the motor.

Fig. 2 is a perspective view of the piston and a portion of the tube that supplies fluid under pressure thereto.

Fig. 3 is a rear elevation of the structure shown in Fig. 2.

Fig. 4 is a front elevation of the piston.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In the embodiment disclosed, a cylinder member is provided, including a body 5 having an internal piston chamber. This piston chamber comprises portions of different diameters, namely, an intermediate bore 6 in which a hammer piston 7 is slidably mounted, a front enlarged bore 8, and two enlarged bore portions 9 and 10 separated by a bore 11 of smaller diameter, the bore 11 being of the same diameter as the bore 6.

The piston 7 is of the reciprocatory type, and has an internal constant pressure chamber 12 having a reduced portion 13 that opens through the rear end of said piston. The front end of the piston is movable into and out of the enlarged bore 8 and the rear end is movable across the enlarged bore 9, through the bore 11 and into the bore 10, having a sliding fit in the bore 11, as will be obvious.

Motive fluid is supplied constantly to the pressure chamber 12, through the medium of a tube 14, which, as shown, has an integral flange 15 at its rear end, constituting in effect the rear cylinder head, said head being

held in place by side bolts 16 that also are engaged with a front head 17. The front end of the tube 14 has a sliding fit in the reduced portion 13 of the constant pressure chamber and said tube enters the main portion of said chamber 12 when the piston is in its rearmost position. Fluid under pressure brought from any suitable source is delivered to the tube 14 by suitable means, as for example, a hose or pipe, a portion of which is shown at 17^a.

The fluid under pressure is delivered to opposite ends of the piston chamber and against the opposite faces of the piston by the following means:—Forwardly inclined ports 18 open from the front portion of the constant pressure chamber 12 through the side walls of the piston a slight distance in rear of its front face, and longitudinal channels 19 are formed in the exterior of the tube 14, these channels opening into the rear chamber 10, and terminating short of the front end of the tube. The bore 9 constitutes an exhaust chamber, and ports 20 lead therefrom to the exterior of the cylinder. Longitudinal grooves 21 are cut in the exterior face of the piston, said grooves terminating substantially midway of the same and opening through the front ends of said piston.

The operation of the motor is as follows:— Assuming that fluid under pressure is being constantly delivered into the internal constant pressure chambers 12 and 13, and with the parts, as illustrated in Fig. 1, this fluid will pass through the ports 18 and operate against the front face of the piston, driving the same rearwardly, the exhaust taking place freely from in rear of the piston, through the chamber 9 and ports 21. When, however, the rear end of the piston enters the smaller bore 11, the exhaust in rear of the piston will be cut off, and when the piston has reached its rearmost position, the channels 19 will be in communication at their front ends with the constant pressure chamber 12. Thus fluid under pressure will flow from said chamber into the rear chamber 10 of the cylinder and against the rear face of the piston to drive it forwardly. In the rearward movement of the piston the ports 18, entering the bore 6 of the cylinder, will be cut off from communication with the front chamber 8, and

directly thereafter the rear ends of the channels 21 will come into communication with the chamber 9, so that the fluid in advance of the piston can escape or exhaust through said channels, into the chamber 9, and thence to the outer air, through the ports 20.

It will be evident that a structure is thus provided, in which the piston will strike an effective blow, as it will have, during its working stroke, pressure against the front wall of the internal constant pressure chamber and against its rear face, its rearward movement being secured by the pressure against the front face of the piston overcoming that against the front wall of the internal pressure chamber. The structure furthermore is economical in the amount of fluid utilized, and an additional advantage resides in the fact that the piston has a rectilinear movement throughout its working stroke.

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.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In apparatus of the character set forth the combination with a cylinder member, of a reciprocatory piston operating therein and having an internal constant pressure chamber the front wall of which is formed by a face of the piston, means for maintaining fluid under pressure in said chamber during the operation of the piston, and means for delivering motive fluid from the chamber to opposite external faces of the piston, to reciprocate the said piston, said means permitting the piston to have a rectilinear non-rotary movement throughout such reciprocation.

2. In apparatus of the character set forth, the combination with a cylinder member, of a reciprocatory piston operating therein and having an internal constant pressure chamber, a fluid supply tube projecting into the chamber and delivering fluid under pressure into the chamber in advance of said tube, and means for distributing fluid from the chamber to reciprocate the piston without rotation.

3. In apparatus of the character set forth, the combination with a cylinder member, of a reciprocatory piston operating therein and having an internal constant pressure chamber the front wall of which is formed by a face of the piston, means for supplying fluid

under pressure to the chamber and maintaining the same therein during the operation of the piston, said piston having a port for delivering the fluid from the chamber to the front of the piston for moving said piston rearwardly, and means other than said port for delivering fluid from the chamber to the rear of the piston to move said piston forwardly.

