(No Model.) 2 Sheets—Sheet 1.

G. W. ROTH.

GAS ENGINE IGNITER.

No. 549,213. Patented Nov. 5, 1895.

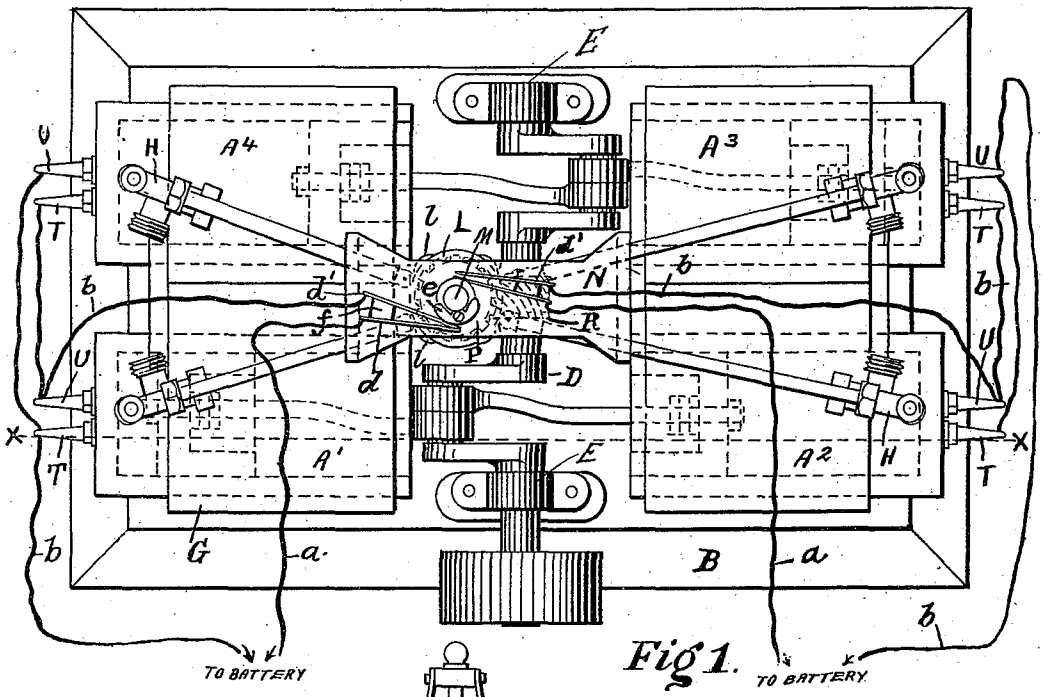

Fig 1.

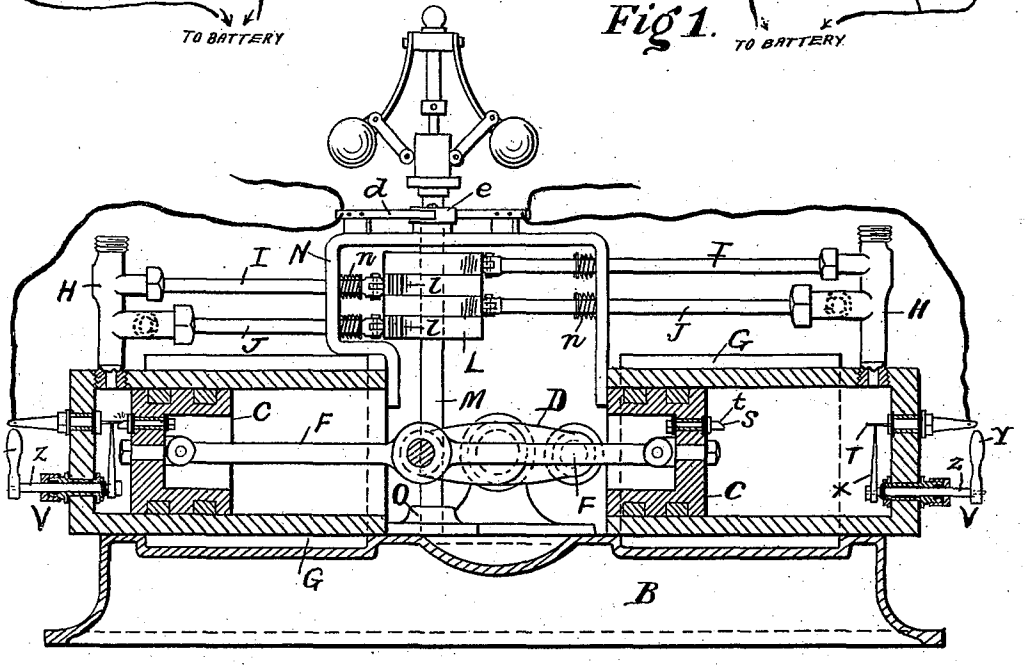

Fig 2.

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(No Model.) 2 Sheets—Sheet 2.

