A. F. ROSS.

FLUID PRESSURE OPERATED DRILL.

APPLICATION FILED JAN. 19, 1903.

902,836.

Patented Nov. 3, 1908.

2 SHEETS—SHEET 1.

Fig. 1.

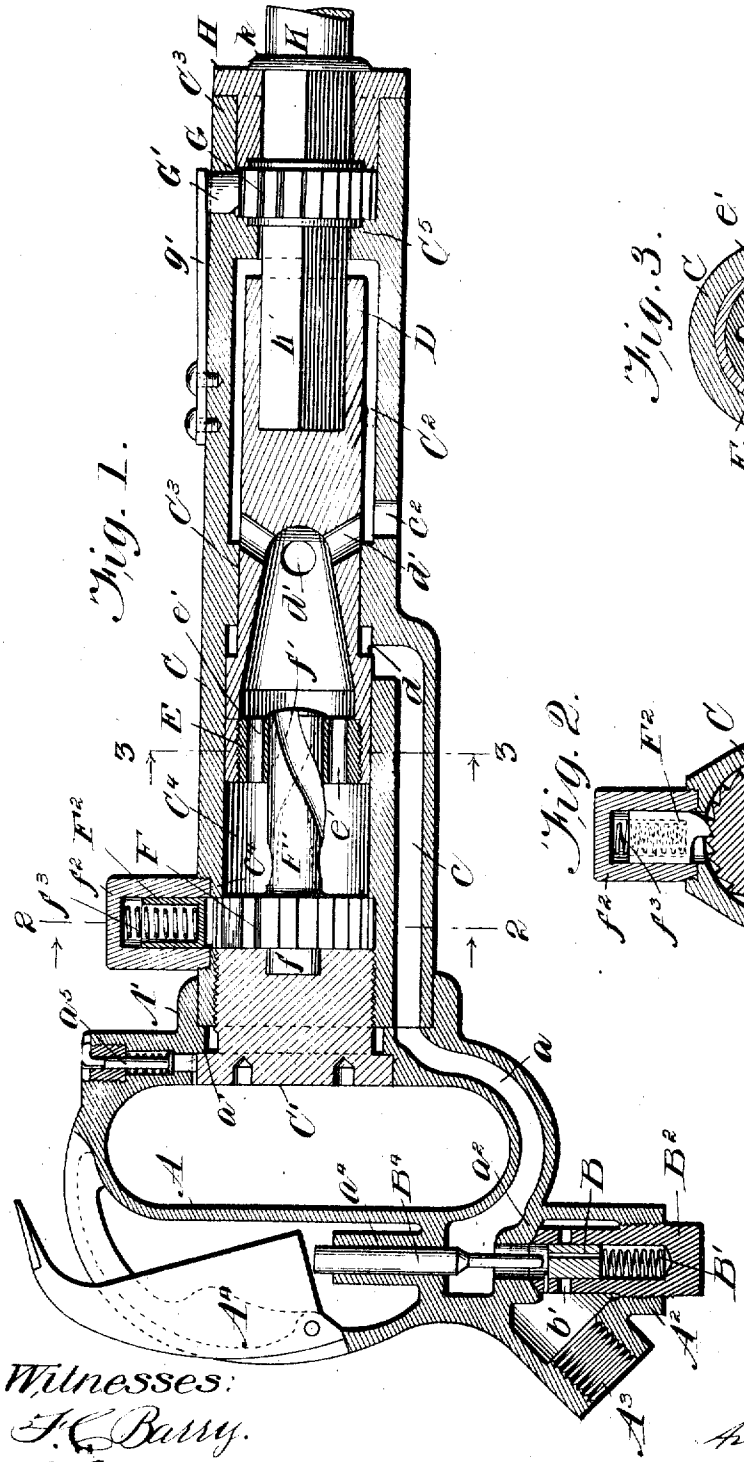


Fig. 3.

