

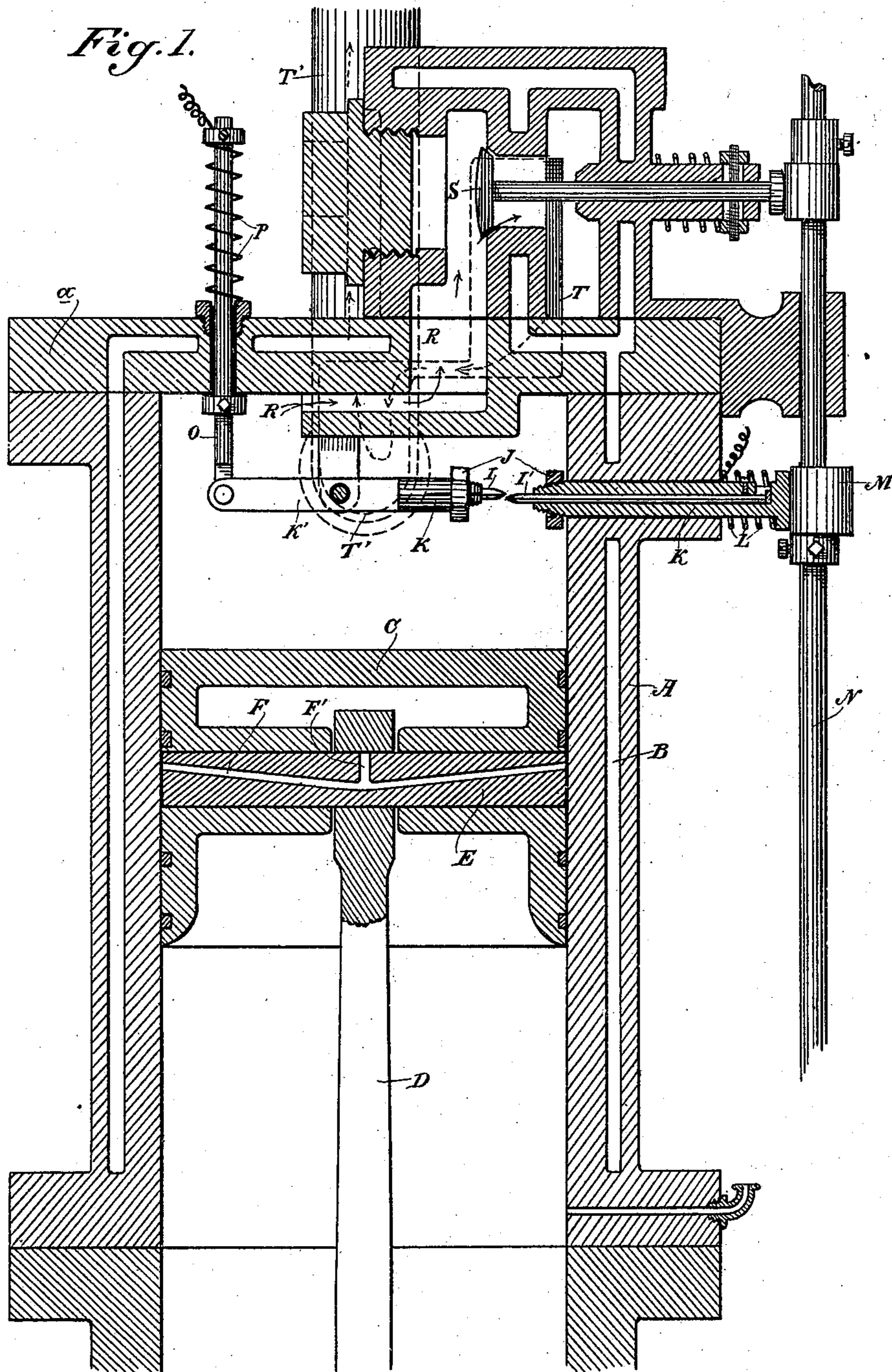
(No Model.)

2 Sheets—Sheet 1.

W. H. WORTH.  
GAS ENGINE.

No. 504,260.

Patented Aug. 29, 1893.



