(No Model.)

M. M. BARRETT & J. F. DALY.

GASOLINE ENGINE.

No. 430,504. Patented June 17, 1890.

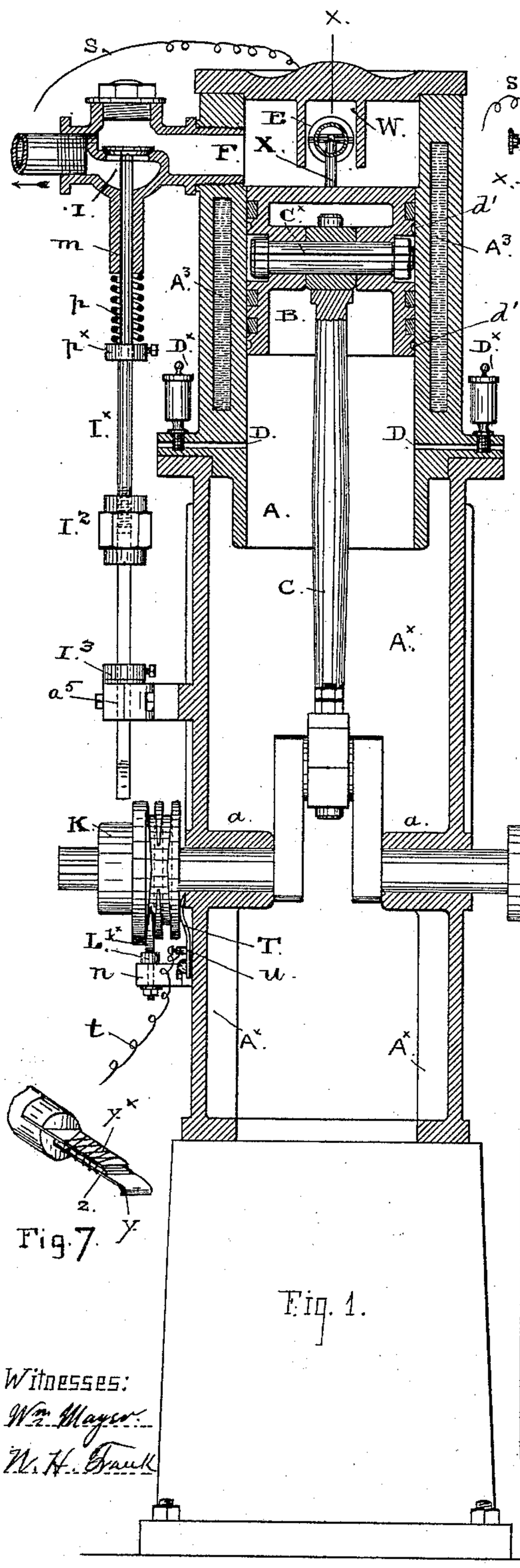

Fig. 1.