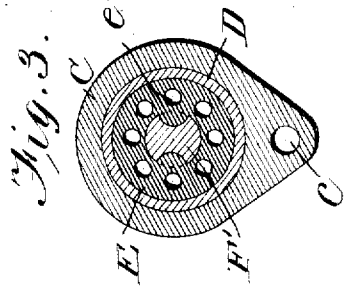
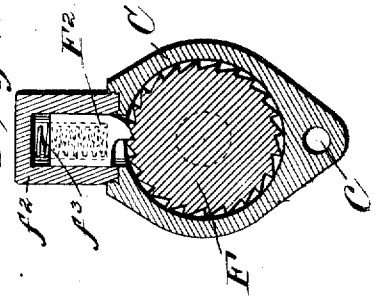


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4.

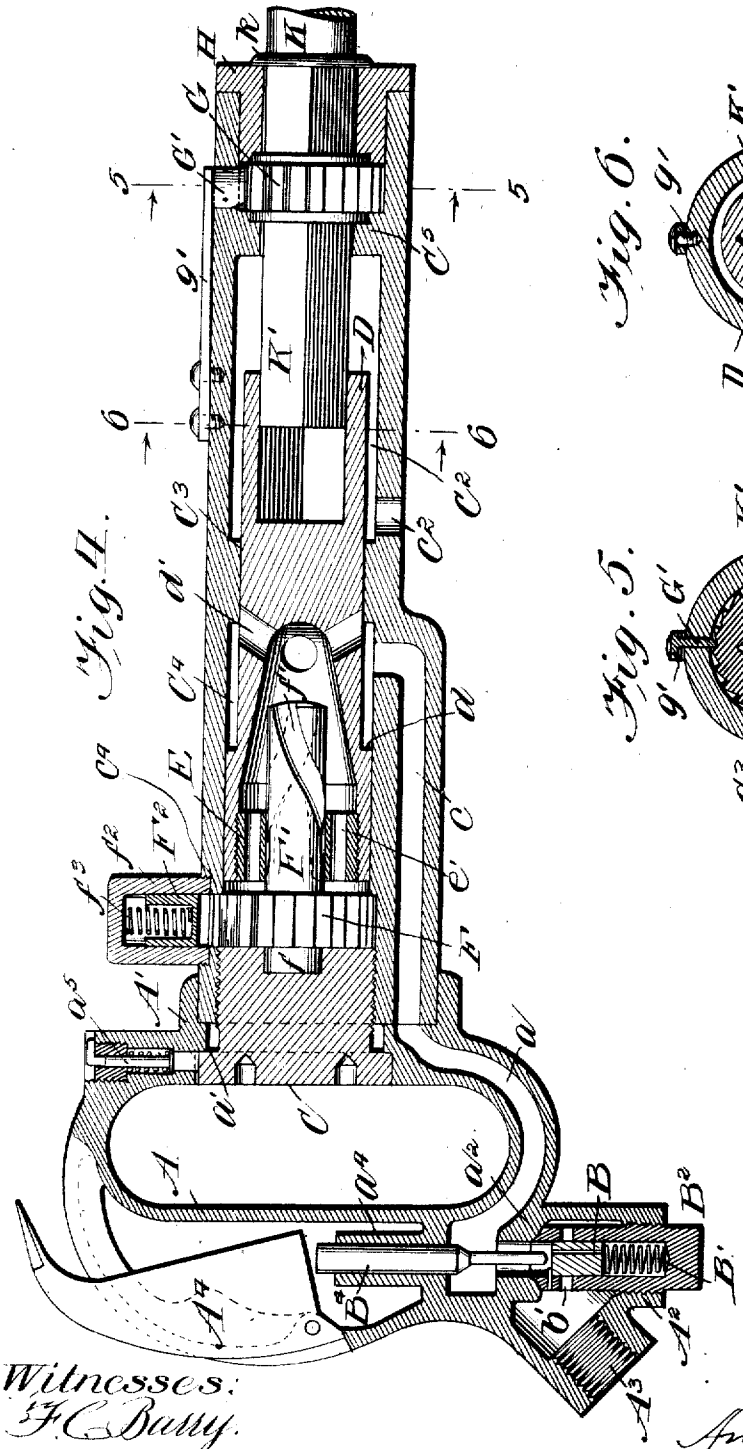


Fig. 6.

