

(No Model.)

W. A. GRAHAM.

GAS ENGINE.

No. 330,317.

Patented Nov. 10, 1885.

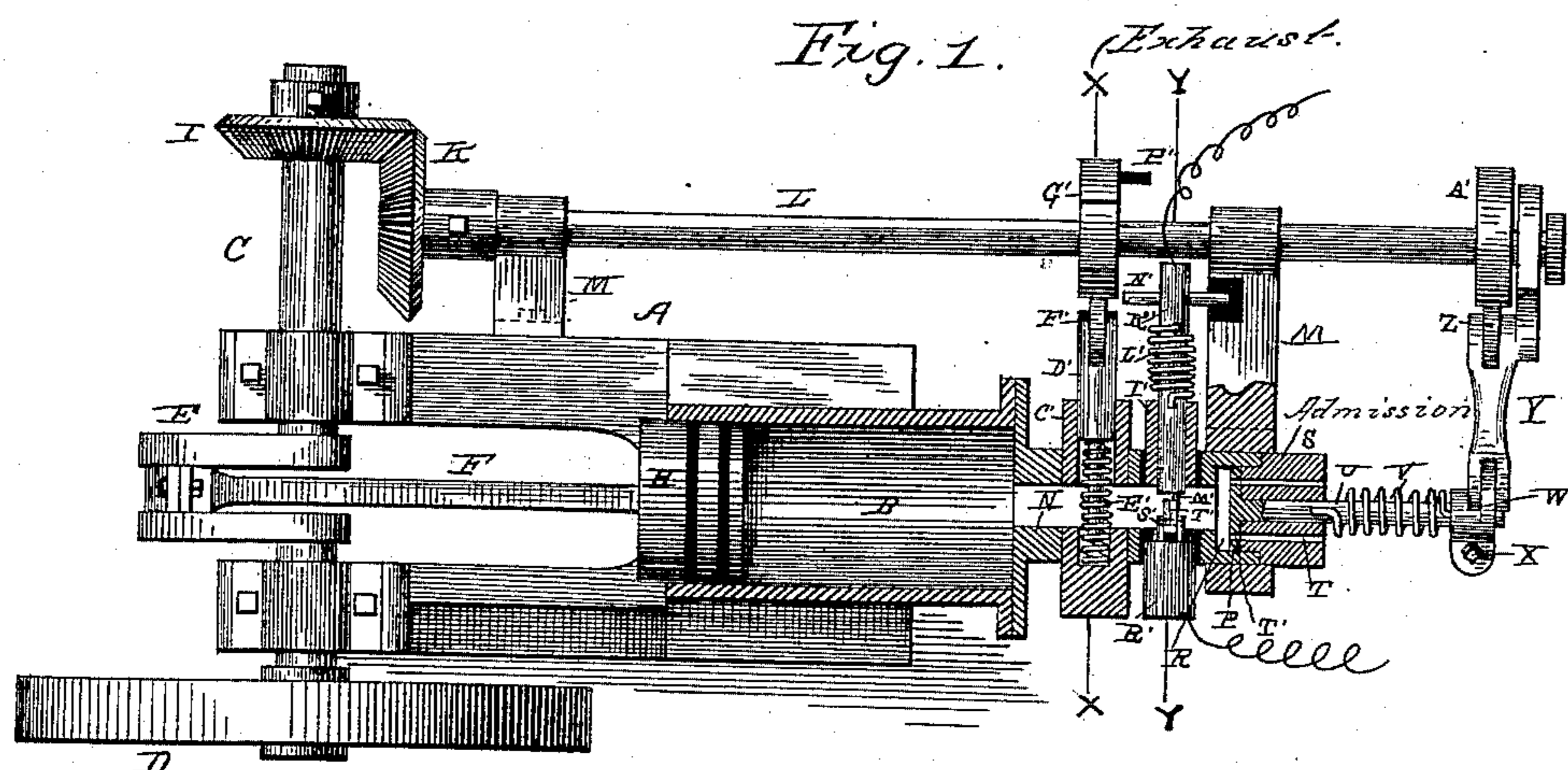


Fig. 2.