Witnesses,  
J. H. House  
H. F. Aschbeck

Inventor,  
William H. Worth  
By Dewey & Co.  
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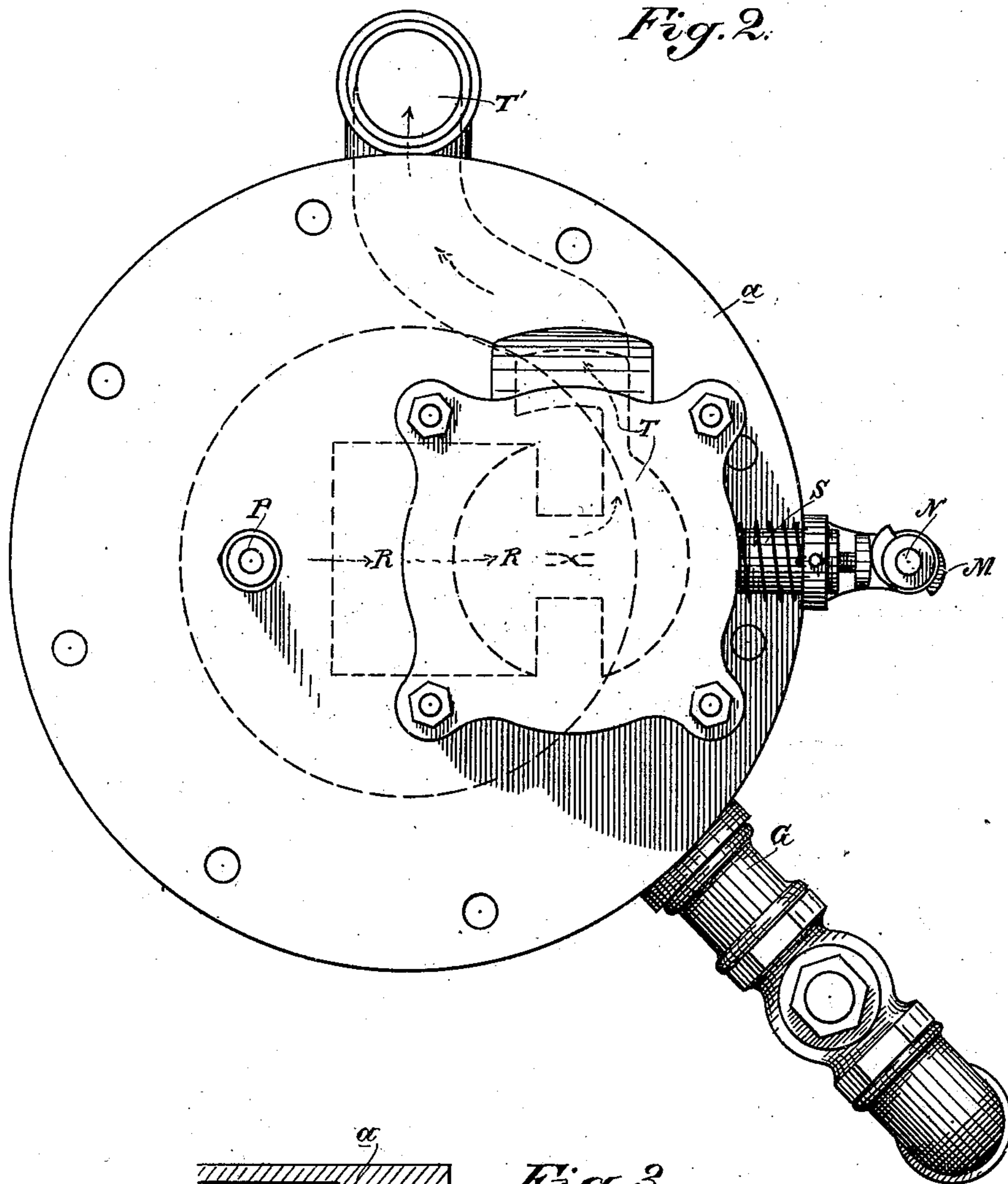
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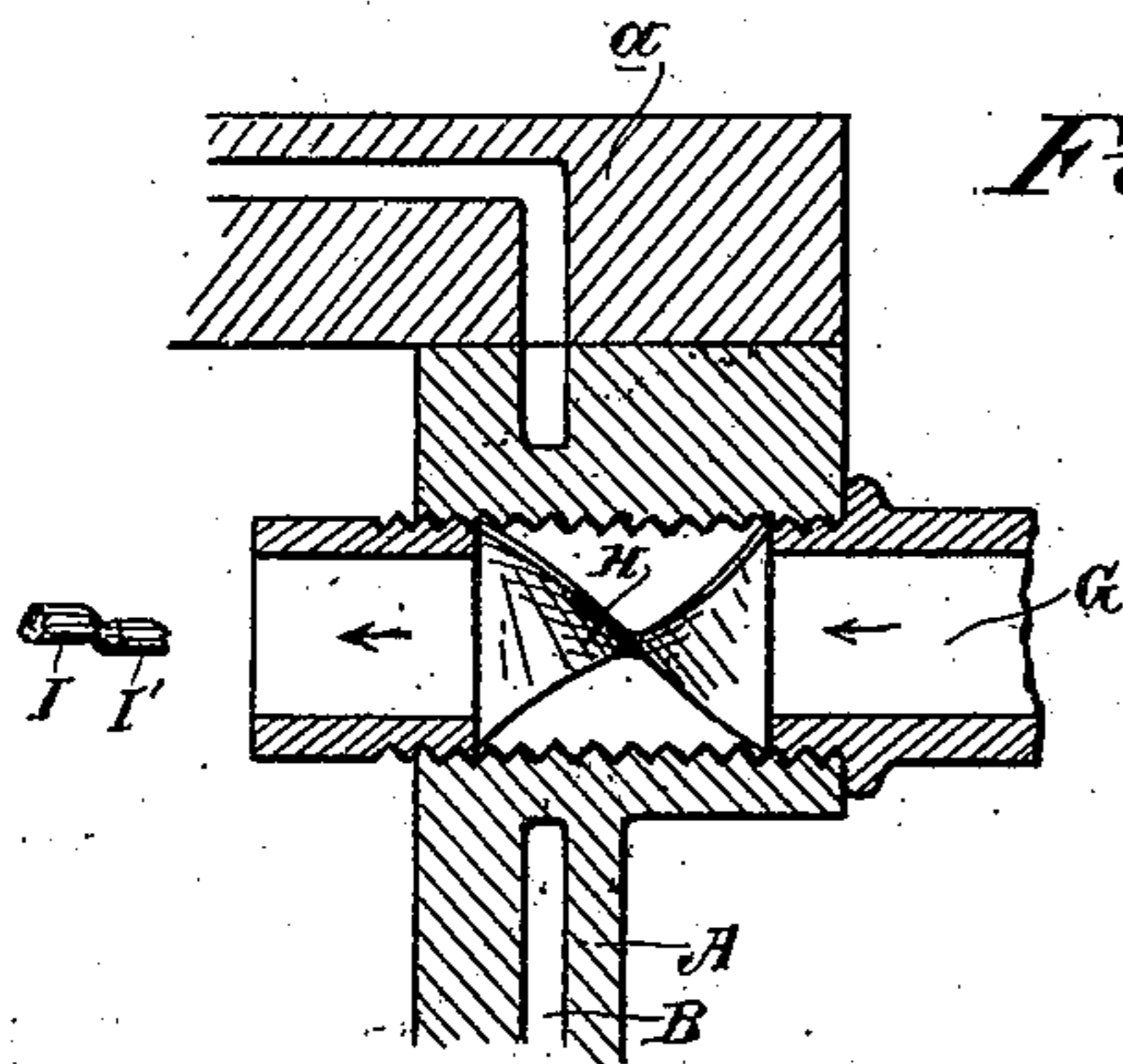
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*Fig. 2.*



