S. S. WYER.

GASOLENE ROCK DRILL.

APPLICATION FILED JAN. 14, 1905.

1,034,053

Patented July 30, 1912

2 SHEETS—SHEET 1.

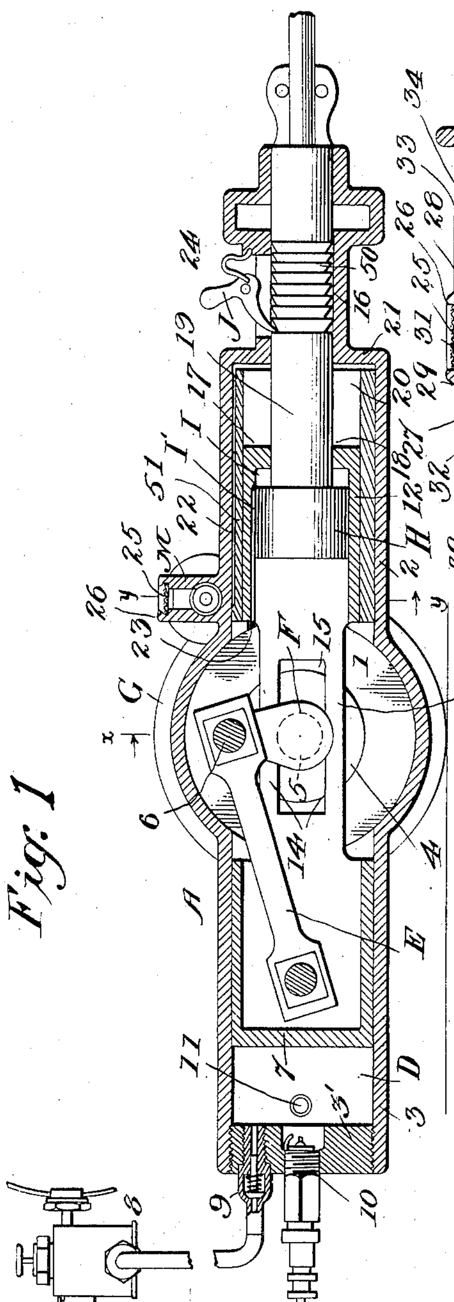

Fig. 1

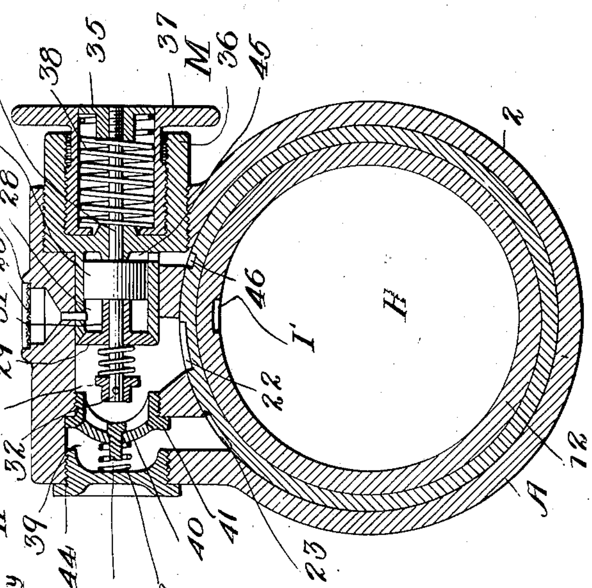

Fig. 2

Witnesses

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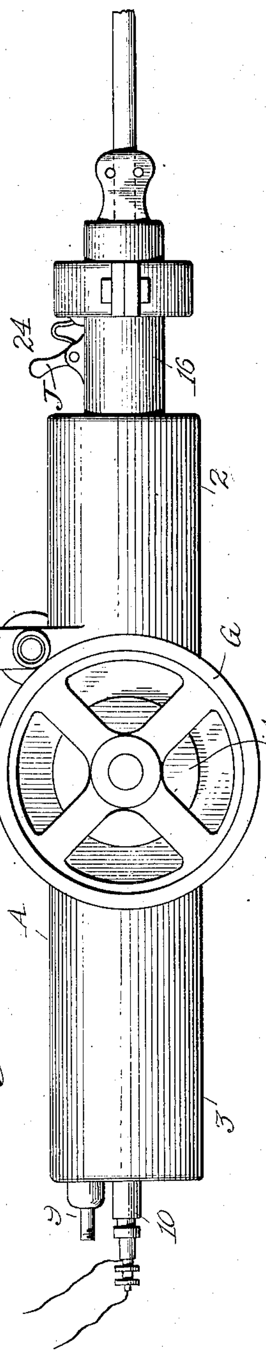
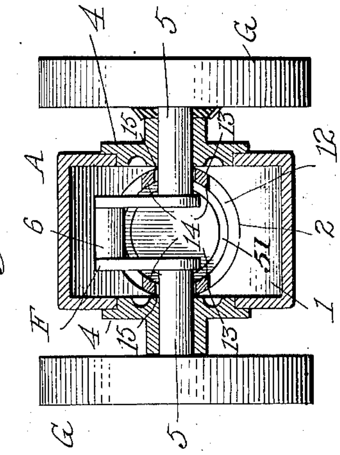


Fig. 3.

Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

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GASOLENE ROCK-DRILL.

1,034,053. Specification of Letters Patent. **Patented July 30, 1912.**

Application filed January 14, 1905. Serial No. 241,077.

To all whom it may concern:

Be it known that I, SAMUEL S. WYER, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Gasolene Rock-Drills, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to improvements in mechanisms in which work of either of several specific sorts is performed by means of a reciprocating driven body.

The improvements which I have devised are particularly well adapted for use in connection with reciprocating drills, such as are used for drilling rock, coal, and other substances.

One of the purposes of the invention is to provide a power generating and transmitting device, the primary agency in which shall be an engine of the kind including those which are actuated by explosions. At present I prefer to use an explosion engine adapted to receive and explode gasolene vapor and to transform the energy of the explosion into the reciprocating movements of a piston-like body.

The description given below, taken in connection with the drawings, will call attention to the features of construction and mode of operation of the mechanism which I have selected for illustration.

Figure 1 is a longitudinal section of a drilling mechanism embodying my improvements. Fig. 2 is an enlarged cross section on the line $y—y$ of Fig. 1. Fig. 3 is a side elevation of the drilling mechanism. Fig. 4 is a cross-section on line $x—x$ of Fig. 1.