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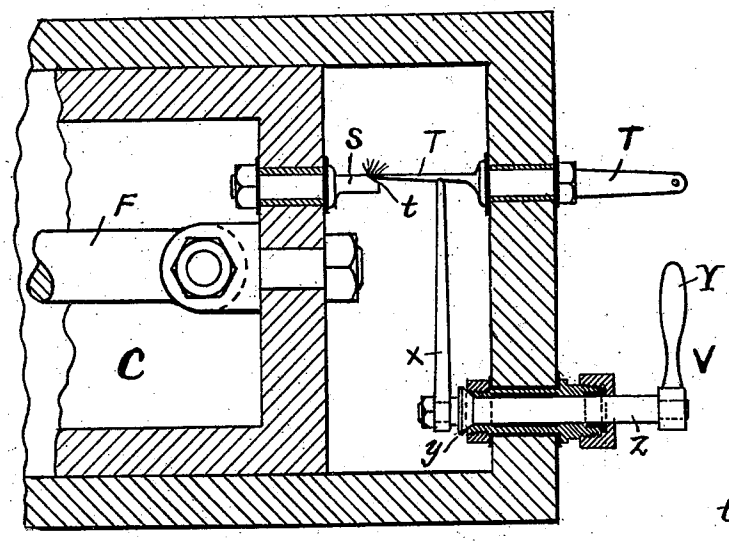

Fig 3.

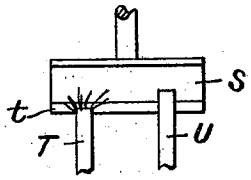

Fig 5

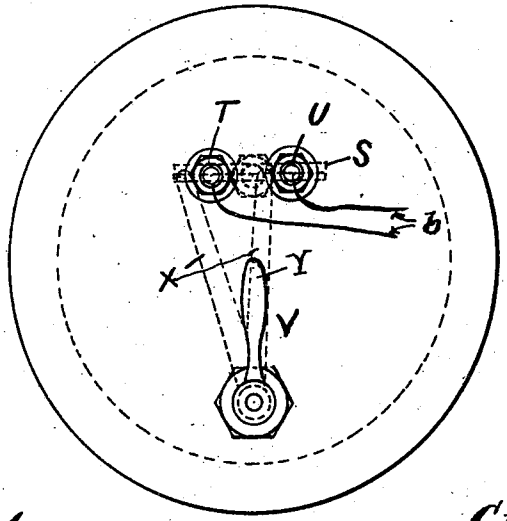

Fig 4.

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UNITED STATES PATENT OFFICE.

GILSON W. ROTH, OF INDIANAPOLIS, INDIANA.

GAS-ENGINE IGNITER.

SPECIFICATION forming part of Letters Patent No. 549,213, dated November 5, 1895.

Application filed November 12, 1894. Serial No. 528,489. (No model.)

To all whom it may concern:

Be it known that I, GILSON W. ROTH, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Gas-Engine Igniters; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to that class of engines in which a mixture of gas or gasoline and air under compression is ignited by an electric spark to operate the piston.

The object of my invention is to provide a gas or gasoline engine with four insulated cylinders, each cylinder providing power at different times at every half-revolution of the crank-shaft and to provide means whereby an electric spark will be caused in each of the cylinders at the proper time in order that the engine may have few dead-points, and, further, to provide means whereby an electric spark may be produced without turning the crank-shaft to start the engine when same is is not running; also means to automatically break off the circuit in each of the cylinders when the cylinders are exhausting the burned gases, and which will automatically connect the circuit at the proper time when the engine has compressed the gas and is ready to fire, thus saving the batteries, as the spark is only necessary in each of the cylinders at every other revolution of the stroke.

A further object is to provide a simple, inexpensive, and efficient mechanism for producing an electric spark to effect the ignition of the charge of compressed gas.

It will be seen that each of the reciprocating pistons of the engine is provided with an insulated electrode directly on a line with each other and in such a manner that they will act with yielding pressure upon the projecting electrode of the piston as it is carried against it by the movement of same.

It is obvious that a gas-engine of this type, only igniting in each of the cylinders at every other revolution of the stroke and means whereby the engine may be started without turning the crank-shaft, will run more uniform and regular than the gas-engines now common in use.

I have aimed to make my invention of few parts and of such simple construction as to make it durable in use and economical to manufacture.

With these objects in view my invention still further consists in certain novel details of construction and arrangement of parts to be hereinafter more fully described, and pointed out in the claims.

Referring to the drawings, Figure 1 represents a plan view. Fig. 2 is a vertical longitudinal sectional view of Fig. 1 on line *x x*. Fig. 3 is an enlarged broken sectional view of the cylinder, showing the electrodes. Fig. 4 is an end view of Fig. 3. Fig. 5 is a broken plan view showing the long and short electrodes.

A', A^2, A^3, and A^4 are the cylinders.

B is the bed-plate; D, the crank-shaft, which has suitable bearings E.

C is the piston, and F is the piston-rod.

G is the water-space around the cylinders.

The combustion end of the cylinder is provided with a head, preferably made integral therewith, so as to securely inclose it and confine the explosive materials, the water-space covers, each of the two cylinders and entirely around them, and is provided with suitable supply and discharge openings.

