

No. 807,399.

PATENTED DEC. 12, 1905.

J. V. RICE, JR.
GAS ROCK DRILL.

APPLICATION FILED OCT. 8, 1900.

4 SHEETS—SHEET 1.

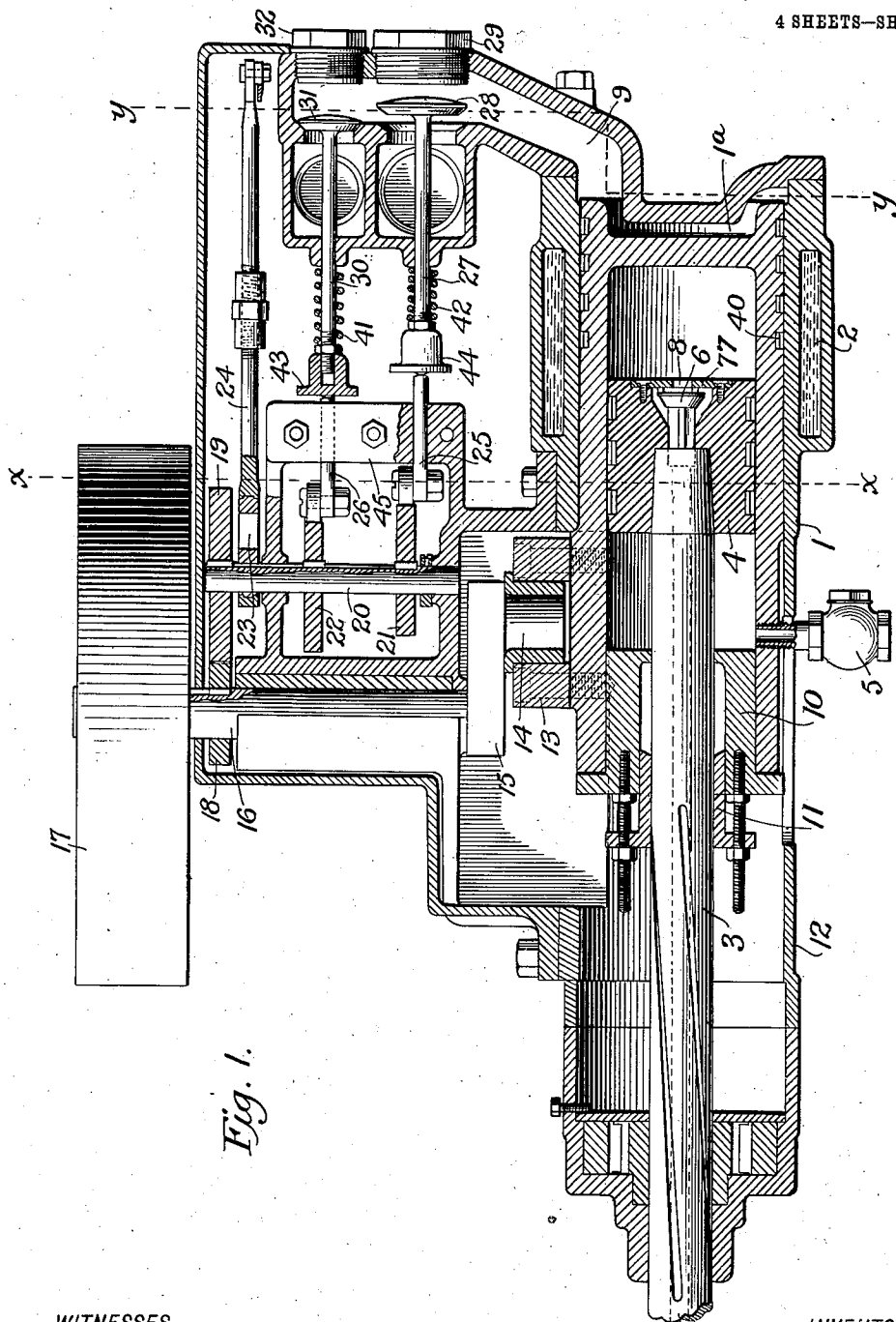


Fig. 1.