In the drawings the casing, housing, or frame-structure is shown indicated as an entirety by A. It comprises a central chamber, as shown at 1, and two cylindrical parts one at each end, as shown at 2 and 3.

Across the central chamber is placed a crank-shaft F which is mounted in suitable bearings, 4, secured to the side walls of the central chamber 1. The axial portions, 5, of the crank-shaft extends through the bearings and on the outside of the casing are provided with balance-wheels or fly-wheels, G, one on each side. For the free movement of the crank part proper at 6, the top and bottom walls of the chamber are expanded and lie on lines substantially concentric with the axis of the shaft.

7 is a piston mounted in the cylinder 3, it being preferably of trunk sort and connected to the crank-shaft F by the pitman E.

D indicates the explosion chamber in the cylinder 3. To this chamber there are admitted at the proper times, and in the well-known way, charges of mixture of gasolene and air, as, for example, from a carbureter such as indicated at 8, which may be of any of the well-known forms. The explosive mixture is admitted through an inlet valve at 9, which, as shown, is of the puppet class, but which may be of any suitable sort, and may be actuated positively from the driven parts if desired. The charges of mixture are successively fired and exploded by a spark device indicated at 10, which also may be of any of the forms now well-known to explosive engineers. The inlet valve 9 and sparking device 10 are inserted in a cylinder head 3′ which is secured to the outer end of the cylinder 3.

The exhaust valve is indicated at 11, this also to be of any preferred sort, and actuated from any suitable part of the driven mechanism.

