No. 749,324. PATENTED JAN. 12, 1904.

J. V. RICE, JR.

ELECTRIC SPARKING IGNITION APPARATUS FOR GAS ROCK DRILLS.

APPLICATION FILED JUNE 8, 1895. RENEWED JULY 16, 1898.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

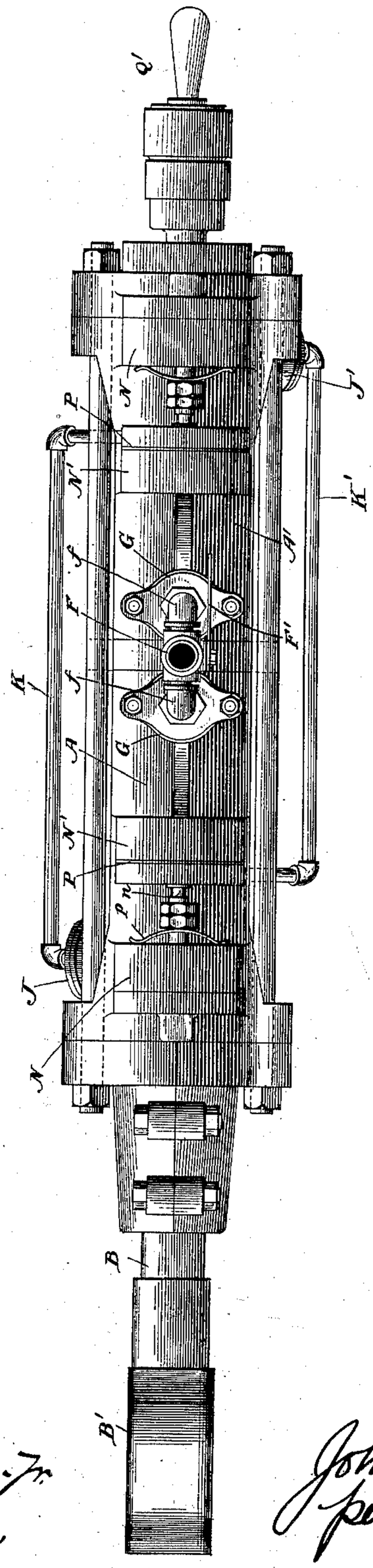
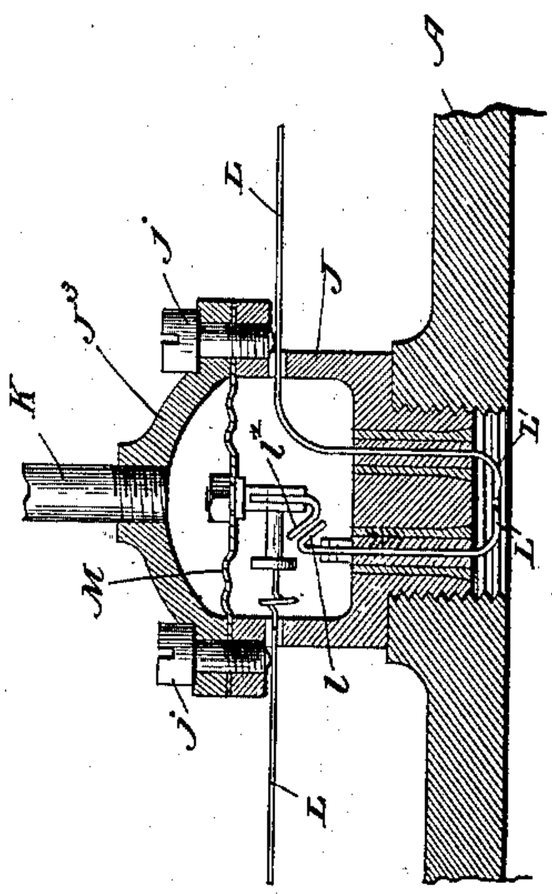


Fig. 3.



Attest.
Edw. C. Durall Jr.
A. W. Bayard.

Inventor.
John V. Rice Jr
per Fred'k Haskin
Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 749,324. PATENTED JAN. 12, 1904.