WITNESSES

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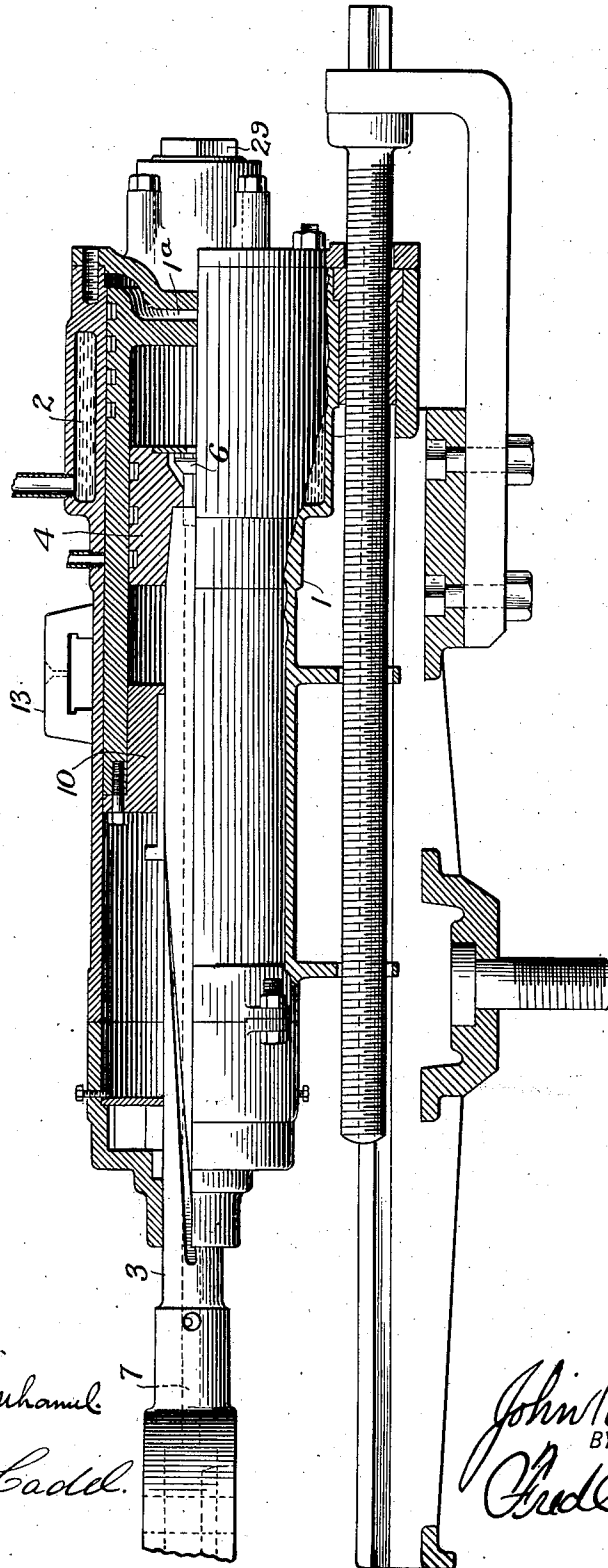
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4 SHEETS—SHEET 2

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.
on y-y.