4. In apparatus of the character set forth, the combination with a cylinder member having bores of different diameters, of a piston slidably mounted in the bore of smaller diameter and having a portion movable into and out of the bore of larger diameter, said piston having an internal constant pressure chamber, means for maintaining a supply of fluid under pressure in the constant pressure chamber, and a port leading from the constant pressure chamber through a portion of the piston that is movable into and out of the bore of larger diameter, said port having its communication cut off by the wall of the bore of smaller diameter.

5. In apparatus of the character set forth, the combination with a cylinder member having a bore of one diameter and a bore in rear thereof of larger diameter, of a reciprocatory piston slidable in the smaller bore and having its rear end movable in the larger bore, said piston having an internal constant pressure chamber, means for supplying fluid under pressure to the constant pressure chamber, and means for intermittently distributing fluid from the constant pressure chamber to the larger bore in rear of the piston and exhausting it therefrom.

6. In apparatus of the character set forth, the combination with a cylinder member having a bore of one diameter and a bore in rear thereof of larger diameter, of a reciprocatory piston slidable in the smaller bore and having its rear end movable in the larger bore and of less diameter than the same, said piston having an internal constant pressure chamber, means for supplying fluid under pressure to the constant pressure chamber, and means for intermittently distributing the fluid from the constant pressure chamber to the larger bore in rear of the piston and exhausting it therefrom.

7. In apparatus of the character set forth, the combination with a cylinder member, of a piston operating therein and having an internal constant pressure chamber the front wall of which is formed by a face of the piston, a tube projecting into the chamber for supplying fluid under pressure thereto, and means for distributing said fluid from the chamber, to operate the piston, including a passageway formed in the tube.

8. In apparatus of the character set forth, the combination with a cylinder member, of a piston operating therein and having an internal constant pressure chamber, a tube

carried by the cylinder member and projecting forwardly into the constant pressure chamber for supplying fluid under pressure thereto, and means for distributing motive
 5 fluid from the constant pressure chamber to opposite faces of the piston, to actuate it, said means including a passageway formed longitudinally in the exterior of the tube and opening into the cylinder member in rear
 10 of the piston.

9. In apparatus of the character set forth, the combination with a cylinder member, of a reciprocating piston operating therein and capable of a rectilinear movement throughout its stroke, said piston having an internal
 15 constant pressure chamber, the front constant pressure wall of which is formed by a face of the piston, means for constantly supplying fluid under pressure to the chamber and against said face, and separate means
 20 respectively opening into the chamber at different points for respectively and alternately distributing the fluid from the constant pressure chamber to opposite portions of the piston
 25 to effect its reciprocation.

10. In a fluid operated percussive tool, a cylinder, a piston having an internal cavity, an inlet plug projecting into said cavity and having a passage for conveying fluid
 30 to the cavity and exerting a constant pressure on the inner end of said cavity, and passages independently communicating with said cavity and arranged to respectively and alternately admit fluid from said cavity to
 35 the said cylinder on opposite sides of said piston.

11. In a fluid operated percussive tool, a cylinder, a piston having an internal bore in its rearward portion, said bore being
 40 smaller in cross sectional area at its rearward end, an inlet plug fitting into said bore and having a passage therethrough for conveying fluid constantly thereto, said plug also having a head fitting said smaller
 45 portion of the piston bore, and a rearward portion of smaller cross sectional area than said head, a port leading from the larger part of the bore to the surface of said piston, a passage leading from the forward
 50 end of the cylinder to a point positioned to register with said piston port near the

forward end of the piston stroke, and exhaust ports uncovered by the piston near the end of each stroke.

12. In apparatus of the character set forth, the combination with a cylinder member, of a piston therein having an internal
 55 constant pressure chamber provided with a front constant pressure face formed upon the piston, and means for supplying fluid
 60 under pressure to the chamber, said piston having a port opening from the constant pressure chamber to the exterior of the piston for delivering fluid to the front of said
 65 piston and another port opening through the piston from the pressure chamber for delivering fluid to the rear of said piston.

13. In apparatus of the character described, the combination with a cylinder member, of a piston therein having a constant internal pressure chamber provided
 70 with a front constant pressure face formed upon the piston, means for supplying fluid under pressure to the chamber, forwardly extending ports opening from the chamber
 75 through the piston to the front of the same, and rearwardly extending ports opening from the chamber through the piston to the rear of the said piston.

14. In apparatus of the character set forth, the combination with a cylinder member having a piston chamber provided with enlargements in its front and rear portions, of a piston operating therein and having
 80 an internal constant pressure chamber, means for supplying motive fluid to the chamber, and ports opening from the constant pressure chamber through the piston wall, one port communicating with the rear
 85 enlargement and the other port communicating with the front enlargement, communication with the enlargement being effected alternately to supply fluid to opposite faces
 90 of the piston.

In testimony whereof I have hereunto set
 95 my hand in presence of two subscribing witnesses.

DANIEL S. WAUGH.

Witnesses:

WILLIAM H. LEONARD,
 JAMES R. ELMENDORF.