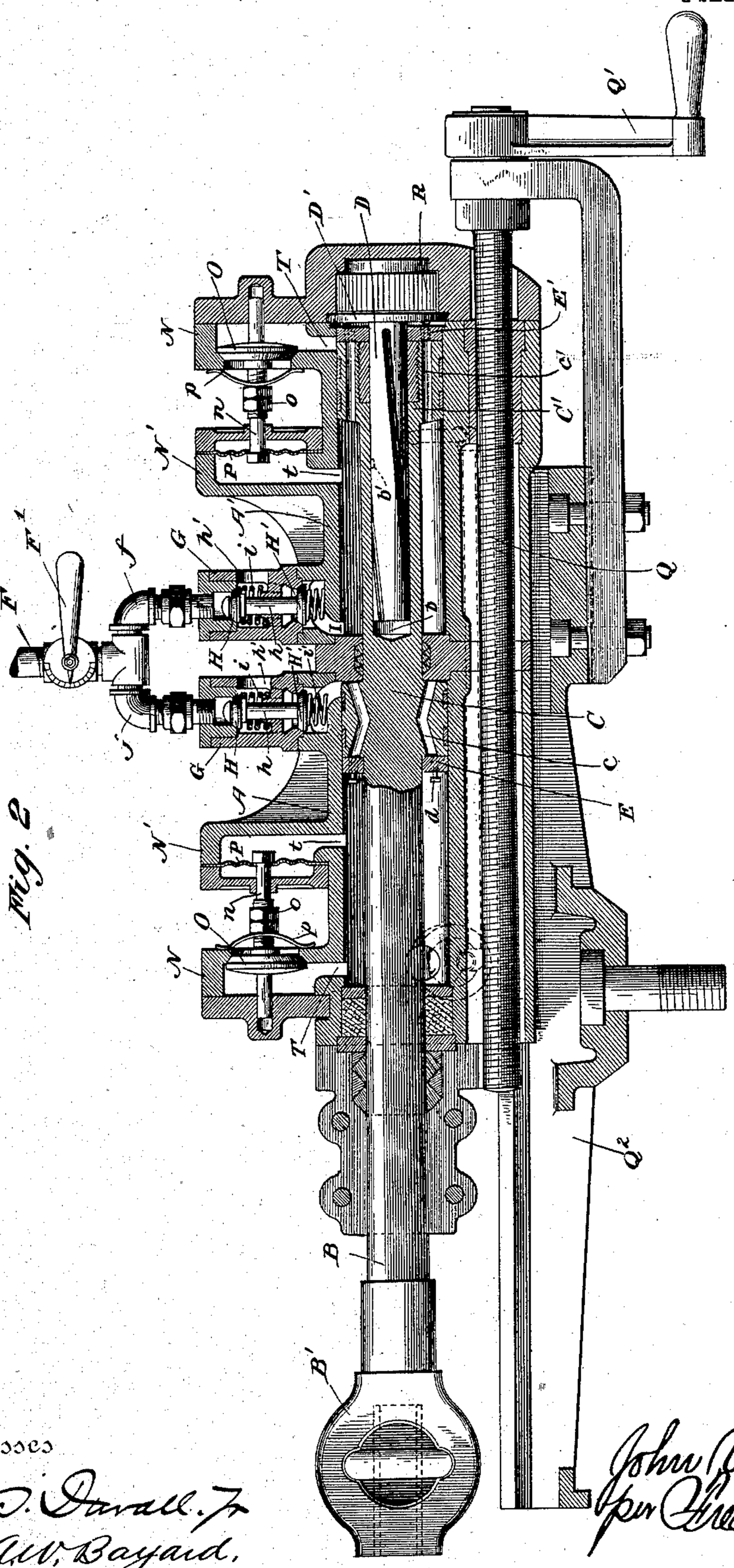
J. V. RICE, JR.

ELECTRIC SPARKING IGNITION APPARATUS FOR GAS ROCK DRILLS.

APPLICATION FILED JUNE 8, 1895. RENEWED JULY 16, 1898.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2



Witnesses
Edw. J. Darall. Jr
A. W. Bayard.

Inventor
John V. Rice Jr
per Fred'k P. Fisher.
Attorney

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 749,324. Patented January 12, 1904.

UNITED STATES PATENT OFFICE.