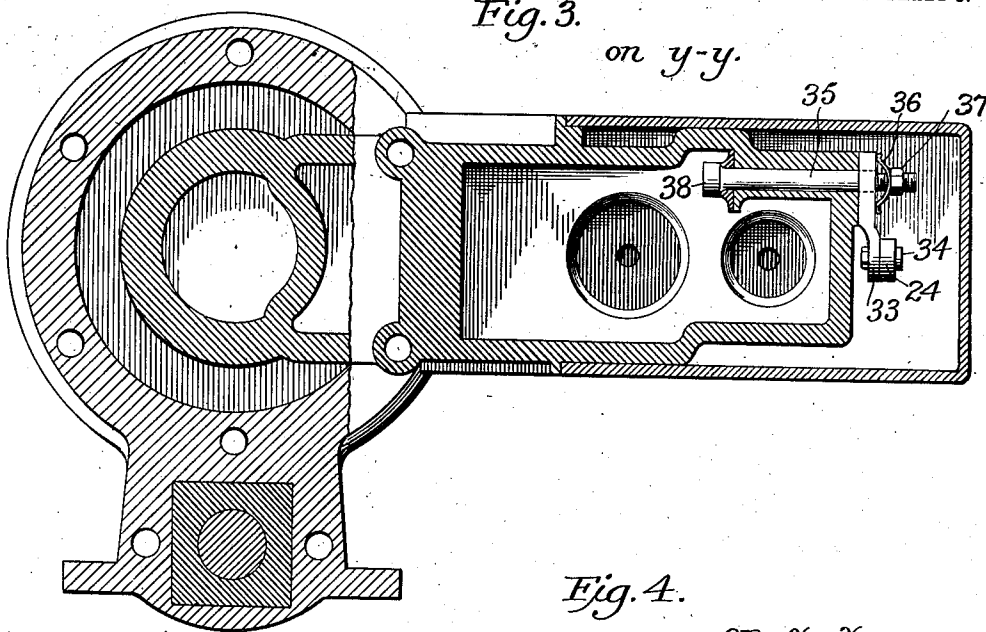
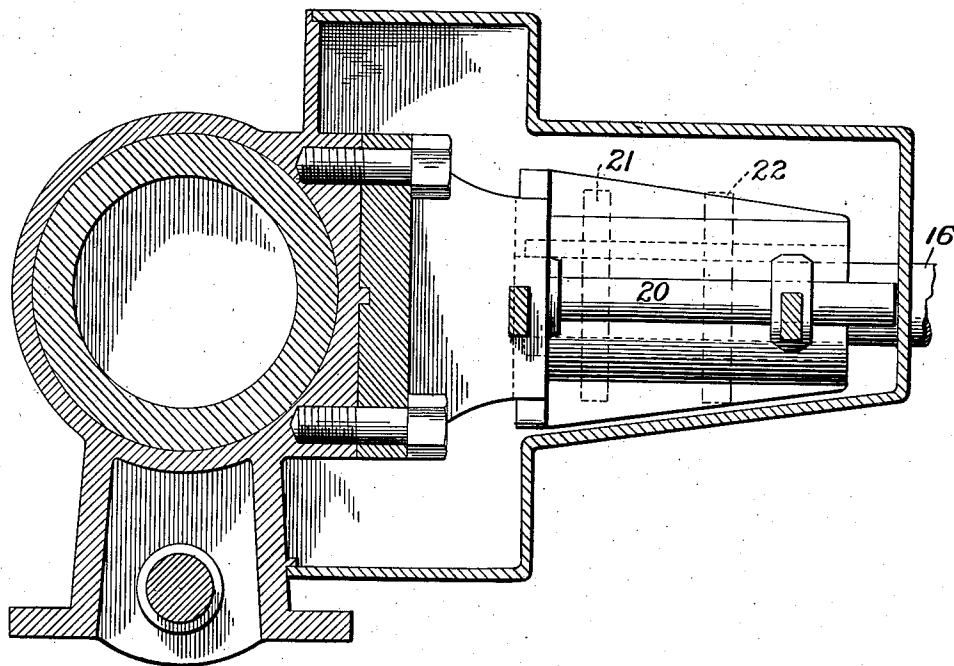


Fig. 4.
on x-x.



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4 SHEETS—SHEET 4.

