(No Model.)

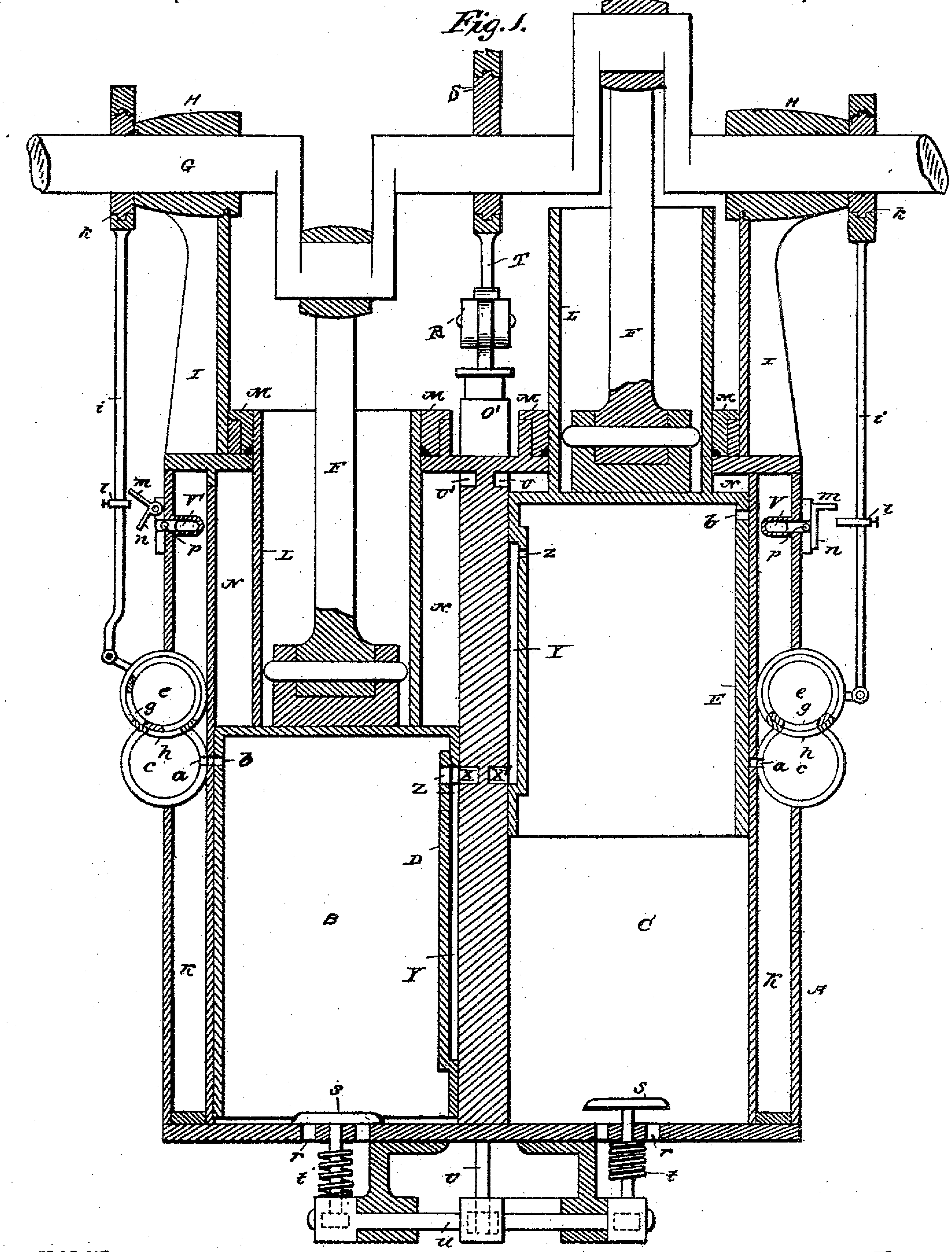
3 Sheets—Sheet 1.

R. ALDRICH.

HYDROCARBON ENGINE.

No. 411,914. Patented Oct. 1, 1889.

Fig. 1.



Witnesses:

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(No Model.) 3 Sheets—Sheet 2.