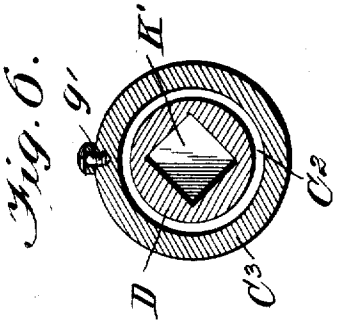
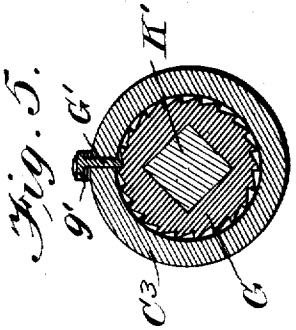


Fig. 5.



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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE-OPERATED DRILL.

No. 902,836. Specification of Letters Patent. Patented Nov. 3, 1908.

Application filed January 19, 1903. Serial No. 139,682.

To all whom it may concern:

Be it known that I, ANDREW F. ROSS, a citizen of the United States, residing at Long Island, county of Queens, State of New York, have invented a certain new and useful Improvement in Fluid-Pressure-Operated Drills, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates in general to fluid pressure operated tools, and more particularly to pneumatic drills.

It is well known that in order to obtain the best results in drilling the tool should be partially rotated between the delivery of the blows thereon so that the position of the cutting edge with respect to the material worked upon may be so varied as to secure the even and rapid advancement of the work.

The primary object of my invention is to provide a fluid pressure operated drill in which a rotary motion is imparted to the tool between the delivery of blows thereon.

A further object of my invention is to provide a fluid pressure operated drill in which the position of the tool relative to the material worked upon is automatically varied during the operation of delivering blows thereon.

A still further object of my invention is to provide a fluid pressure operated drill which will be comparatively simple in construction, inexpensive in manufacture, and efficient in operation.

My invention, generally described, consists in a cylinder, a piston reciprocated therein, a tool rotatably mounted in the end of the cylinder and adapted to receive the impact of the piston during its reciprocations, the shank of the tool being in non-rotative engagement with the piston, and means for rotating the piston during its reciprocations and thereby varying the position of the cutting edge of the tool with respect to the material being worked upon.

My invention will be more fully described hereinafter with reference to the accompanying drawings in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is a longitudinal central section; Fig. 2 a cross section on line 2—2, Fig. 1; Fig. 3 a cross section on line 3—3, Fig. 1; Fig. 4 a view similar to Fig. 1 showing the parts in an adjusted position; Fig. 5 a view on line 5—5, Fig. 4; and Fig. 6 a view on line 6—6, Fig. 4.

Similar reference characters are used to designate similar parts in the several figures of the drawings.

My invention is designed to be applied to any desired type of fluid pressure operated drill but for convenience I have shown the same as applied to a drill of the valveless type which may be generally described as follows: A indicates the handle of the tool which is provided with a circular flange A′ into which extends the end of the cylinder C. A cylinder head C′ is inserted through the handle into the end of the cylinder where it is secured by a screw threaded engagement. The handle is securely retained upon the cylinder by means of a circular flange a' which projects between the end of the cylinder and the circular flange on the outer end of the cylinder head. In order to retain the cylinder head in a fixed position with respect to the handle and cylinder a fastening device, such as the spring actuated latch a^5, is employed which engages ratchet teeth on the periphery of the cylinder head.

A^2 indicates a chamber formed in the handle into which extends a valve casing B^2. A throttle valve B is located within the casing B^2 and is normally retained in position to cover the ports b' through the valve casing by means of a coil spring B′. The valve casing is retained in engagement with a circular shoulder a^2 in the handle by means of its screw threaded connection with the chamber A^2.

A^3 indicates a screw threaded opening leading to the valve casing with which is connected a conduit for the supply of fluid pressure.

A^4 indicates a lever pivoted in the handle and adapted to engage a plunger rod B^4, the lower end of which unseats the throttle valve when the lever A^4 is oscillated.