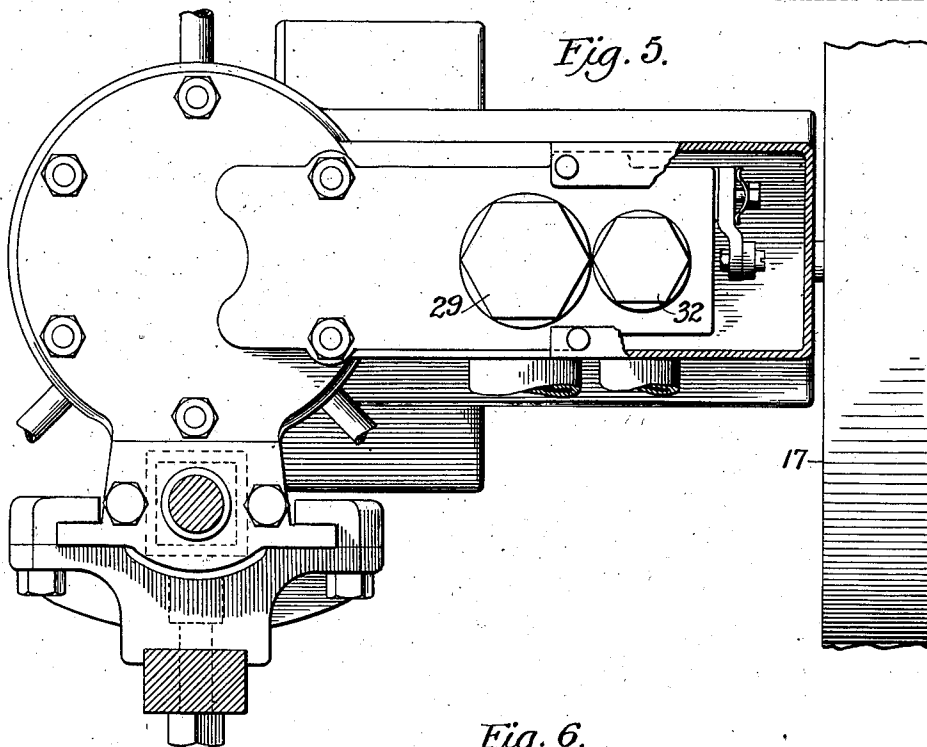
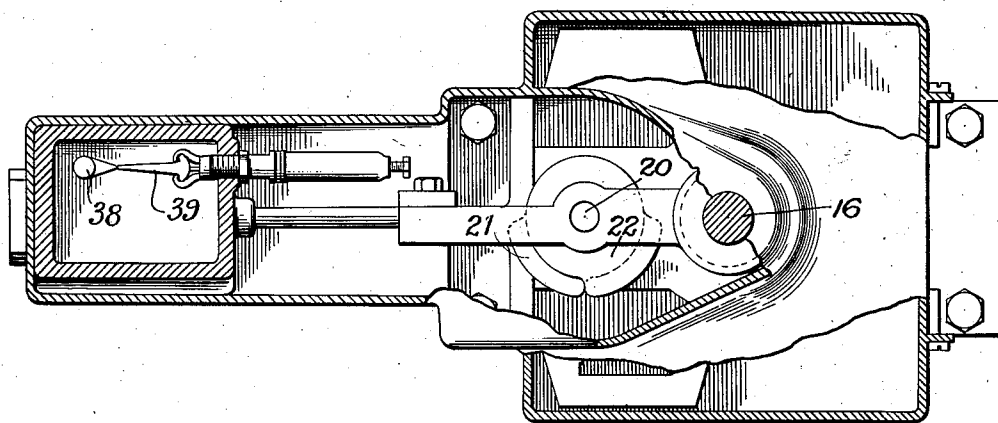


Fig. 6.



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GAS ROCK-DRILL.

No. 807,399.

Specification of Letters Patent.

Patented Dec. 12, 1905.

Application filed October 8, 1900. Serial No. 32,360.

To all whom it may concern:

Be it known that I, JOHN V. RICE, Jr., a citizen of the United States, residing at Edgewater Park, in the county of Burlington and State of New Jersey, have invented certain new and useful Improvements in Gas Rock-Drills, of which the following is a specification.

