

(No Model.)

2 Sheets—Sheet 1.

E. NARJOT.  
GAS ENGINE.

No. 515,530.

Patented Feb. 27, 1894.

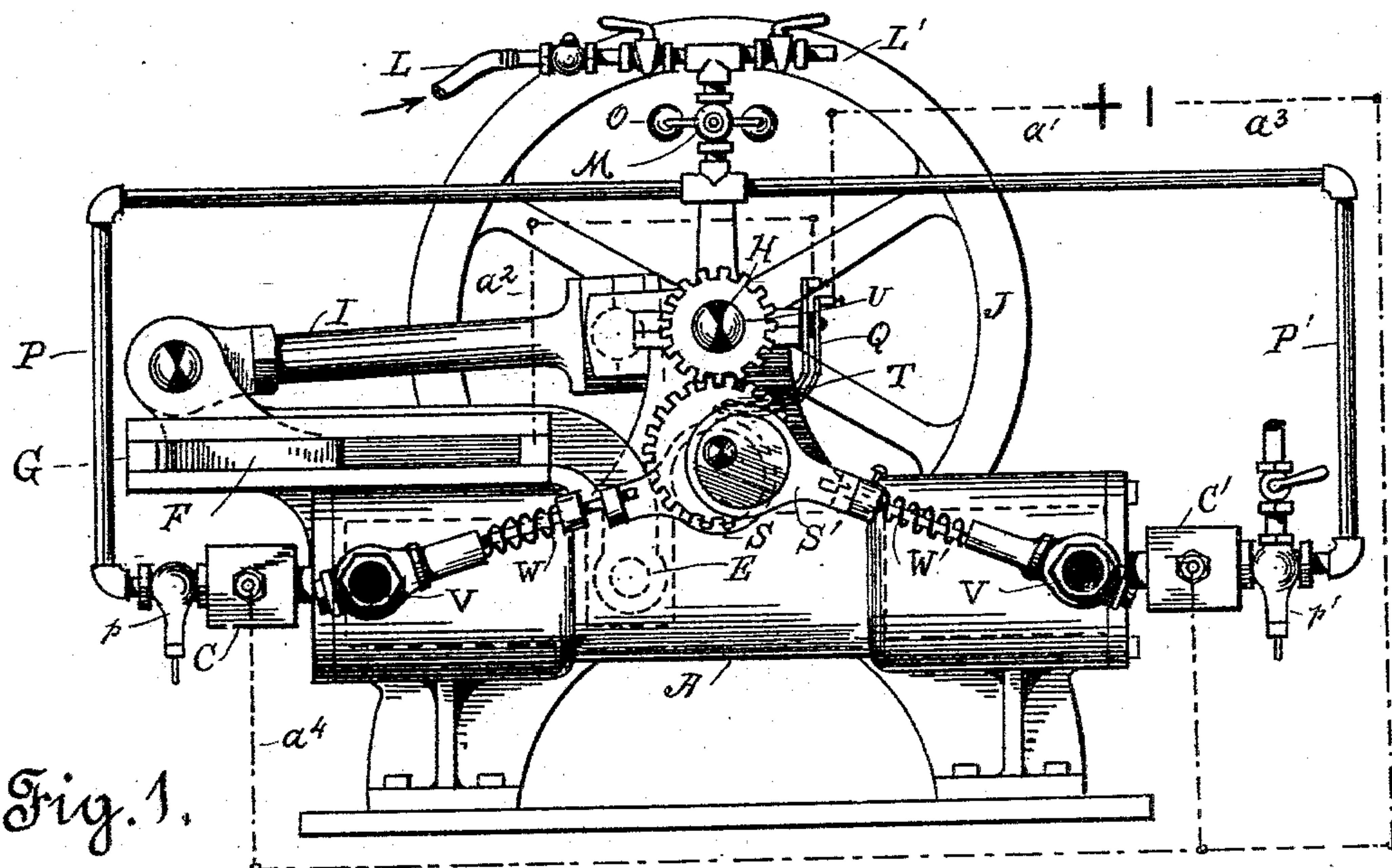


Fig. 1.