JOHN V. RICE, JR., OF EDGEWATER PARK, NEW JERSEY, ASSIGNOR TO THE JOHN V. RICE, JUNIOR, COMPANY, OF EDGEWATER PARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELECTRIC SPARKING IGNITION APPARATUS FOR GAS ROCK-DRILLS.

SPECIFICATION forming part of Letters Patent No. 749,324, dated January 12, 1904.

Application filed June 8, 1895. Renewed July 16, 1898. Serial No. 686,134. (No model.)

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 Electric Sparking Ignition Apparatus for Gas Rock-Drills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an igniting device for gas-driven rock-drills and the like, the invention having for its object the provision of a simple and efficient igniter for this kind of machinery.

In the drawings and the following description I have described more or less of the general motor or engine structure, but have done this simply for the purpose of illustrating one form of the engine device with which my improved igniter can be successfully employed. Another copending application, filed April 16, 1903, Serial No. 152,965, is intended to cover the drill proper and the details and peculiarities thereof, and reference is hereby made to that application for a fuller understanding of the construction and operation of the details of the motor and what I claim thereon.

The present invention therefore consists, essentially, in the construction, arrangement, and combination of the parts of the igniting device, substantially as will be hereinafter more fully described and then particularly pointed out in the claims.

In the annexed drawings, illustrating my invention, Figure 1 is a top plan view of a gas-actuated rock-drill with my improved igniting device applied thereto. Fig. 2 is a longitudinal sectional view of the same with certain parts in elevation. Fig. 3 is an enlarged detail sectional view of one of the igniting devices.

Like letters of reference denote like parts throughout the different figures.

A A′ designate two cylinders of substantially the same size placed in alinement with each other, so as to constitute in reality a single cylinder.

B denotes the piston-rod. It has thereon a piston C in cylinder A and a piston C′ in cylinder A′. The cylinders A A′ are carried by some suitable frame, as Q^2, on which they, together with all the other connected parts, are adjustable by means of a screw, as Q, having a handle Q′. The pistons are both provided with passages running transversely through them, *c* and *c′*, and each piston is provided with a valve plate or ring for controlling the passage of the gas through the aforesaid passages.

The portion of the piston-rod B which lies within the cylinder A′ is made hollow to provide a tubular cavity *b* to receive the grooved rod D, made integral with a disk D′, and also the ratchet-wheel R, situated in a recess in the right-hand head of cylinder A′ and engaged by pawls for permitting the rotation of the ratchet in one direction and effectively preventing it from rotating in the other. By this arrangement the piston-rod will during one reciprocation be permitted to pursue a rectilineal movement without rotating, while at the next reciprocation it will not only pursue a rectilineal movement, but will also rotate to a greater or less extent in order to accomplish the necessary shifting of the drill at the end of each stroke in like manner with the customary operation of rock-drills.

At the adjoining ends of the cylinders A A′ are the induction-ports I for the combined gas and air, while at the opposite ends of the cylinders the side walls are provided with the outlet-ports T T, through which the exhaust takes place, there being between ports I and T the auxiliary outlet-ports *t*, through which the gas passes to act on the diaphragm that operates the exhaust-valve. N and N′ denote small chambers on the wall of the cylinders A and A′. Port T communicates between the bore of cylinder A and the chamber N, and the port *t* communicates between the bore of cylinder A and chamber N′. Exhaust-valve O is located within chamber N and secured upon a valve-stem *n*, one end of which is sup-

ported in a recess in the wall of casing N, while the other end passes through a bearing in the end of the casing N′ and is attached to the flexible diaphragm T in the chamber N′. The cylinders are fitted with a suitable valve mechanism for admitting gas, a mixture of gas and air, or some other suitable explosive compound through the inlet-ports I I; but it is unnecessary to describe their construction here in detail.

At each end of my improved drill-machine is a gas-igniting device, which is preferably electrically operated. One of these devices is located, therefore, at the outer end of each of the cylinders A A′.

I will now proceed to describe the construction and arrangement of the parts of the gas-igniting mechanism.