R. ALDRICH.

HYDROCARBON ENGINE.

No. 411,914. Patented Oct. 1, 1889.

Fig. 2.

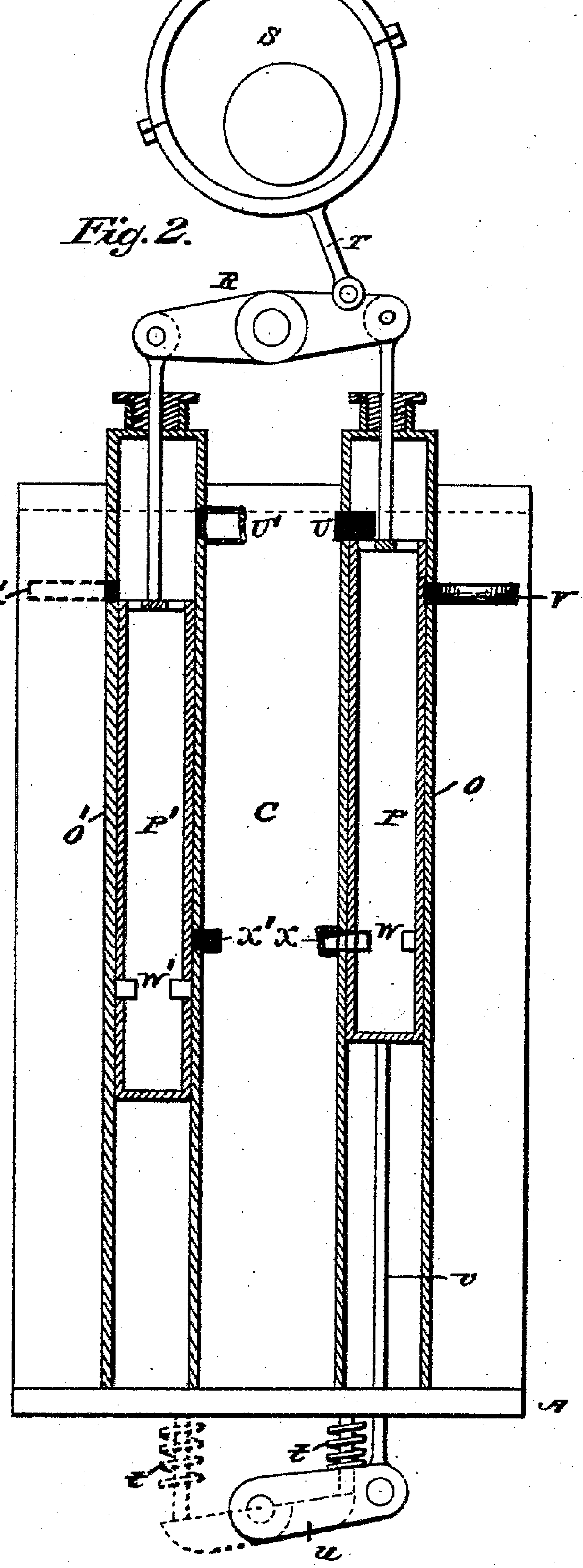


Fig. 3.