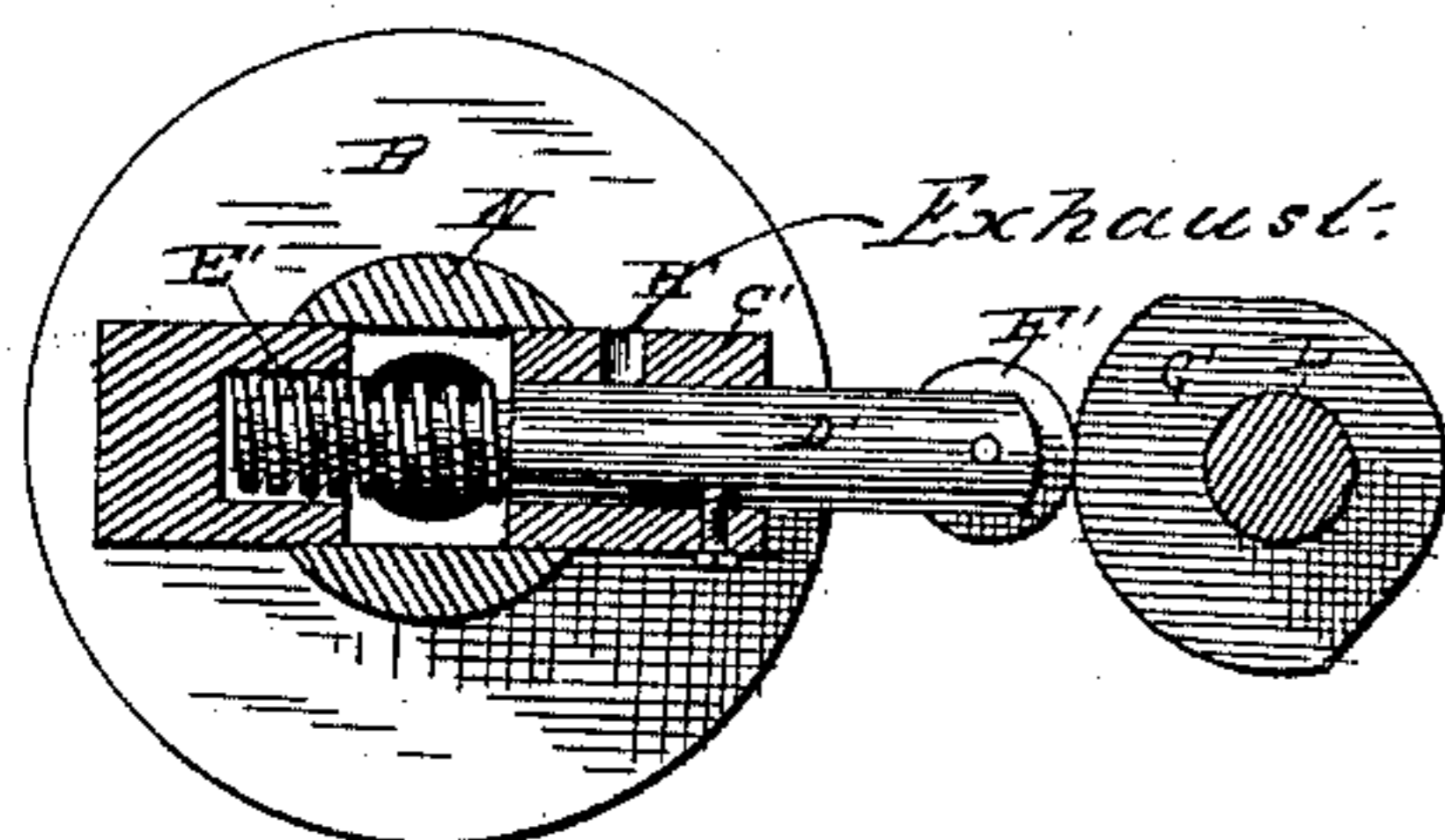


Fig. 3.