The piston 7 is secured to a cross-structure which extends to and into the cylinder 2 at the other end of the casing or housing. In this cylinder 2 there is a plunger or piston-like body at 12. The two pistons 7 and 12 are connected together by cross-arms or plates 13, preferably made as shown; that is to say, with top and bottom brace at 14 having a slot or passage-way 15 through which pass the axial parts of the crank-shaft.

The front wall or head end of the cylinder 2 has a sleeve or bearing 16 extending forward some distance. The head 17 of the piston part 12 has an aperture at 18 through which passes the stem part 19 of the ultimately driven reciprocating part. This stem 19 in the present construction carries the head H which is fitted snugly within the body 12 and the stem 19 fits as snugly as possible in the aperture 18 in the end wall 17. At I there is an air space provided between the wall 17 and the front surface of the plunger head H, and the piston and plunger head are cushioned in their several movements by the body of air contained within this space.

An air space or duct I′ relatively small in cross-sectional area, serves to supply a sufficient quantity of air to the space in front of the piston H, so as to provide a cushion for the said piston after it has cut off communication between the front end of the chamber and the said air duct. This air duct I′ is cut or grooved out of the inner wall of the piston 12, and extends from the end of the piston which communicates with the reservoir 1, up to within a short distance of the wall 17 of the piston body 12.

At 20 there is an air-compressing chamber between the front wall 21 of the casing cylinder 2 and the front end 17 of the reciprocating piston cylinder 12. 22 is an air-duct cut in the outer surface of a shell 51 rigidly held within the cylinder 2 and within which the piston 12 reciprocates. This passage 22 leads from the end of the compression chamber back to the apparatus, indicated as an entirety by M, which directs, controls and regulates the air currents, and 23 is a duct which extends from this same air regulating apparatus to the interior of the chamber 1 at the center of the mechanism. Of this air conducting and controlling mechanism M, 25 is a wire gauze screen over the inlet air opening 26. 27 is an outlet air chamber connected to an inner chamber 28 by means of puppet valve 29 which is actuated by a spring 30. Valve 29 has a long hub 31 that slides on the stem 32, which is an integral part of the piston 33 and extension stem 34, the latter having a nut 35. 36 is a valve body that is screwed into the shell of the machine and contains the piston 33 and forms the seat for the valve 29. 37 is an adjusting nut that works in the valve body 36 and contains the spring 38. By turning nut 37 the compression of spring 38 and the resulting pressure against nut 35 may be varied at will. 39 is a delivery chamber connected to chamber 28 by means of the puppet valve 40, which has a seat 41. 42 is a spring for actuating valve 40, the latter sliding on the spindle 43, which is an integral part of the seat 41, spindle 43 and seat 41 being connected by means of ribs. 44 is a plug that is screwed into the shell A, its object being to make the puppet valve accessible. 23 is a port connecting chamber 39 with the air chamber 1. 22 is a port connecting chamber 28 with the driving cylinder chamber 20. 45 is an air chamber at one side of the piston 33 and which is in communication with the chamber 1 by means of a port 46 similar to the port 23. The mechanism M in this present construction is shown solely for the purpose of illustrating one method of carrying out applicant's invention, other air controlling and regulating devices now well known being adaptable to the same purposes.

The manner in which the parts that I have above described, constituting my improved mechanism, operate will be readily understood from the drawings and the above description.

At each explosion in the chamber D the piston 7 is driven toward the right (relative directions being indicated on the drawings), and simultaneously with each such movement the piston at 12 compresses a body of air in the compression chamber 20.