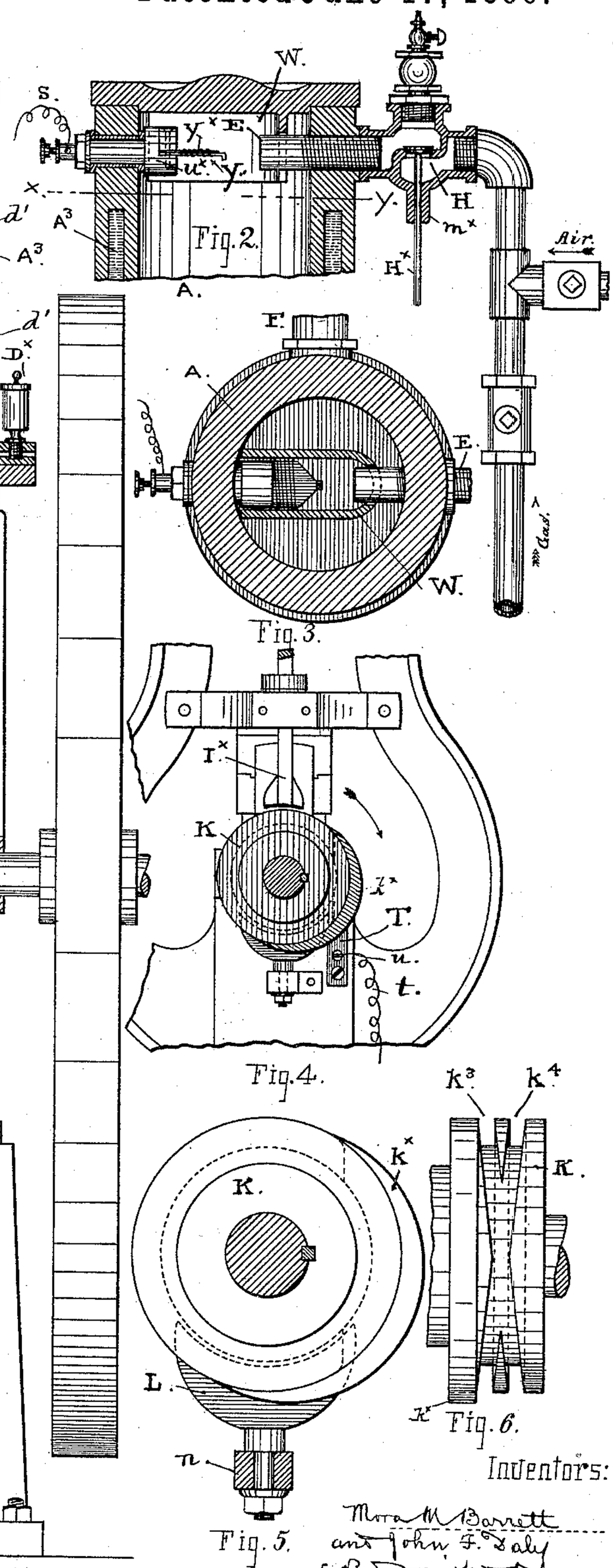

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 7.

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

MORA M. BARRETT AND JOHN F. DALY, OF SAN FRANCISCO, CALIFORNIA.

GASOLINE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 430,504, dated June 17, 1890.

Application filed July 31, 1889. Serial No. 319,288. (No model.)

To all whom it may concern:

Be it known that we, MORA M. BARRETT and JOHN F. DALY, citizens of the United States, residing in the city and county of San Francisco and State of California, have invented certain new and useful Improvements in Gasoline-Engines, of which the following is a specification.

Our invention relates to improvements in engines of that class in which the expansive force of a mixture of air and gas exploded in the engine-cylinder acts directly upon the piston; and our improvements consist in a novel valve-operating mechanism for working a valve at every alternate stroke of a piston, in a novel construction of electric gas-exploding mechanism, and also in certain novel construction and combination of parts, producing a simple, compact, and lightly-running engine, all as hereinafter fully described.

The accompanying drawings form part of this specification and represent the novel points and features of our invention with such parts of the engine shown as are necessary to a clear understanding of the construction and operation of the whole.

Figure 1 is a side elevation of our engine with cylinder-frame and piston represented in vertical section. Fig. 2 is a vertical section through the upper portion of the cylinder at the gas-inlet valve, the section being taken diametrically through the cylinder at the line *x x*, Fig. 1. Fig. 3 is a horizontal section taken at the line *x y*, Fig. 2, and looking toward the cylinder-head from the inside. Fig. 4 is a front view of the valve-operating mechanism seen at the left-hand side of Fig. 1. Figs. 5 and 6 are detail views, on a larger scale, of the shifting-cam in the valve mechanism, one view showing the front and the other the side of the cam. Fig. 7 is a perspective view of the contact-spring.

The engine is of the single-acting kind. Its cylinder A is mounted on the supporting-frame $A^{\times}$, in which are bearings *a a* for the crank-shaft, and the piston connected by the piston-rod C to the crank has the force of the exploded charge applied against its top face while the bottom is open to the atmosphere. A water-jacket A^3 surrounds the body of the cylinder, and is connected with a cold-water supply by inlet and outlet pipes for circulation of water to keep the parts cool. Oil-passages D D lead from the outside into the cylinder to carry lubricating-oil through the shell to the piston, and this part B, in addition to its packing-grooves, has oil-grooves *d'*, that become filled with oil and serve to distribute it over the inner surfaces of the cylinder as the piston moves over them. The coupling-pin $C^{\times}$ is drilled longitudinally from end to end also for an oil-channel. The passages D communicate with reservoirs $D^{\times}$.