My present invention relates to an improvement in rock-drills, and more particularly to that subdivision of the general class intended primarily to be actuated by a gas or other explosive mixture.

The principal object I have in view in my present improvements is to secure greater compactness in the arrangement of the parts of the drill set forth in my copending application for Letters Patent, filed May 20, 1899, Serial No. 717,565, to which reference is here made, while other objects are to improve the general operation and achieve simplicity, cheapness, and durability; and the invention therefore consists, essentially, in the construction and combination of parts, substantially as will be described and claimed.

In the annexed drawings, Figure 1 is a horizontal sectional plan view of my improved gas-actuated rock-drill. Fig. 2 is a sectional side elevation of the same. Fig. 3 is a transverse section on the line *y y* of Fig. 1, certain parts being removed. Fig. 4 is a transverse section on the line *x x* of Fig. 1, certain parts being removed. Fig. 5 is a right-hand end elevation. Fig. 6 is a partial sectional side elevation taken from the side opposite to that shown in Fig. 2.

Like numerals of reference denote like parts in all the different figures.

1 denotes the main cylinder, surrounded by the water-jacket 2, said cylinder being opened at one end, while at the other end is the explosion-chamber 1^a, and said cylinder 1 being supported in the main machine-frame 12.

Reciprocating in the cylinder 1 is the hollow trunk-piston 40, at one end of which is the inserted sleeve or head 10, packing-gland 11, and the adjusting-screws for tightening or loosening the said gland 11. Through the said end of piston 40 passes the piston-rod 3, that is secured at its inner end to the inner block 4, that is movable within the piston 40 and serves as a part of the elastic connection between the piston and piston-rod.

In further explanation of the precise form of cushion connection herein explained for the piston and its rod it may be said the

piston-rod 3 has an axial passage 7, that receives air through some suitable inlet-port and allows said air to pass to the block 4, from which it is discharged into the right-hand end of the interior of piston 40 through the valve 6. Said valve is held from opening too far by the plate 77, which is centrally perforated at 8 and is secured to block 4 by pins or screws, as shown. Air is delivered to the left-hand end of the piston 40 on the left-hand side of block 4 by a suitable valve, as 5, (see Fig. 1,) said valve being an automatic check-valve and opening and closing automatically as the inner block 4 slides back and forth, so that the requisite amount of cushioning air may be supplied to the interior of the hollow piston 40 at the left-hand end of block 4.

On the piston 40 is secured a cross-head 13, in which travels a crank-pin 14 on the crank-arm 15, that is secured to or made a part of the crank-shaft 16, carrying the fly-wheel 17. Shaft 16 is properly supported in bearings in the main frame.

Parallel to the crank-shaft 16 another shaft 20 is supported in suitable bearings in the motor-frame, and on this are two cams 21 and 22 and an eccentric 23. Likewise on shaft 20 is a gear-wheel 19, that is engaged and driven by a pinion 18 on crank-shaft 16. The eccentric 23 actuates an eccentric-rod 24, whose opposite extremity is pivoted at 34 (see Fig. 3) to the lower end of an arm 33, connected to a revoluble pin 35, carrying at one end an electrode 38, which contacts with the oscillating electrode 39 in sparking. The end of pin 35 that connects with arm 33 is screw-threaded, and thereon is a nut 37, pressing against a spring 36, and in this way holding the electrode 38 tightly in place, as well as so keeping the pin 35 in place as not to allow any leakage through its bearings.

The passage 9, leading from the explosion-chamber 1^a, both conveys the explosive mixture to said chamber and also disposes of the exhaust after each explosion.