The air compressed in chamber 20 passes along the duct 22 to the chamber 28 and, lifting the valve 40, passes into the chamber 39 and thence through the port 23 to the chamber 1 at the rear of the plunger H. It will be understood, of course, that this action takes place providing the pressure in the chamber 1 is sufficiently reduced, so that the valve 40 will be raised by the air compressed in the chamber 20. On the return stroke of the piston 12 the air will be drawn in through the opening 26 and, lifting the valve 29 from its seat, will pass into the chamber 28 and thence through the port 22 to the compression chamber 20. The next forward movement or compression stroke of the piston 12, compresses the air in the chamber 20, which was drawn in as described, and forces it along the path, as before traced, into the chamber 1. With succeeding strokes the pressure in the chamber 1 is raised and in order that the machine may not be disrupted or brought to a standstill by too great an accumulation of pressure, means is provided for preventing the increase of pressure beyond a certain point. This is accomplished as follows: As has been before pointed out, the chamber at the back of the piston 33 is connected with the chamber 1 by means of a port 46. When, therefore, the pressure in these chambers has risen beyond a certain point, the piston 33 will be moved to open the valve 29, thereby placing the chamber 28, and therefore the compression chamber in communication with the atmosphere through the opening 26. Any pressure then developed in the compression chamber 20 will pass out into the atmosphere and will not operate to increase the pressure in chamber 1, the device just referred to acting as a safety means. During the first stroke or the first few strokes, it may be that the plunger H, its stem 19, and the attached tool will remain stationary, but after a sufficient number of compression strokes have been made, and the pressure in the chamber 1 has been raised sufficiently, there results a forward movement or movements to the right of the plunger H and its attached parts, the plunger H being dependent entirely upon the accumulation of air pressure behind it for motive power to drive it in its working or forward stroke. This forward movement of the plunger head occurs at the time that the hollow piston cylinder 12 is moving toward the right; when the latter is by the crankshaft drawn in a reverse direction, it positively draws backward toward the left the plunger head, putting it in position to be ready for the next forward stroke or movement. So long as the pressure in the chamber 1 is maintained sufficiently high there will be a tendency for the plunger head H and the tool to quickly follow the part 12, the above-described air-cushion at I being continually between them. When the tool strikes its work, and the plunger head H is stopped, it will be again picked up by the piston 12 on its return to the left. In short, the plunger head is dependent upon piston cylinder 12 for its return movement, but is independent thereof on its forward movement or strokes, the latter being caused by the air under pressure in the chamber 1.

Instead of having the drill bit or reciprocating tool rigidly connected to the plunger head, they may be loose in relation to each other and the plunger may be arranged and caused to operate after the manner of the tools of the "hammer" class.

When the tool and the plunger head are directly connected, as shown, it will be preferable to combine with them automatically acting devices to effect a step-by-step rotation of the tool, and for this purpose any of the mechanisms can be used that are now well-known to the builders of rock drills.

Where, as in the present instance, the tool is rigid with the plunger head and reciprocates therewith, it is desirable at more or less frequent intervals to remove the tool and substitute another, this being provided for by the socket and adjustable fastening devices at 24. With a drilling machine of the sort here presented, depending for its power upon an explosive engine, it is not desirable to stop the engine when one tool is being replaced by another, and I have devised means for permitting such manipulating of the tools while the engine continues in motion.

J is a pawl pivoted to the housing or casing and adapted to be put into engagement with the shank or stem 19 of the plunger, the stem being provided with ratchet ribs at 50 to engage the pawl. When it is desired that the plunger should remain stationary, notwithstanding the movements of the engine, the pawl is dropped into active position and the plunger thereafter cannot come forward, the piston cylinder at 12 reciprocating independently of it. The safety mechanism for the air-pressure prevents an indefinite increase therein, and the engine can safely continue running. The pawl is allowed to thus hold the plunger in its innermost position until the operator has effected the change of tools and thereupon, if he throws the pawl into its inactive position, the tool again resumes its work.

What I claim is,—

1. In a drill or equivalent mechanism having a reciprocating tool, the combination with the tool of a tool casing, an explosive engine on the tool casing comprising an engine piston, an air compressor comprising a piston, the air compressor piston being connected to the engine piston, a plunger head for the tool, the said mechanism comprising passageway for the air compressed by said piston to said plunger head and means for controlling the compressed air delivered to the plunger head.

2. The combination of a tool, having a driving head, driving devices for the head detached therefrom, and means for locking the head in various positions relatively to the driving devices while the driving devices are in motion, substantially as set forth.