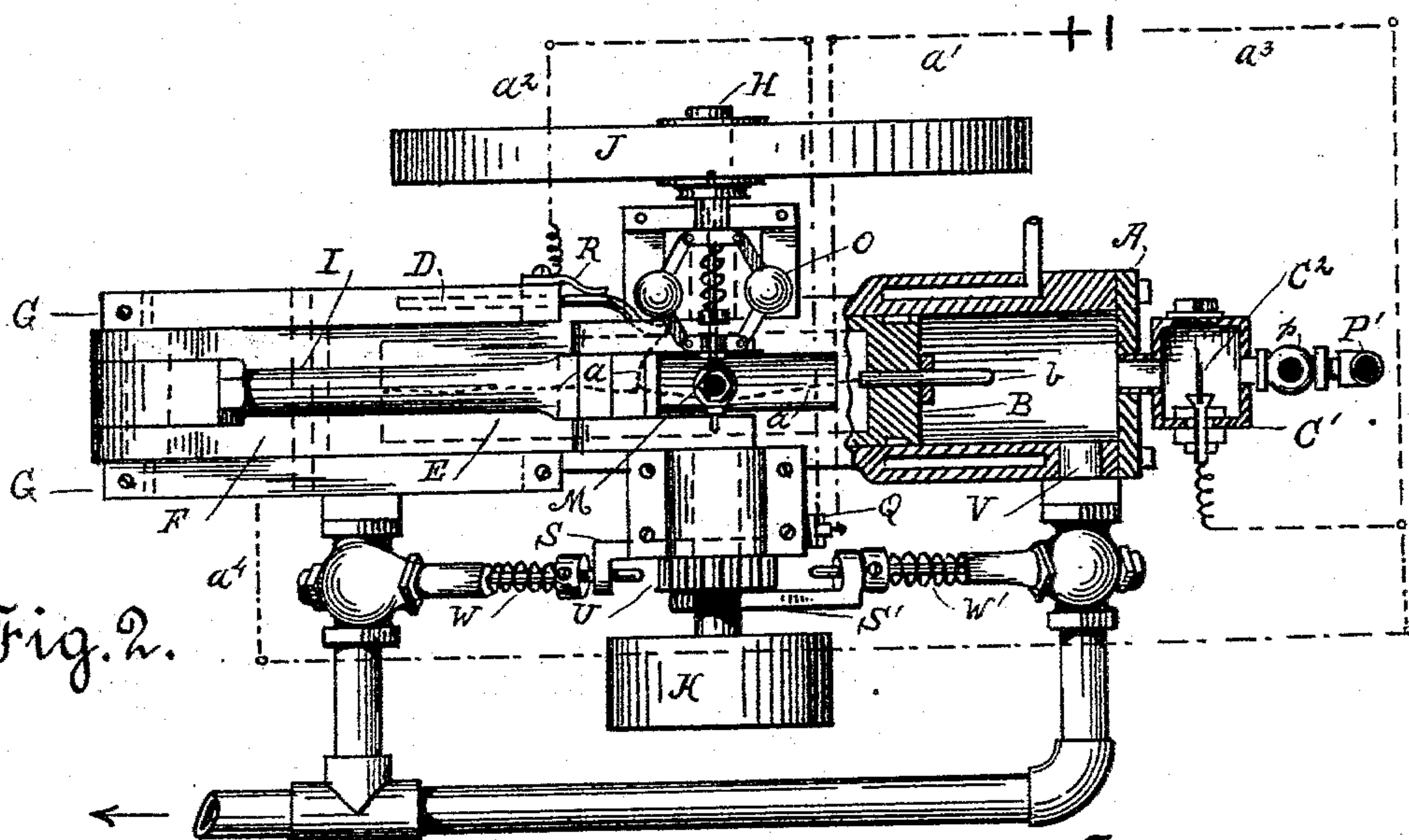


Fig. 2.

Witnesses.

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*by A. H. Ste Marie,*  
*att'y*

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2 Sheets—Sheet 2.

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Fig. 3.