*Fig. 3.*



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# UNITED STATES PATENT OFFICE.

WILLIAM HENRY WORTH, OF PETALUMA, CALIFORNIA.

## GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 504,260, dated August 29, 1893.

Application filed June 20, 1892. Serial No. 437,386. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HENRY WORTH, a citizen of the United States, residing at Petaluma, Sonoma county, State of California, have invented an Improvement in Gas-Engines; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to certain improvements in gas engines.

It consists in details of construction which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a vertical section of the cylinder taken through the plane of the electrodes, showing also a section of the piston, the end of the crank rod and connecting pin. Fig. 2 is a plan view of the cylinder. Fig. 3 is a section showing the gas inlet and mixing device.

A is the cylinder of my engine, shown in the present case in a vertical position having the usual annular water spaces B through which water circulates to keep the cylinder from undue heating.

C is the piston fitted to reciprocate within the cylinder having suitable packing rings, and D is a connecting rod extending from the piston to the crank pin.

E is the pin by which the connecting rod is united with the piston. This pin extends entirely through the piston and has holes F bored longitudinally into it from the ends, these holes F declining from the exterior ends, and meeting at their lowest points at the center, where they connect with a vertical passage F' which opens into a chamber in the piston head, containing oil or lubricant. This lubricant passing down through the passage F' is delivered into the passages F, and is gradually carried outward to the ends where it is delivered upon the inner surface of the cylinder, and is distributed by the reciprocation of the piston so as to keep the interior of the cylinder constantly lubricated.

Gas is admitted to the cylinder A near its upper end through an inlet opening G controlled by a suitable valve mechanism not here described.

The gas and air having been mixed in proper proportions before being delivered into

the passage G, pass through this passage into the upper end of the cylinder, as the piston moves toward the lower end of the cylinder.