J denotes a casing which is screwed into the side of the cylinder A and is closed by the outer cover J^3, fastened to casing J by means of the screws *j* or any other suitable devices. At the center of the cover J^3 a pipe K is attached thereto, which leads to the cylinder A′ and enters the wall thereof at a point a short distance from the right-hand end of said cylinder. (See Fig. 1.) On the wall of the cylinder A′ at a point about opposite to the point of entrance of pipe K is situated a casing J′, similar in form and function to the casing J and similarly attached to the cylinder. From the casing J′ a pipe K′ leads to the cylinder A and enters the wall thereof at a point approximately opposite to the casing J. (See Fig. 1 and also Fig. 3.) The casings J and J′ being of similar construction an explanation of one of them will be sufficient for both. By referring to Fig. 6 it will be seen that the casing J is divided interiorly into two compartments by means of a flexible diaphragm M, which is held in place by having its edge inserted between the casing J and the cover J^3. This diaphragm is made of any suitable flexible or yielding material—such as, for instance, a thin steel plate—and is preferably corrugated in order to increase the contact-surface of the gas therewith, as well as to improve its resilient power. The gas, which enters the casing J through the pipe K, acts against one side of the diaphragm M, but does not pass to the other side thereof. On this latter side are two electric wires or conductors L L, running from some suitable point and passing through the casing J until they enter the adjoining cylinder A or A′, as the case may be, where the two points or electrodes L′ L′ at the ends of these two wires are situated in close contact with each other and adapted to give a good spark when the electric circuit is closed. One of the wires, L, which passes through the casing J is a continuous wire; but the other is broken into two parts, having two inclined contact ends *l l*, the end *l′* being carried by the flexible diaphragm M, while the end *l* is stationary on casing J. It will be observed that a pressure against the opposite side of diaphragm M will cause the wire end *l′* to come into contact with wire end *l*, although these two ends are normally out of contact with each other, being separated for a short distance in order that the electric circuit may normally be open. The feature of having these ends *l l′* inclined as shown is of importance in maintaining an accurate contact between them for the necessary length of time after contact has once been made. When contact between these ends is so made, as stated, it will be evident that by conductivity a spark will be produced between the electrodes L L′, which spark will necessarily ignite the volume of gas within that part of the cylinder where the electrodes are located. Thus we have a gas-igniting device for each cylinder which will ignite a volume of gas at the end of each piston-stroke in order to give the necessary impulses to the piston, as will be hereinafter more fully explained.

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

1. In an igniting device for gas-driven rock-drills and the like, the combination of a cylinder, a piston, igniting devices arranged in connection with the cylinder, said devices consisting essentially of fixed, separate electrodes in the cylinder and a circuit-closing diaphragm in a casing external to the cylinder and a pipe leading to a closed compartment of said casing from the interior of the cylinder, substantially as described.

2. In an igniting device for gas-driven rock-drills and the like, the combination of the cylinders, the pistons therein, igniting devices arranged in connection with the cylinders, said devices consisting essentially of fixed, separate electrodes and a circuit-closing diaphragm, and pipes leading to said diaphragm from the interior of the cylinders, substantially as described.

3. In an igniting device for gas-driven rock-drills and the like, in combination with the cylinders, a piston movable therein, outlet and inlet valves, an igniting mechanism consisting essentially of a casing on the wall of the cylinder, a flexible diaphragm in the casing dividing it into two compartments, electric wires having separate, fixed electrode-points within the cylinder, said wires having their electric circuit opened and closed by the movement of said diaphragm, and a pipe leading from the interior of the cylinder to convey pressure to the compartment on one side of said diaphragm, substantially as described.

4. In an igniting device for gas-driven rock-drills and the like, in combination with the cylinders, a piston movable therein, outlet and inlet valves, an igniting mechanism consisting essentially of a casing, a flexible diaphragm in the casing dividing it into two compartments, electric wires having fixed, separate electrode-

points within the cylinder and running through one of the aforesaid compartments, wherein one of the wires is divided into parts having inclined ends adapted to contact with each other and one of the said ends being carried by the diaphragm, the electric circuit being opened and closed by the movement of said diaphragm, and a pipe leading from the interior of the cylinder to convey pressure into the other compartment and against one side of said diaphragm, substantially as described.

5. In an engine of the character described, the combination with the cylinder, of an igniting device consisting essentially of fixed, separate electrodes in the cylinder and a circuit-closing diaphragm and a pipe leading to said diaphragm from the interior of the cylinder, substantially as described.

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

JOHN V. RICE, JR.

Witnesses:

JOHN A. BOLAND,

H. F. REARDON.