31 designates the inlet-valve, and 28 the exhaust-valve. A plug 32 in the wall of the passage 9 allows access to be had to valve 31 when desired, and a similar plug 29 in wall of passage 9 permits access to valve 28 when desired. Valve 31 has a stem 30, equipped with a spring 41, that is tensioned between the valve-casing and a nut 43 on the end of stem 30, which spring acts normally to keep the valve closed. Valve 28 has a stem 27,

equipped with a spring 42, that is tensioned between a nut 44 and the valve-casing, and this spring acts normally to keep the valve closed. A short rod 26 plays through a bearing in a part 45 of the main frame and has one end against the nut 43, while the other end is acted on by the cam 22. Another similar rod 25 has one end against nut 44, while the other end is acted on by the cam 21, and thus it will be seen that the cams 21 and 22 control the opening of the valves 28 and 31.

The operation of the apparatus may now be described. The internal-combustion engine which operates to drive the drill is not different in its principle of operation from an ordinary four-cycle engine. The combustion of the charge of gas or vapor mixed with air in the chamber 1^a in rear of the piston causes the latter to reciprocate, and the reciprocation of the piston in turn through the cross-head 13, the crank 14, the shaft 16, and the connected gearing operates the valves and the igniter to cause successive charges of gas and air to be admitted to the cylinder and fired and to allow the escape of the products of combustion in a well-known manner. As the piston reciprocates its motion is imparted to the piston-rod, the connection between the two, however, being elastic. It will be understood that the valves 5 and 6 operate automatically to admit sufficient quantities of air into the chambers on either side of the block 4 and to confine it therein.

The main advantages attained by the present form of the invention are simplicity and compactness. It will be understood, of course, that I am not confined to the precise construction shown.

What I claim is—

1. The combination of the main cylinder having at one end an explosion-chamber, a hollow, elongated piston, a piston-rod elastically connected to said piston, a cross-head on the piston, a crank-shaft actuating said cross-head, a cam-shaft parallel to the crank-shaft and driven thereby, and the inlet and outlet valves controlled by the cams of said shaft.

2. The combination with the main cylinder having at one end an explosion-chamber, of a hollow, elongated piston provided with an elastically-connected piston-rod, and provided also with an automatic check-valve for admitting air automatically to the interior of the piston, and the gas inlet and exhaust outlet valves together with means for operating them.

3. The combination of the main cylinder, a hollow piston therein, an inner sliding block

in the piston having an air-valve, a piston-rod provided with a longitudinal air-passage therein, said rod being attached to the inner sliding block, and the gas inlet and exhaust outlet valves together with means for operating them.

4. The combination with the main cylinder, having at one end an explosion-chamber, of a hollow piston within the cylinder, an inner sliding block in the piston, an air-valve arranged in said block, a piston-rod attached to the block and provided with a longitudinal air-passage which is controlled by the valve located in the block, an automatically-operating air-inlet valve on the wall of the piston, a cross-head on the piston, a crank-shaft, and the gas inlet and exhaust outlet valves.

5. The combination of the cylinder, its hollow piston, a piston-rod, a sliding block within the piston to which the piston-rod is attached, said sliding block having an air-valve controlling the passage of air through the piston-rod into the piston at one side of the sliding block, an air-inlet valve on the wall of the piston for admitting air automatically to the other side of the sliding block, and the gas inlet and exhaust outlet valves together with means for operating them.

6. The combination of the cylinder, a piston therein, a piston-rod, a sliding block within the piston to which the piston-rod is attached, a valve in the sliding block controlling the delivery of air through a passage in the piston-rod into the piston at one side of the sliding block, and means on the wall of the piston for admitting air automatically to the other side of the sliding block.

7. The combination with the main cylinder having at one end an explosion-chamber, of a hollow elongated piston therein, a piston-rod having an air-passage, means for yieldingly connecting the piston-rod to the piston consisting of a sliding block within the piston and on the end of the piston-rod, a valve in the sliding block for controlling the delivery of air which comes through the piston-rod at one side of the block, and means on the wall of the piston for automatically admitting air to the other side of the block, a crank-shaft, means connecting said shaft with the piston, and the gas inlet and exhaust valves together with means for operating them.

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

JOHN V. RICE, JR.

Witnesses:

WILLIAM J. DICKSON,
FRED E. TASKER.