3. In a drilling or equivalent mechanism, the combination of a tool, a plunger head therefor, means for operating said plunger head by compressed air, means independent of said operating means for locking said tool against movement, and means for controlling the air pressure, substantially as set forth.

4. In a drill or equivalent mechanism, the combination with a casing consisting at one end of an engine cylinder and at the other end of an air compressor cylinder, of a piston in said engine cylinder, a piston in said air compressor cylinder, said pistons being connected toge her, and a tool plunger head between said pistons, said mechanism comprising ducts for conducting air from said air compressor cylinder to the space between said pistons, substantially as set forth.

5. In a drill or equivalent mechanism, the combination with a casing consisting at one end of an explosive engine cylinder and at the other of an air compressor cylinder, of a piston in said engine cylinder, a piston in said air compressor cylinder, said pistons being connected together, and a tool plunger head between said pistons, said mechanism comprising ducts for conducting air from said air compressor cylinder to the space between said pistons, substantially as set forth.

6. In a drill or equivalent mechanism, the combination with a casing consisting at one end of an engine cylinder and at the other of an air compressor cylinder, of a piston in said engine cylinder, a piston in said air compressor cylinder, said pistons being connected together, a tool plunger head between said pistons, and a tool stem extending through the said air compressor piston and the end of the said air compressor cylinder, said mechanism comprising ducts for con-

ducting air from said air compressor cylinder to the space between said pistons, substantially as set forth.

7. In a drilling or equivalent mechanism, the combination with the tool, of a tool casing comprising at one end the cylinder of an explosive engine and at the other end the cylinder or an air compressor, a piston in the engine cylinder, a piston in the compressor cylinder and a tool head operated by air from said compressor.

8. In a drilling or equivalent mechanism, the combination with the tool, of a tool casing comprising at one end the cylinder of an explosive engine and at the other end the cylinder of an air compressor, a piston in the engine cylinder, a piston in the compressor cylinder, the engine and compressor pistons being rigidly connected together, and a tool head operated by air from said compressor.

9. In a drill or equivalent mechanism, the combination with a casing consisting at one end of an explosive engine cylinder and at the other end of an air compressor cylinder and of a central inclosed, fluid-tight chamber communicating with the two cylinders, a piston in said engine cylinder, a piston in said air compressor cylinder, said pistons being connected together, a crank shaft, a connecting rod between the crank shaft and one of the pistons, the said connecting rod and the cranked portion of the shaft being located within the central part of the casing, a fly wheel connected to the crank shaft, and a third tool operating piston within the air compressor cylinder and on that side of the compressor piston which is near the central chamber, and means for conducting the air compressed in the compressor cylinder to the said central chamber.

10. In a drilling or equivalent mechanism, the combination of a reservoir, having connected movable end walls, supports for the end walls, means for reciprocating said end walls, means for supplying air under pressure to said reservoir, and a piston slidably mounted in said reservoir near one end and adapted to be acted upon by the compressed air to be moved with the end walls when they move in one direction, and to be moved in the other direction when the end walls move in the other direction, by one of said end walls, substantially as set forth.

11. In a drilling or equivalent mechanism, the combination of a reservoir, having movable connected end walls, supports for the end walls, means for reciprocating said end walls, means for supplying air under pressure to said reservoir, and a piston slidably mounted in said reservoir near one end and adapted to be acted upon by the compressed air to be moved with the end walls when they move in one direction, and to be moved in the other direction when the end walls move in the other direction, by one of said end walls, an air cushion space being provided between said piston and the last mentioned end wall, substantially as set forth.

12. In a drilling or equivalent mechanism, the combination of a cylindrical reservoir containing a gaseous fluid, of which the end walls at least are movable, these walls being connected to each other, a tool operating piston slidably mounted in said reservoir and cushioned from contact with either end thereof by said gaseous fluid, and means for applying an intermittently variable gas pressure upon the outside face of one of said end walls to cause the reciprocation of said end walls.

In testimony whereof I affix my signature in presence of two witnesses.

SAMUEL S. WYER.

Witnesses:
CHAS. V. VIGOR,
F. C. BOZENHARD.