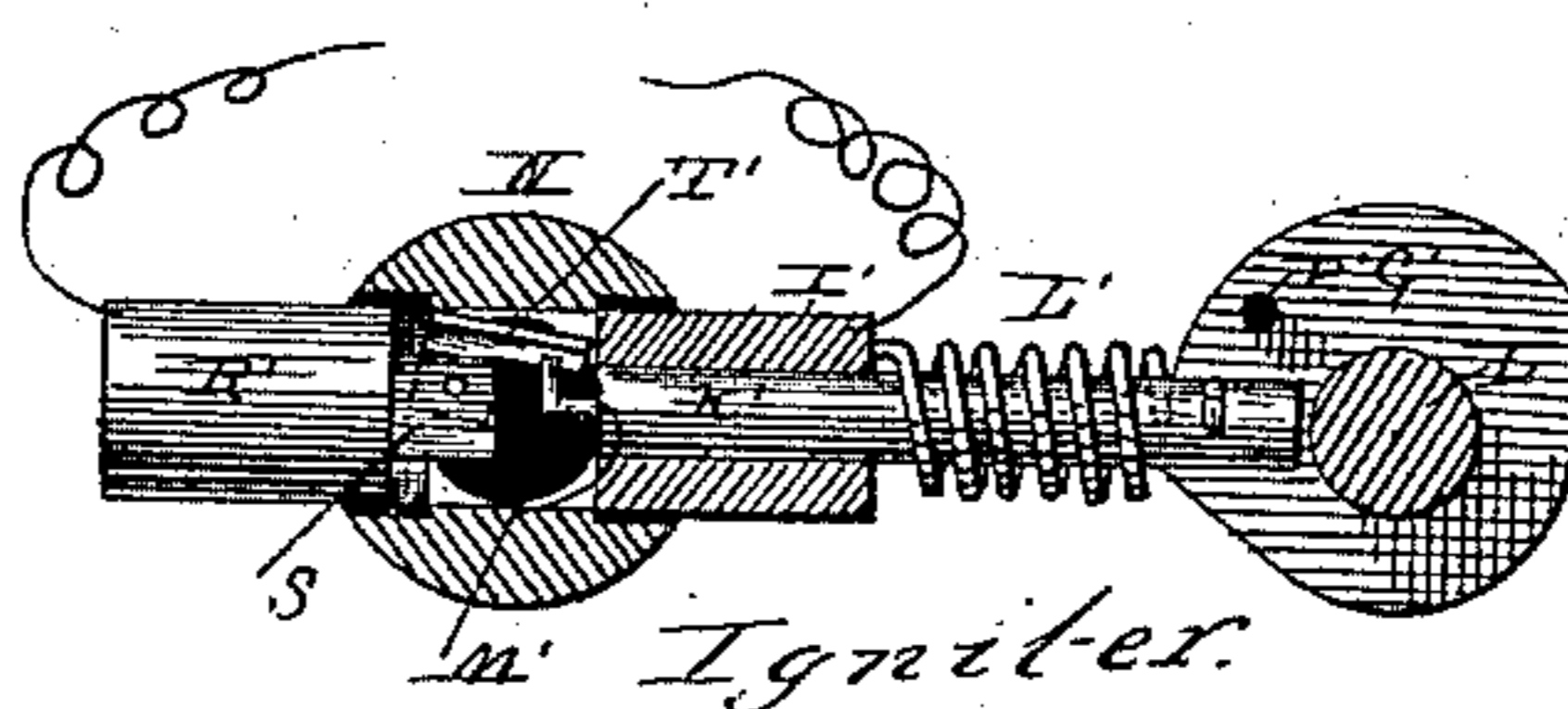


Fig: 4.