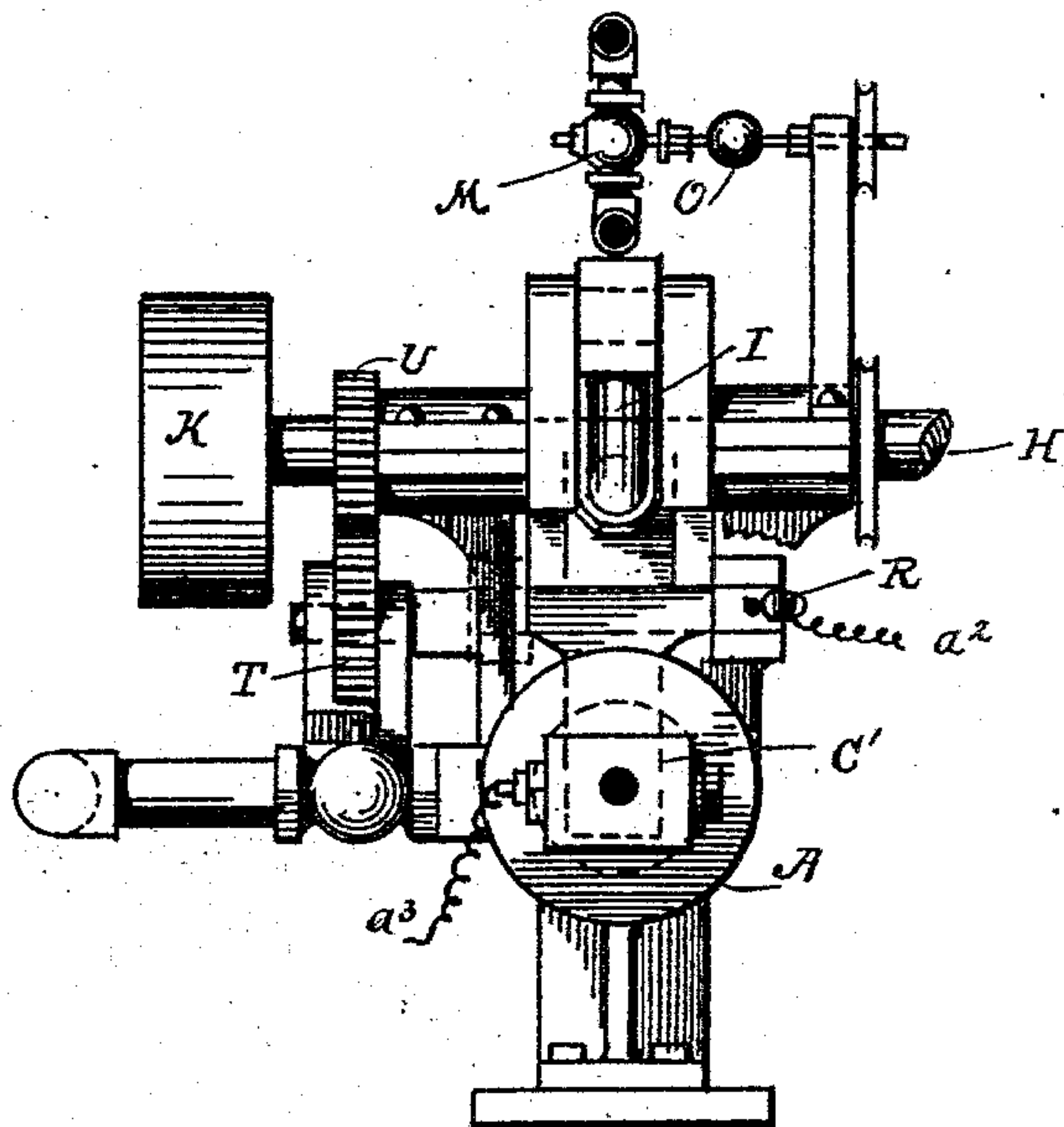


Fig. 4.