H is a combined supply and exhaust valve which communicates with the combustion end of the cylinders and has the rods I to operate the supply-valve and the rods J to operate the discharge or exhaust valves. Said rods are operated by means of the cams L, preferably made separate, so that each rod will operate independently of each other and are secured to the vertical shaft M. Said shaft has the yoke-bracket N at the top and bearings O at the bottom and is operated by means of the spiral gear-wheel P meshing in the spiral worm R on the crank-shaft. The vertical shaft M is intended to make one revolution to two revolutions of the crank-shaft D. Each of the said cams has one projection J on its periphery to operate the valve-rods. The end of the valve-rods bearing against the cams have rollers to avoid friction and wear and has the spiral spring N to automatically close the valves after the projection on the cam has passed the roller.

S is the electrode in the piston-head and is

insulated from said head by non-conducting washers and is held in place by means of a nut bearing against the washer.

T and U are the flexible electrodes which pass through the cylinder-head and are insulated therefrom and extend into the cylinder far enough for the projecting rigid electrodes on the piston-head to come in contact therewith as the piston reaches its extreme advance position. The contacting parts of the short flexible electrodes have a platinum point, so that when the point of same slides off the angle *t* of the rigid electrodes it will cause an electric spark and will ignite the explosive material.

It is to be understood that the flexible electrode U is slightly longer than the electrode T and that said short electrode T only makes the spark as it slides off the angle, and it only has the platinum point. The long flexible electrode U is only intended to connect the circuit until the spark is produced.

V is a handle to connect the circuit to produce a spark when the engine is not running and is provided with the bifurcated arms *x*, which come in contact with both of the flexible electrodes when the rubber handle Y is turned slightly to the right.

Z is the stem, and is provided with a valve-seat *y* to prevent the gases from escaping from the cylinder and is insulated from the cylinder. It is to be also understood that the cylinder and piston are insulated and are not in the circuit.

I arrange an electric battery or a series of batteries in suitable positions and carry the wires *a* and *b* from their poles to the electrodes.

I arrange in a convenient place on top of the engine a circuit-breaker *d* and *d'*, to which the wires *a* and *b* are attached, respectively, and the circuit is only connected in each of the cylinders as the cam *e* of the governor-shaft presses the breakers *d* and *d'* together, and after the cam has passed the breaker the circuit is broken by means of the points separating.

In operation the cylinders A^4 and A' are connected and are in the circuit. A^4 has ignited and is forcing out the burned gases. A' is now ignited, and as soon as the piston reaches the opposite end the circuit on cylinders A^4 and A' is broken. By this time the cam *e* has passed the breakers *d* and *d'* and closed the breakers on the opposite side, and cylinders A^2 and A^3 are in the circuit and remain so until after said cylinders ignite, respectively, in succession.

f is an insulated block between the two plates of the breakers.

It will be manifest to a skilled mechanic that the details of construction may be variously modified within the limits of my invention without materially changing the mode of action.

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

1. In a gas or gasoline engine, the combination with two or more cylinders, of a piston in each cylinder, the crank shaft connected with said pistons, valves controlling the supply of explosive materials to each cylinder and also controlling the exhaust, a vertical shaft operating from the crank shaft, operatively connected with said supply and exhaust valves, and devices for igniting the charge of explosive materials in each of the cylinders successively, and a circuit breaker, operated by a cam for each set of cylinders to connect the circuit to cause a spark in each of the cylinders at the proper time and means for producing a spark when the engine is not running, substantially as described.

2. In combination, the cylinder, the stationary electrodes secured in the head thereof, the reciprocating piston carrying an electrode adapted to contact and break contact with said stationary electrodes to form a spark and the supplemental means for forming a spark when the piston is inactive, substantially as described.

3. In combination, the cylinder, the piston reciprocating therein carrying an electrode, the stationary electrodes secured in the cylinder head adapted to contact and break contact with said electrode, carried by the piston, when said piston is operated, to form a spark and the supplemental electrode adapted to contact and break contact with said stationary electrodes to form a spark when said piston is inactive, substantially as described.

4. In combination, the cylinder, the piston reciprocating therein carrying an electrode, the stationary electrodes secured in the cylinder head adapted to contact with said electrode carried by the piston, the supplemental electrode and the means for manually operating said supplemental electrode when said piston is inactive to form a spark, substantially as described.

5. In combination the cylinder, the piston reciprocating therein carrying an electrode, the two stationary electrodes secured in the cylinder head, the supplemental forked electrode provided with an operating handle outside the cylinder head, said handle being adapted to be turned to cause the arm to contact and break contact with the stationary electrodes for forming a spark, substantially as described.

6. In a gas engine having two pairs of cylinders, the electrodes secured in the heads of each cylinder, the common wires connecting the electrodes of each pair of cylinders, the independent contact spring for each pair of cylinders and the cam alternately closing the circuit through each pair of cylinders, substantially as described.

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

GILSON W. ROTH.

Witnesses:
JNO. S. THURMAN,
MERRILL MOORES.