D indicates a piston located within the cylinder. The end of the piston adjacent to the handle of the tool is enlarged in diameter, thereby forming a shoulder d. The chamber C^4 in the cylinder within which the end of the piston reciprocates is of an interior diameter conforming to the exterior

diameter of the enlarged end of the piston. A second chamber C^2 is formed in the cylinder which is separated from the chamber C^4 by an annular partition C^3. The interior diameter of the annular partition conforms to the exterior diameter of the reduced portion of the piston. An exhaust port c^2 leads from the chamber C^2. The piston is hollow and is provided with a series of passages d'.

K indicates a tool the shank of which extends through the bushing H located in the end C^5 of the cylinder. The shank of the tool projects into the chamber C^2 so as to receive the impact of the piston when it is driven towards the front end of the cylinder.

The tool shank is provided with a flange k around the same which is adapted to rest against the bushing H so that the pressure by which the tool is applied to its work retains the bushing against said flange and thereby holds the tool longitudinally immovable in position to receive the impact of the piston.

The operation of a tool of the valveless type such as above described is well known and may be briefly described as follows: When the handle A^4 is oscillated the throttle valve is unseated and fluid pressure passes through the ports b' into the passage a, thence through the passage c in the cylinder to the chamber C^4. The fluid pressure is exerted upon the shoulder d on the piston which forces the same from the position shown in Fig. 1 to that shown in Fig. 4 inasmuch as the enlarged end of the piston is exposed to atmospheric pressure through the hollow interior and the ports d' communicating therewith which register with the exhaust chamber C^2. The piston is consequently forced towards the handle of the tool until the ports d' pass beyond the annular partition C^3 at which time fluid pressure is admitted to the chamber C^4 and exerted upon the enlarged end of the piston, thereby driving the latter from the position shown in Fig. 4 to that shown in Fig. 1.

The reciprocation of the piston delivers a succession of blows upon the shank of the tool, thereby performing the desired work upon the material against which the cutting edge of the tool is forced.

In order that the tool may be rotated during the delivery of blows thereon by the piston I have provided the end of the piston with a socket into which extends the shank K′ of the tool, and have provided means for rotating the piston during its reciprocations. The cross sections of the socket in the piston and the shank of the tool are angular and conform to each other, thereby non-rotatably connecting the tool and piston so as to transmit the rotary movement of the piston to the tool.

The means which I have disclosed for rotating the piston consists in locating a disk E in the open large end of the piston and providing such disk with a longitudinal opening therethrough into which extends one or more spiral ribs e. A ratchet wheel F is located at the end of the chamber C^4 adjacent to the cylinder head C′ and is retained in a transverse plane with respect to the cylinder by means of a stud f which engages a socket formed in the inner end of the cylinder head. A shoulder c^4 is also formed in the chamber C^4 to retain the ratchet wheel in engagement with the end of the cylinder head. A post F′ projects longitudinally from the inner face of the ratchet wheel F and is provided with spiral grooves f' in its periphery which conform to the spiral ribs e' formed in the disk E. A pawl F^2 is located in a casing f^2 which communicates with the interior of the chamber C^4 adjacent to the cylinder head. A spring f^3 normally forces the pawl F^2 into engagement with the teeth on the ratchet wheel F.

A second ratchet wheel G is located in the end of the cylinder between the inner end of the bushing H and the partition C^5 in the cylinder. The ratchet wheel G is provided with an annular opening through the center conforming to the cross section of the shank of the tool which extends through the ratchet wheel into the socket in the end of the piston. A pawl G′ is provided for engaging the teeth on the ratchet wheel G. This pawl may be of any desired form, for convenience it being shown as supported upon a leaf spring g' secured at its free end upon the exterior of the cylinder.