E is the gas-inlet, and F is the exhaust, which is located at a point about ninety degrees from the gas-inlet at the circumference of the cylinder. The inlet-valve H in the supply-pipe E is lifted by suction, and the charge of air and gas is drawn into the cylinder at the descending stroke of the piston when the exhaust-valve is shut. Both valves are of the upwardly-acting kind, and the exhaust-valve is lifted at every alternate upstroke of the the piston by the cam K on the crank-shaft to open the cylinder to the atmosphere. The stem $I^{\times}$ of the exhaust-valve I passes down through a guide-socket *m* on the bottom of the valve-body, and the stem $H^{\times}$ of the inlet-valve is similarly arranged. By suitably connecting this stem with a regulating device or governor of such character that greater or less resistance to the rise of the valve from its seat in proportion to the speed attained by the engine is secured it will be seen that the supply of gas can be controlled, and the size of the charge can be varied automatically as the conditions of speed require, the area of the inlet being increased according as the speed falls below a given point or decreased as that point is passed in the other direction. The valve can also be regulated by applying a weight or a spring to the stem. The exhaust-valve is closed by a coil-spring *p*, placed between the valve-body and a collar $p^{\times}$ on the stem, and it is lifted by the face-cam K, upon which the foot of the stem seats. About one-half of the circumference of the cam is concentric, and the remaining portion $k^{\times}$ is the stem-lifting part. In the body of the cam, and extending around the circumference, a right and a left hand groove k^3 k^4 intersect each other, as shown in Figs. 1 and 6, and a switch-piece or swiveled follower L on a fixed

support *n*, directly under the cam, plays in these grooves as the cam rotates with the crank-shaft. Provision is made for the longitudinal movement of the cam thus produced by fixing it to the crank-shaft by a groove and spline, and the switch-grooves are so arranged that the cam is shifted on the shaft from beneath the valve-stem at every alternate revolution of the crank. The cam is properly shaped and timed also to seat the valve and close the exhaust as soon as the piston begins its downward movement. In addition to this office and action, the cam is employed as a part of the exploding mechanism to make and break the electric circuit, in which part of our improvements the crank-shaft, piston-rod, and piston are in the circuit and conduct the current to the terminal *x* on the head of the piston. The wire *t* from one pole of the battery is connected by binding-post *u* to an insulated circuit-closing spring T, fixed at one end to the frame in position to bear against the back of the cam when that part is shifted toward the frame and to set out of contact when the cam is thrown forward into line with the valve-stem. The other wire *s* is connected with the contact-point *y* inside the cylinder, forming the other terminal, and thus the cam by contact with the spring completes the conductor, so that the current is carried to the point *x* through the crank-shaft, piston-rod, and piston. The terminals *x y* are pressed together at every upward movement of the piston; but no spark is produced at the stroke when the exhaust-valve is being held open by the cam.

The primary object of breaking the circuit of the register at the alternate upstroke of the piston is to prevent unnecessary consumption of battery and wear of the contact-spring, thereby rendering the igniting apparatus much more durable. At the upstroke of the piston, when the engine exhausts, the igniting-spark is not required, and consequently it is a waste of energy to let the parts generate a spark at such stroke. The more often the contact-points make and break circuit the more quickly they become eaten away and the more frequently they must be renewed. Therefore the durability of the battery and parts of the electric ignitor are increased by preventing the generation of a spark at the alternate exhaust-stroke. In connection with this part of the invention attention is called to the construction of the contact-spring *y*, which is formed of a spring-tongue $y^{\times}$, fixed in the end of the post $u^{\times}$, and a tongue or plate *y*, that receives the direct contact of the point *t*, the two pieces being separated from each other by a strip of asbestus *z*. By this construction the spring part $y^{\times}$ is kept from being heated and its elasticity is not destroyed, as it otherwise would be if acting directly with the contact-point *t* to produce the spark.