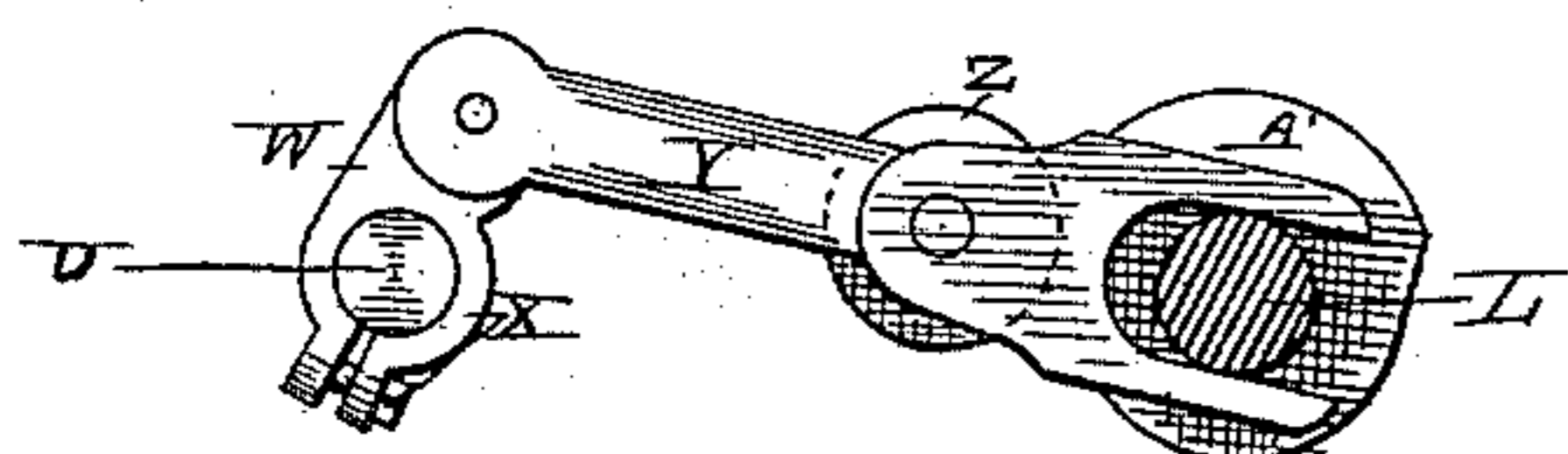
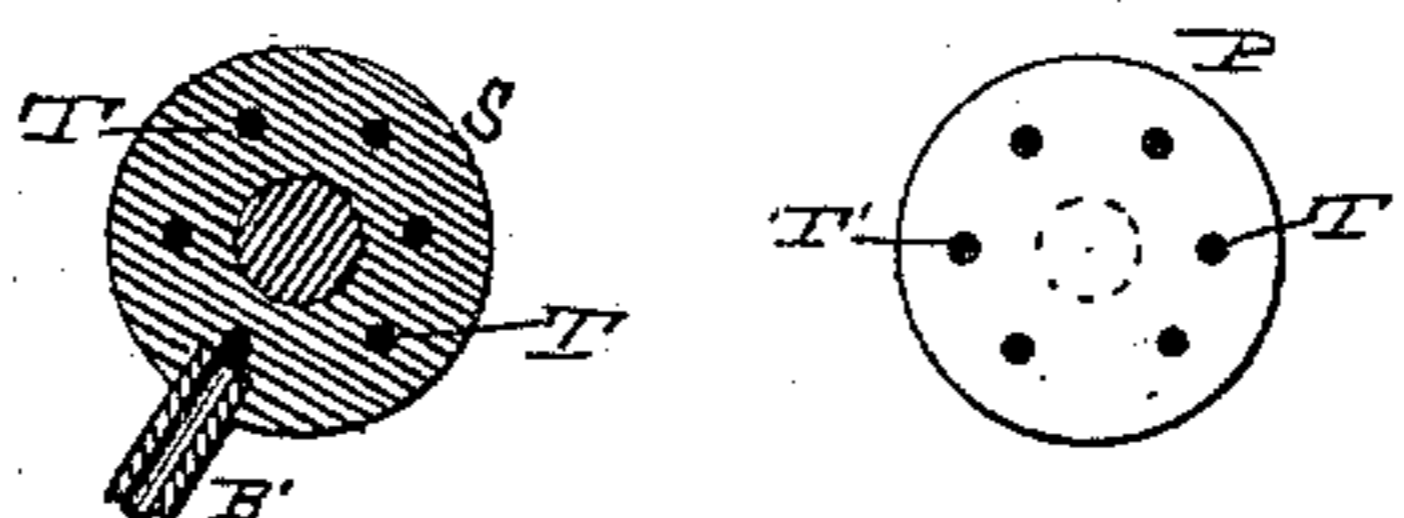


Fig. 5



WITNESSES

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WILLIAM A. GRAHAM, OF CARLISLE, PENNSYLVANIA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 330,317, dated November 10, 1885.

Application filed August 18, 1885. Serial No. 174,684. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. GRAHAM, a citizen of the United States, residing at Carlisle, in the county of Cumberland and State of Pennsylvania, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to certain improvements in gas or explosive engines; and it has for its objects to provide for accurately combining with the gas entering the cylinder behind the piston a proper quantity of air to produce the explosion, and to ignite the mixed gas and air by an electric spark at the proper time, as more fully hereinafter described. These objects I attain by the means illustrated in the accompanying drawings, in which—

20 Figure 1 represents a view partly in plan and partly in horizontal section; Fig. 2, a transverse sectional view taken on the line *x x* of Fig. 1; Fig. 3, a similar view taken on the line *y y* of Fig. 1; Fig. 4, a detailed view of the induction-valve-operating mechanism, and Fig. 5 detailed views of the induction-valve and valve-seat.

30 The letter A indicates the bed of the engine, B the cylinder thereof, and C the driving-shaft, which is provided with a fly-wheel, D, at one end. These parts are of the ordinary or any approved construction. The driving-shaft is provided with a crank, E, to which is connected the forward end of the piston-rod F, which is pivoted at its rear end in a recess in the piston or plunger H, which reciprocates in the cylinder in the usual manner. The driving-shaft has mounted on it a beveled cog gear-wheel, I, which intermeshes with a similar beveled cog gear-wheel, K, mounted on the forward end of a shaft, L, extending longitudinally along one side of the engine and journaled in suitable bearing-blocks, M, attached thereto. At the rear of the cylinder is a tubular extension, N, in which are located the induction and exhaust valves and the device for igniting the mixed gas and air at the proper time.