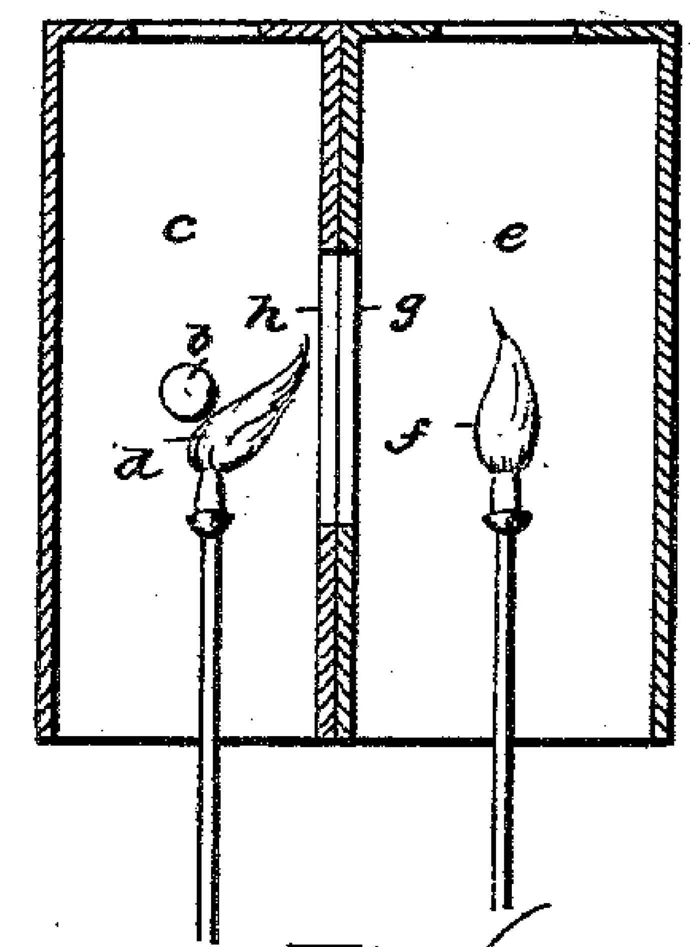
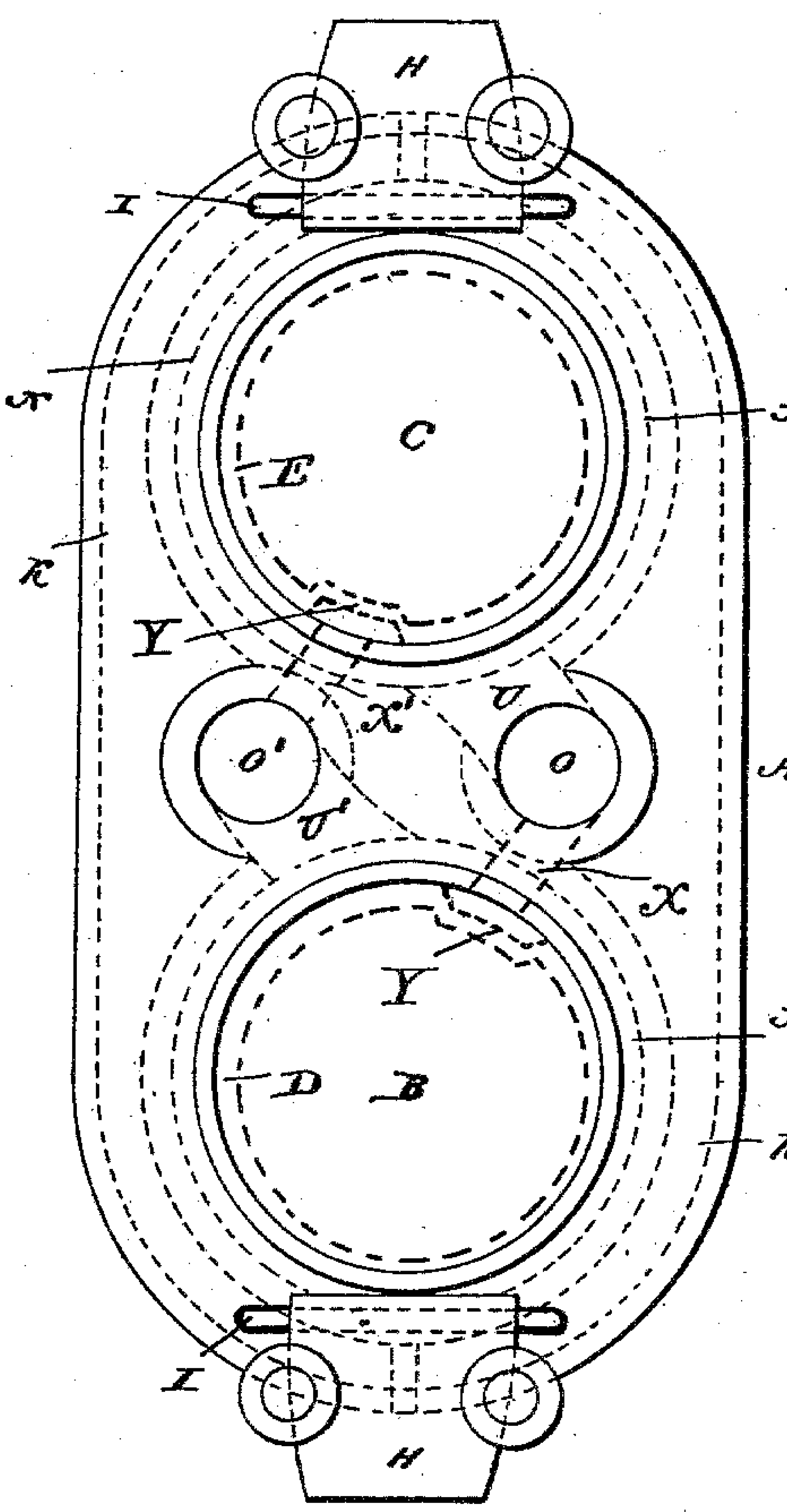