The valve-stem $I^{\times}$ is divided into two parts that are coupled by a sleeve I^2 on the upper end of the lower section, having a socket, in which the end of the other section of stem has loose movement, a small space between the adjacent ends being left when the valve is seated. The collar I^3 holds the stem at suitable working height over the cam and serves to regulate the length of the stem as the foot wears down, this collar resting on the bracket a^5, through which the stem plays. An elastic washer is interposed between these parts to deaden the sound. This construction of valve-stem has the effect to produce smooth contact and separation between the cam and the foot of the stem, by which the operation of the valve is made almost noiseless.

Another feature of our improvements consists in placing the exploding-points in such close relation to the gas-inlet that the stream of cold gas shall impinge against the contact-spring *y*. The low temperature of the gas at its time of expansion in the cylinder is thus utilized to keep down the temperature of the contact-points. The effect is increased also by placing over the spring and around the mouth of the gas-inlet a hood W, that incloses the spring on two sides and acts to confine the stream of gas around that part at the time of its entrance. This hood is seen in Figs. 2 and 3. It can be cast in one piece with the cylinder-head, or it may be a separate piece secured to the inside of the cylinder. As thus constructed and combined for operation, these improvements produce a single-acting engine of great simplicity and possessing also many advantages in points of durability, noiselessness, and readiness of adjustment to run at high or low speed.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a gasoline-engine, the combination of a cylinder and cylinder-head having a hood formed of parallel plates projecting from it and the fixed contact-point on one side of the cylinder and the gas-inlet on the opposite side, both covered by the hood, as set forth.

2. In an electric-spark producer for gas and gasoline engines, a fixed contact-point or electrode located within the cylinder-space above the piston and connected through the cylinder with the battery outside, a contact-point or electrode fixed on the piston and adapted by the movement of that part to be pressed against the fixed contact-point, a contact-spring on the engine electrically isolated from all the parts of the engine and its frame and having electrical connection with the battery, and the shifting-cam on the engine-shaft, having movement as described, by which the electric current is interrupted at every alternate stroke of the piston and is established at the beginning of every other stroke.

3. In combination with the valve I, to be operated at every alternate revolution of the piston-actuating shaft, the longitudinally-sliding cam K on the shaft, the swiveled switch-piece L, the grooves k^3 k^4 in the cam,

and the divided valve-stem composed of the two sections joined by a coupling-sleeve, the adjustable collar, and the coil-spring, substantially as described.

4. In a gas or gasoline engine, the electric-spark producer consisting of the fixed tongue inside the cylinder, formed of the spring $y^{\times}$, the contact-piece y, and the interposed non-conducting layer of asbestus or like heat-resisting material and constituting one terminal of the circuit from a suitable battery, and the contact-point x on the piston and in electrical connection with the battery through the piston-rod and adjacent part, substantially as described.

5. The herein-described engine for working with gas or gasoline, consisting of the upright cylinder A, the frame $A^{\times}$, having bearings for the crank-shaft, the single-acting piston B, crank-shaft, and piston-rod, gas-inlet E, inlet-valve H, exhaust F, exhaust-valve I, the hood W, suitable valve-operating mechanism actuated by or from the crank-shaft at every alternate revolution thereof to open the exhaust, the spring p as a means of closing said valve, and the automatic spark-producer adapted to explode the charge of gas at the downward movement of the piston when the exhaust is closed, composed of the fixed contact-point y, conductor s, moving contact-point x on the piston, the conductor t, and a circuit-breaker located between the contact-point x and the conductor t outside and actuated by the revolutions of the crank-shaft to break the circuit at every alternate contact of the two points $x\,y$ in that period of the movements of the piston when the exhaust-valve is open, all combined for operation as set forth.

In testimony that we claim the foregoing we have hereunto set our hands and seals.

MORA M. BARRETT. [L. S.]
JOHN F. DALY. [L. S.]

Witnesses:
J. E. FORD,
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