It will be noticed that the teeth on the two ratchet wheels F and G extend in the same direction, hence when fluid pressure is admitted through the interior of the piston when the latter is in the position shown in Fig. 4 and is exerted upon the end of the piston within the chamber C^4, the piston is rotated through the engagement of the spiral ribs in the disk with the spiral grooves on the post fixed to the ratchet wheel F. The pawl F^2 prevents the ratchet wheel from rotating in a direction towards which it would have a tendency to move by reason of the spiral connection between the same and the piston. Inasmuch as the ratchet wheel F cannot rotate, the piston is rotated such rotation of the piston being permitted by reason of the direction of the inclination of the ratchet wheel G. It is consequently evident that during the movement of the piston towards the tool a rotary motion is imparted to the latter from the piston, thereby insuring the variation of the position of the cutting edge of the tool with respect to the material worked upon each time a blow is delivered upon the tool by the piston. The movement of the piston away from the tool rotates the ratchet wheel

F, the rotation of the piston being prevented by reason of the ratchet wheel G which retains the shank of the tool and consequently the piston from rotating in the direction towards which there is a tendency for the piston to rotate owing to the spiral connection between the piston and the ratchet wheel F.

It is obvious that by reversing the direction of the inclination of the teeth on the ratchet wheels the piston would be held from rotation during its forward stroke, while the ratchet wheel F would be permitted to rotate during such stroke of the piston, and that during the movement of the piston towards the handle of the tool the ratchet wheel F will be held stationary while the ratchet wheel G will permit the tool to rotate with the piston, thereby varying the position of the cutting edge of the tool with respect to the material worked upon during the back stroke of the piston instead of during the forward stroke of the piston.

From the foregoing description it will be observed that I have invented an improved fluid pressure operated drill in which the position of the tool with respect to the material worked upon is varied during the operation of the tool, thereby securing a rapid and even advancement of the work. It will be further observed that by providing means for rotating the piston and non-rotatably connecting the tool to the piston, the reciprocation of the piston automatically imparts a rotary movement to the tool at the same time that it is delivering its impact thereupon.

While I have described more or less precisely the details of construction I do not wish to be understood as limiting myself thereto, as I contemplate changes in form, the proportion of parts, and the substitution of equivalents, as circumstances may suggest or render expedient, without departing from the spirit of my invention.

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

1. In a fluid pressure operated drill, the combination with a cylinder, of a piston reciprocating therein, a tool rotatably supported by the cylinder in position to receive the impact of the piston, non-rotative direct connections between said piston and the shank of the tool, and means for imparting rotary motion to the piston during its reciprocations.

2. In a fluid pressure operated drill, the combination with a cylinder, of a reciprocating piston therein, a tool rotatably supported by the cylinder in position to receive the impact of the piston, said piston having a socket into which extends the shank of the tool, the cross section of the shank of the tool and said socket being such as to permit a relative longitudinal movement but prevent a relative rotary motion between the tool and piston, and means for rotating said piston during its reciprocations.

3. In a fluid pressure operated drill, the combination with a cylinder, of a reciprocating piston therein, a tool rotatably supported by the cylinder in position to receive the impact of the piston, said piston having a socket into which extends the shank of the tool, the cross section of the shank of the tool and said socket being such as to permit a relative longitudinal movement but prevent a relative rotary motion between the tool and piston, a ratchet wheel rotatably mounted transversely within the back end of the cylinder, a post fixed to said ratchet wheel and extending into an opening in said piston, said post and opening having engaged spiral ribs and grooves whereby the reciprocation of the piston produces a relative rotary movement between the same and said ratchet wheel.

4. In a fluid pressure operated drill, the combination with a cylinder, of a reciprocating piston therein, a tool rotatably supported by the cylinder in position to receive the impact of the piston, said piston having a socket into which extends the shank of the tool, the cross section of the shank of the tool and said socket being such as to permit a relative longitudinal movement but prevent a relative rotary motion between the tool and piston, a ratchet wheel rotatably mounted transversely within the back end of the cylinder, a post fixed to said ratchet wheel and extending into an opening in said piston, said post and opening having engaged spiral ribs and grooves whereby the reciprocation of the piston produces a relative rotary movement between the same and said ratchet wheel, a second ratchet wheel surrounding and non-rotatably mounted upon the shank of the tool, and pawls engaging the teeth on said ratchet wheels.

In testimony whereof, I sign this specification in the presence of two witnesses.

ANDREW F. ROSS.

Witnesses:
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C. C. CUNNINGHAM.