Fig. 4.



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(No Model.)

3 Sheets—Sheet 3.

R. ALDRICH.

HYDROCARBON ENGINE.

No. 411,914.

Patented Oct. 1, 1889.

Fig. 5.

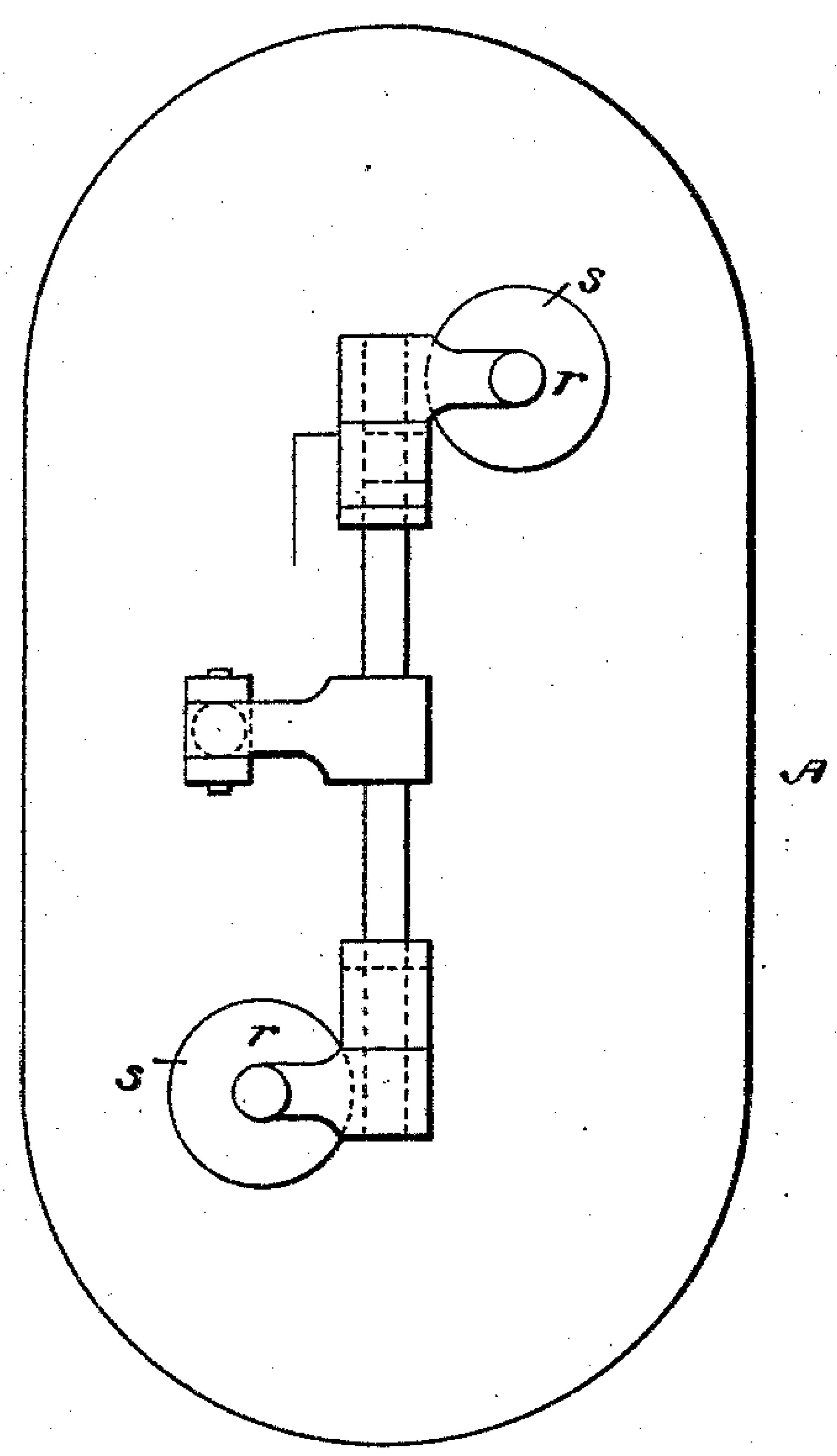
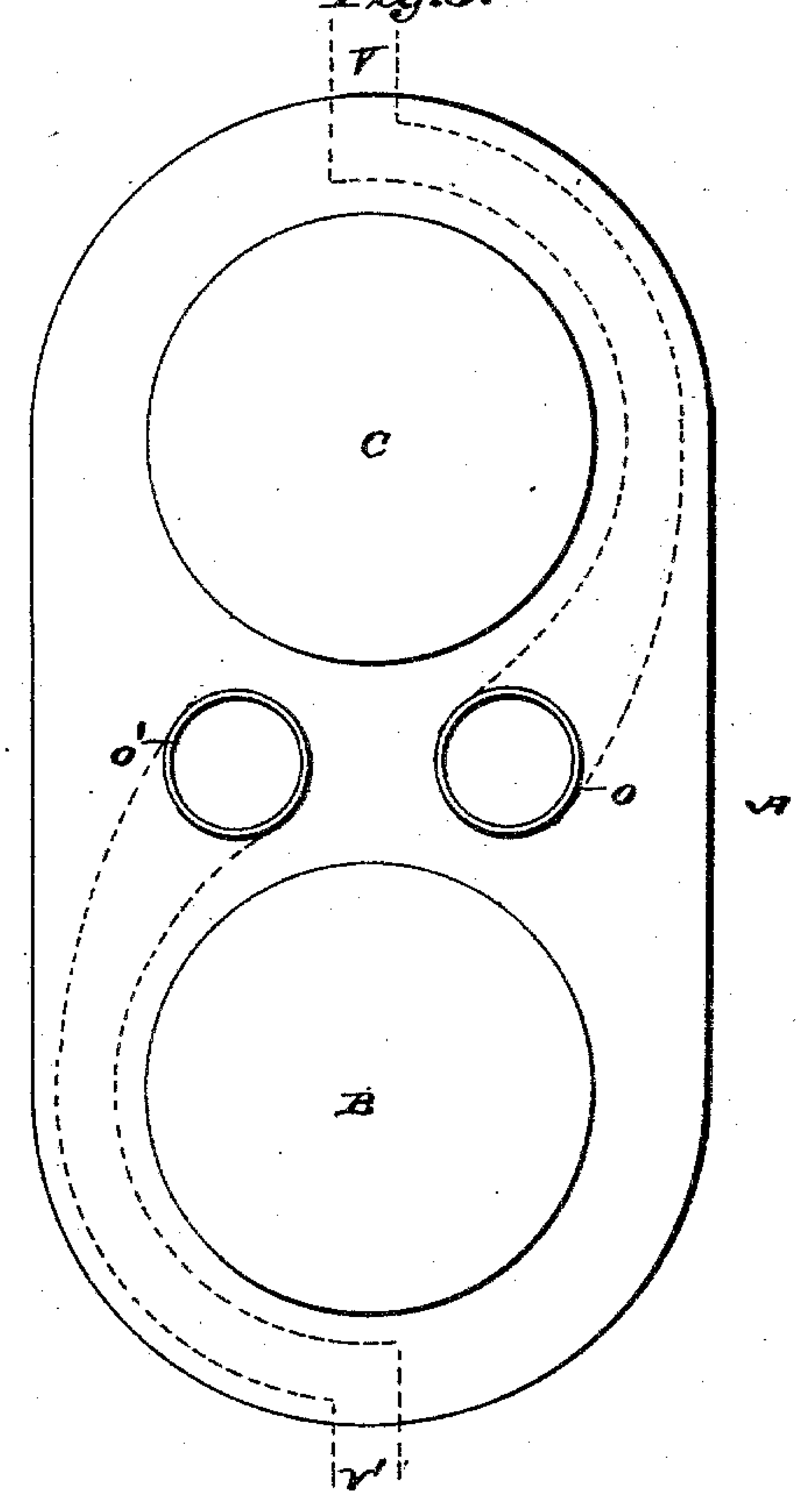