45 The letter P indicates the induction-valve, which is cylindrical in form, and is arranged to rotate in a cylindrical recess, R, in the rear of the tubular extension N.

S indicates the valve-seat, which is provided with a series of apertures, T, passing through it. The valve is provided with a series of similar apertures, T', which are open to the external air at the rear, and are adapted to communicate with the apertures in the valve-seat at proper intervals, as more fully hereinafter described. The valve is mounted on a valve-rod, U, and is held normally closed by means of a spiral spring, V. To the rear end of said valve-rod is secured an adjustable arm, W, which is split at its lower end and clamped to the rod by means of a set-screw, X, so that the throw of the valve may be readily regulated. The upper end of the said arm has pivoted to it one end of a pitman, Y, the other end of which is bifurcated and rides upon the shaft L, by which it is guided in its movement. The said pitman is provided with a friction-roller, Z, which bears against a rotating cam, A', mounted on the shaft L, by which the said pitman is operated at the proper time to open the valve. The valve is provided with a gas-induction pipe, B', leading from a suitable source of supply, in order to admit gas to the engine.

75 The letter C' indicates a transverse tube extending laterally from the tubular extension N. In the said tube is located a reciprocating plunger, D', which has behind it a spiral spring, E', which keeps it pressed normally outward. The said plunger is bifurcated at its outer end, and is provided with a friction-wheel, F', which bears against a rotating cam, G', mounted upon the shaft L, by means of which the plunger is forced inward at proper intervals to close the exhaust. The tube C' is provided with an opening, H', through which the exhaust takes place when the plunger is forced outward.

95 The letter I' indicates a short lateral tube extending from the tubular extension, and K' a cylindrical shaft located and adapted to partially rotate in said tube. The shaft is provided with a spiral spring, L', which holds it in a normal position. On its inner end the shaft is provided with a right-angled conductor, M', which is connected to a suitable battery or other source of electrical supply by means of a suitable conducting-wire. The shaft at its outer end has a lateral arm, N',

which is tripped at proper intervals by a trip-pin, P', on the cam G', so as to move the conductor or oscillate it back and forth.

The letter R' indicates an insulated plug, 5 which is inserted in a lateral aperture in the tubular extension directly opposite the shaft carrying the conductor, before mentioned. This plug has at its inner end a short recessed extension, S', in which is pivoted a tumbler, 10 T', which is preferably made of platinum or other refractory metal which is not readily oxidized. The lower side of said tumbler, at its forward end, is beveled, as indicated, so that the conductor in passing will lift it and 15 allow it to drop after passing, thus making two contacts at each movement of the conductor and inducing two sparks. The tumbler is connected to the opposite pole of the battery or generator to that with which the 20 conductor is connected by means of suitable conducting-wires.

The operation of my invention is as follows: When the piston is at the end of the cylinder nearest the valves, the admission-valve opens 25 and admits a charge of air and gas during a part of the forward stroke. The electric contact is then established, causing a spark and an explosion, which drives the piston forward. The exhaust opens when the piston reaches 30 the forward or open end of the cylinder, and remains open during the return of the piston, thus expelling the exhaust. A new charge is then admitted as before, and so on.

Having thus described my invention, what I

claim, and desire to secure by Letters Patent, 35 is—

1. The combination, in a gas-engine, of the partially-rotating valve having a series of apertures extending through it, the valve-seat 40 having a series of similar apertures, the spiral spring mounted on the valve-rod and the arm and pitman, and operating-cam mounted on the longitudinal shaft deriving its motion from the driving-shaft, substantially as and for the purpose specified. 45

2. The combination, with the cylinder of the engine, of the partially-rotating rod and spring by which it is held normally, the conductor secured to said rod, the tumbler adapted to 50 operate in connection with said conductor and the transverse arm, and trip-pin mounted on the cam-wheel of the exhaust-valve, whereby an electric spark is produced to ignite the charge in the cylinder, substantially as specified. 55

3. The combination, with the cylinder, of 60 the lateral tube having an exhaust-opening, the plunger and spring by which it is pressed normally outward, and the cam mounted on the longitudinal shaft deriving its motion from the driving-shaft, whereby the exhaust from 60 the cylinder is effected, substantially as specified.

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

WILLIAM A. GRAHAM

Witnesses:

CHAS. D. DAVIS,
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