In order to thoroughly mix and incorporate the gas and the air, I have shown a spirally shaped blade or mixer H secured in the length of the passage G so that as the components of the gas pass through it they are given a whirling or twisting motion which serves to thoroughly mix and incorporate them at the instant when they are delivered into the cylinder, and as this mixture is purely mechanical it insures its having the highest possible explosive quality at the instant when it is required. The mixer H fits easily in the passage, and is clamped in place by the two tubes screwing in against it from opposite ends.

I I' are the electrodes by which the explosion is produced through the agency of a battery or other electric current producing apparatus, this explosion taking place at the instant when the explosive compound has been compressed in the upper end of the cylinder by the return of the piston after the cylinder has been filled. These electrodes are fitted into tubular sleeves K, the outer ends of which are tapered, split, and are provided with exterior nuts J which when screwed upon the tapering split ends, compress them upon the electrodes I I' which pass through them, thus holding the latter firmly in place. The sleeve K which carries the electrode I' is surrounded by a spiral spring L which acts to withdraw it and its electrode whenever it is released. It is forced inward so as to form contact with the electrode I, by means of a cam M fixed upon the shaft N which is properly rotated by connection with the crank axle, so that the electrode I' is forced into contact with the electrode I at the instant when the piston C is in proper position to receive the impulse caused by the explosion, and the spark is thus produced by making or breaking contact between the electrodes. This constant making and breaking of contact causes a certain amount of wear upon the electrodes, so that some time they will cease to come together in the proper manner to produce the spark. By means of my adjusting mechanism, which I have here shown,

I am enabled to regulate the position of the electrodes with relation to each other so as to compensate for all wear and retain them at all times in the proper position to produce the  
5 spark.

The sleeve K which carries the electrode I is mounted upon a pivoted oscillating arm K', and the rear end of this arm is connected with the rod O extending up through the  
10 head of the cylinder and insulated therefrom by any suitable insulating material. This rod is surrounded by a spring P, the tendency of which is to draw it up, and thus hold the electrode I down in line with the  
15 direction of motion of the electrode I'. These electrodes being tapered or pointed, as shown, it will be manifest that when the electrode I' comes in contact with the electrode I the spring P will yield, thus allowing the arm  
20 K' to oscillate upon its fulcrum pin, and while allowing a perfect contact between the electrodes it will prevent the bending or breaking of them by too great a pressure. The constant rubbing also prevents the deposit of  
25 a coating which would decrease their conductivity. As soon as the electrode I' is withdrawn by the action of the spring L, the spring P will act through the rod O upon the arm K', and will again move the electrode I  
30 into line with the electrode I'. In the present case I have shown the exhaust passage R extending up through the removable head a of the engine cylinder, with a valve S which is opened at the proper intervals to allow the  
35 exhaust gases to escape, and from this a port or passage T leads downwardly into the side of the body of the cylinder so as to discharge into the outlet passage T'.

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

1. In a gas engine, electrodes arranged with their major axes on approximately the same line, means for moving one of said electrodes  
45 longitudinally inward, a spring for retracting it, means for allowing the other electrode to

swing into an inclined plane, and a spring for retracting it.

2. In a gas engine and in combination with the cylinder, a reciprocating piston, spring  
50 actuated electrodes I and I', arranged on approximately the same plane and pointing toward each other whereby contact is made by the point of one electrode passing over the  
55 point of the other in a plane parallel with the length of both electrodes, carriers upon which they are mounted and by which they are moved into and out of contact with each other, sleeves within which the electrodes are ad-  
justably fixed and clamping nuts or screws  
60 by which they are held in place within the sleeves, substantially as herein described.

3. In a gas engine, and in combination with the cylinder and a piston reciprocating there-  
65 in, the electrode I' a sleeve projecting exterior of the cylinder and within which the electrode is mounted, means for adjusting the electrode within the sleeve and clamping it in place therein, a cam acting against the sleeve  
70 to move it forward, and a spring surrounding the sleeve exterior of the cylinder for returning the sleeve, substantially as herein de-  
scribed.

4. In a gas engine and in combination with the cylinder and a piston reciprocating there-  
75 in, the tapering or pointed reciprocating electrode I', the correspondingly shaped electrode I mounted upon the oscillating arm K', the rod O connected with said arm extending through the head of the cylinder, and the  
80 yielding spring P whereby the carrier K' and electrode I are allowed to yield when contact is formed with the reciprocating electrode, and are returned to their position when the  
85 latter is withdrawn, substantially as herein described.

In witness whereof I have hereunto set my hand.

WILLIAM HENRY WORTH.

Witnesses:

GEO. F. ALLEN,  
L. G. MAY.