Fig. 6.



Witnesses:

Inventor:
Robt. Aldrich
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Attorney.

UNITED STATES PATENT OFFICE.

ROBERT ALDRICH, OF MILLVILLE, MASSACHUSETTS.

HYDROCARBON-ENGINE.

SPECIFICATION forming part of Letters Patent No. 411,914, dated October 1, 1889.

Application filed October 5, 1888. Serial No. 287,350. (No model.)

To all whom it may concern:

Be it known that I, ROBERT ALDRICH, a citizen of the United States, residing at Millville, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Hydrocarbon-Engines; 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.

This invention relates to improvements in gas-engines; and it consists in certain constructions and combinations of parts hereinafter set forth.

In the annexed drawings, Figure 1 is a vertical central section through a twin-cylinder engine embracing my improvements. Fig. 2 is a vertical section through the gas-feeding valves, with contiguous parts in elevation. Fig. 3 is a detail section through one of the lighting devices. Fig. 4 is a plan view of the engine, with the crank-shaft and piston removed. Fig. 5 is a bottom plan view. Fig. 6 is a plan view showing the main cylinders in outline, and the inlet and outlet parts and tubes of the latter cylinders in dotted lines.

Mounted on a suitable base A are twin cylinders B C, and the latter are provided with trunk-pistons D E, respectively. To the pistons are secured the pitmen F, attached to a crank-shaft G, the latter being journaled in bearings H, mounted on standards I. The cylinders are surrounded by water-jackets K, and the pistons have reduced upper parts L, which pass through openings in the cylinder-heads, and are there surrounded by glands M and packing, so that the space between the reduced portion of each piston and the corresponding cylinder forms a chamber N for the reception of the explosive mixture of gas and air, for the purpose hereinafter explained.

Between the main cylinders are the valve-cylinders O O′, provided, respectively, with piston-valves P P′, open at the upper end, and connected to a rock-lever R, operated by an eccentric S, to which it is connected by a rod T. The cylinder O is connected to the chamber N of the cylinder C by a port or passage U, and back of the said port receives one end of a pipe V, the course of which is shown in dotted lines, Fig. 6. The cylinder O′ is connected to the chamber N of the cylinder B by a port or passage U′, and back of said port receives one end of a pipe V′. (See Figs. 2 and 6.)

Near the inner end of the piston-valve P is a part W, which during a certain part of the stroke is brought opposite a port or passage X, opening directly into a chamber Y, formed in one side of the piston D. The piston-valve P′ has a similar port W′, communicating during a portion of the stroke with a port X′, which in turn leads directly into the chamber Y in the piston E. The chamber Y in each piston D E opens into the interior of the cylinders through a port Z. The recess Y is sufficiently long to keep it in communication with the said port X during the entire stroke of the said piston.

On the opposite side of each main cylinder is a port *a* and a corresponding port *b* in the piston. The port *a* opens into a chamber *c*, which contains a jet *d* of lighted gas (shown in Fig. 3) for the purpose of igniting the charge when in the main cylinder. Each chamber *c* has a contiguous chamber *e*, also containing a lighted jet *f*. The casing of the chamber *e* is arranged to rock on a longitudinal axis, so as to bring an opening therein opposite an opening *h* in the casing of the chamber *c*. The movable casing is connected by a rod *i* to an eccentric *k* on the crank-shaft G. The rod *i* carries an adjustable toe *l*, arranged to engage a projection *m* on an air-inlet valve *n* to the pipe V, aforesaid. The pipe V, near the air-inlet, is entered by a pipe *p*, which conveys hydrocarbon fluid from a reservoir to the pipe V.

It will be understood that the foregoing description of details relates to one of the main engine-cylinders only, and that the construction of the parts connected with the other cylinder are identical.

The bottom of each cylinder B C is provided with an opening *r* for the escape of burned gases, for the discharge of a charge of gas that may have failed to ignite, or as an air-valve. Each opening *r* is provided with a valve *s*, the spindle of which is surrounded by a spring *t*. The valves are alternately raised by arms on a rock-lever *u*, actuated by a pitman *v*, connected to one of the pistons P.

Supposing an explosion has taken place in cylinder C, the operation is as follows: The piston E is forced forward and the piston D in the contrary direction, or backward. When the piston D begins its backward movement, the piston-valve P is in the position shown in Fig. 2, with the port W opposite the port X, and hence the chamber N of the cylinder C is in communication with the interior of the piston B. The gas in the said chamber N will thus be forced by the piston E into the piston B. The eccentric S will slowly move the piston-valve P inward until the port X is closed to its interior, and this will occur before an explosion can take place in piston D, thus shutting off all communication between a cylinder in which an explosion is about to take place and the gas-chamber from which it receives its supply. As the piston D moves backward (the pipe V′ and port U′ being in communication through the cylinder O′) the mixed gas and air from the pipe V′ will be drawn into the chamber N in front of the said piston. It will be understood that the eccentric *k* has moved the rod *i* and opened the valve *n*, during the above-described operation, so that air is drawn into the pipe V, together with the hydrocarbon from the pipe *p*. When the piston D has completed its backward movement and is in the position shown in Fig. 1, the port *b* is open to the port *a* in the chamber *c*, while the casing of the chamber *e* has been moved by the rod *i*, so that the opening *h* is closed. The explosion then takes place, forcing the piston D outward, and the above-described operation is repeated in the cylinder C and its connections. During the backward movement of the piston D the valve *s* is open to allow the escape of the burned gas of the previous explosion in the said cylinder, or, as before stated, in case the charge fails to ignite it allows the unburned charge to escape, the charge driving the exhaust before it. This valve is closed previous to the explosion and after it.

As the igniting-flame is often extinguished by the explosion, it is reignited by the other jet *f*, since the movable casing is turned by the rod *i* and its eccentric sufficiently to make the openings *g* and *h* coincide. When the explosion takes place, the passage is closed.

It will be noted that as one main piston is moving upward it serves to fill the other cylinder with the explosive mixture, so that the force of the explosion is utilized throughout the upstroke of the piston.

Having described my invention, what I claim is—

1. In a gas-engine, the combination of the cylinders B C, trunk-pistons with contracted portions forming chambers, and with recesses, as described, the cylinders O O′, with piston-valves P P′, provided with ports U U′ and W W′, the pipes V V′, with fluid and air inlets, means, substantially as described, for operating the piston-valves P P′, and igniting-jets *d*, communicating through ports with the cylinders, as set forth.

2. In a gas-engine of the character described, the combination of the pipe V, the fluid-supply pipe *p*, the air-valve *n*, and a tripping device applied to the rod *i* of the lighting device, substantially as described.

3. In a gas-engine, the combination of cylinders B C, trunk-pistons having contracted portions forming elongated chambers Y, the cylinders O O′, provided with piston-valves P P′, ported at U U′ W W′, the pipes V V′, having fluid and air inlets, the ports Z Z X X′, and means, substantially as described, for operating said valves P P′, and igniting-jets *d*, communicating through ports with the cylinders, as specified.

4. The combination of the cylinders B C, the trunk-pistons constructed, as described, with recesses Y and ports Z *b*, the ported cylinders *c c*, communicating with each other and with the ports *b*, and gas-jets in said cylinders, for the purpose specified.

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

ROBERT ALDRICH.

Witnesses:

DAVID MANNING, Jr.,

WILLIS E. SIBLEY.