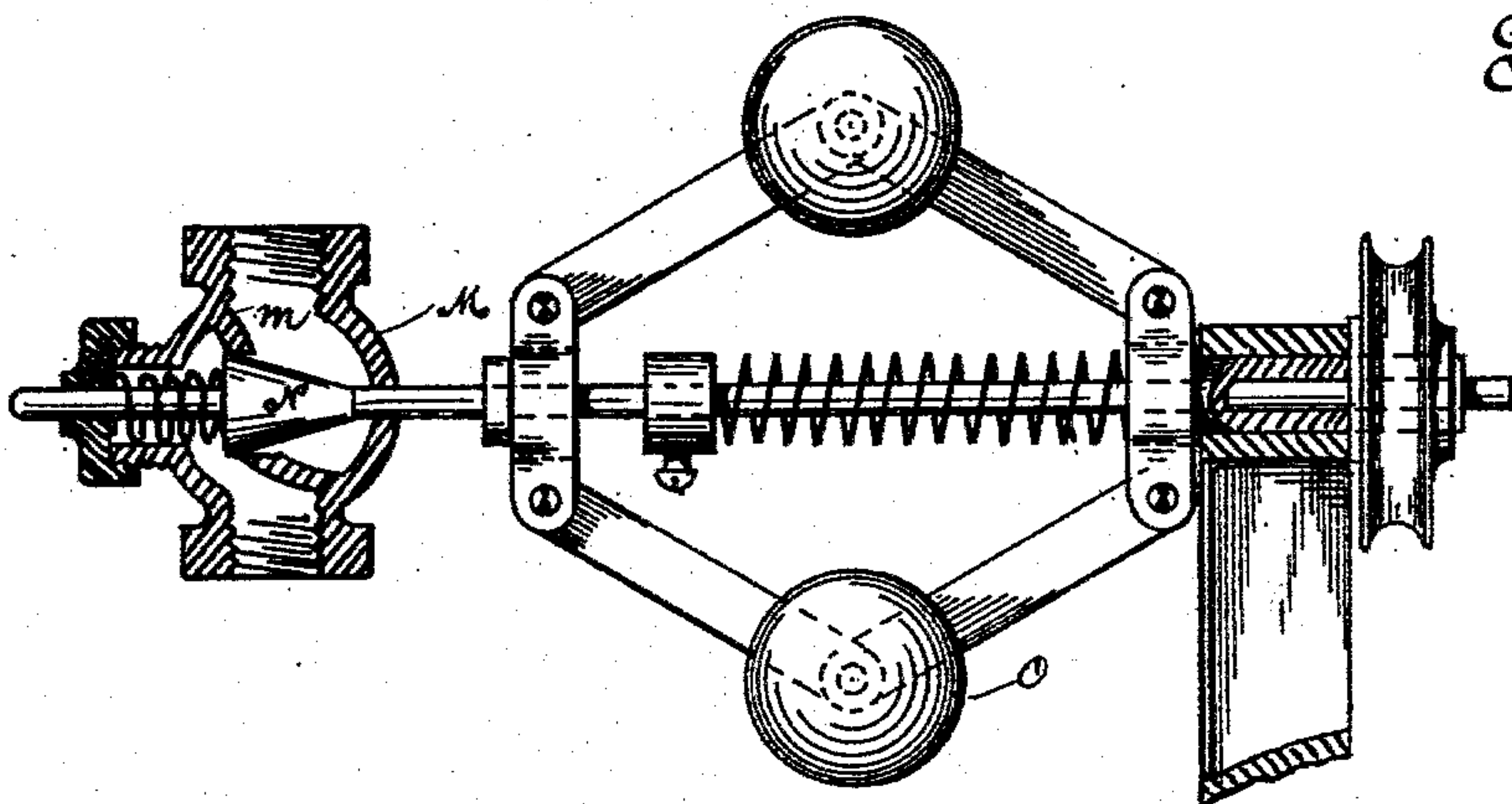
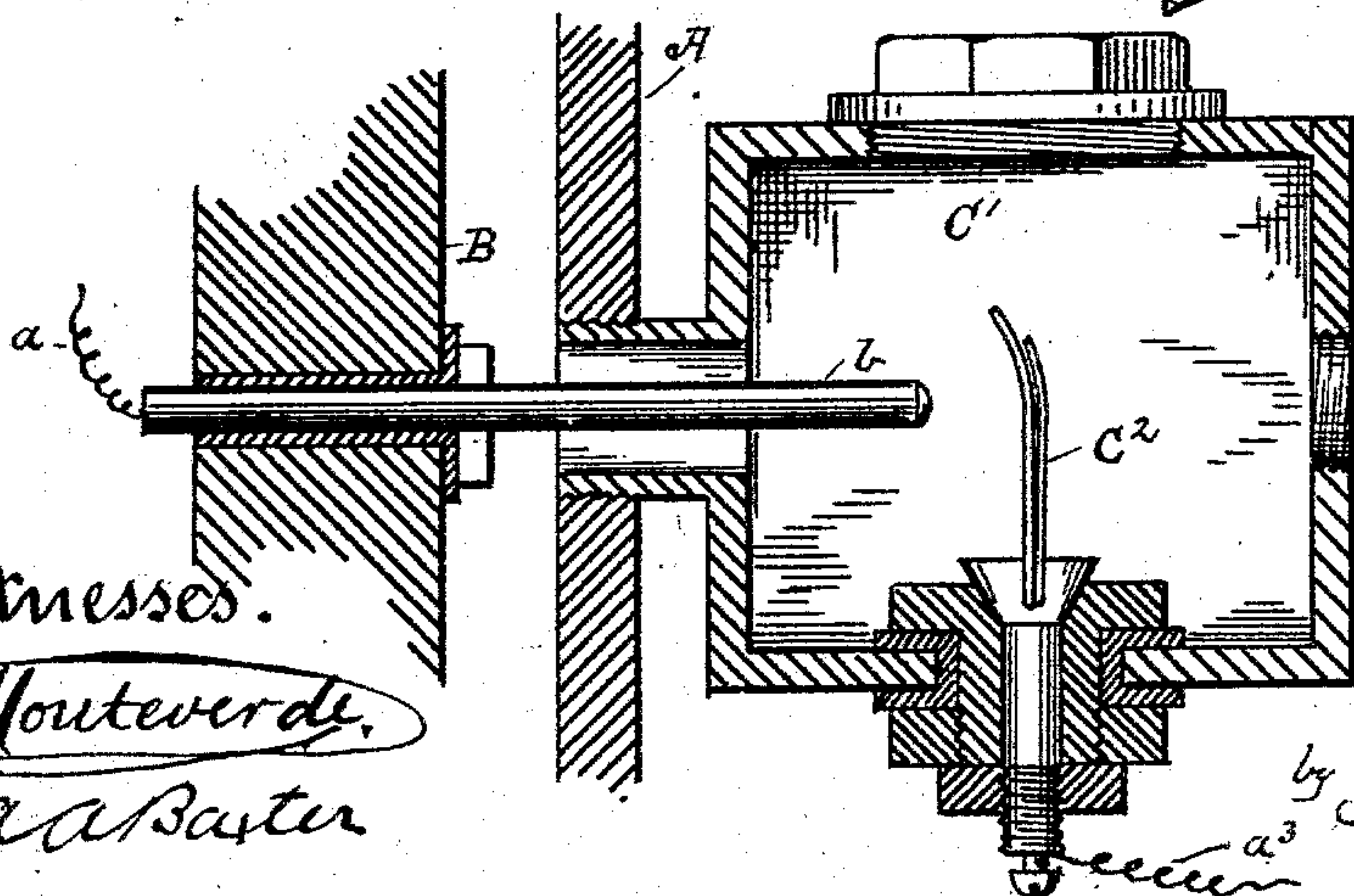


Fig. 5.



Witnesses.

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# UNITED STATES PATENT OFFICE.

ERNEST NARJOT, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO HENRI VAYRE, OF SAME PLACE.

## GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 515,530, dated February 27, 1894.

Application filed August 2, 1892. Serial No. 441,962. (No model.)

*To all whom it may concern:*

Be it known that I, ERNEST NARJOT, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Gas-Engines; and I 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 has reference to that class of engines in which a mixture of gas and air consumed within the working cylinder constitutes the active force employed to drive the piston and impart motion to a shaft connected therewith.

The object of my improvements is to provide a simple, safe and handy prime mover of the class referred to, one that will combine lightness with strength and speed with noiselessness, and one which may be depended on to run with regularity and steadiness whether running light or under a heavy load. With this end in view, I have devised an engine furnished with a cylinder taking a charge at each end but having a single piston without piston-rod, and devoid of packing, stuffing-boxes or other equipments liable to cause friction and limit the usefulness of the machine. The single piston rotates a driving-shaft through suitable connections, and the shaft in turn regulates the impulses given to the piston, by mechanism controlling the admission and exhaust valves and periodically making and breaking an electric circuit so that sparks may fire the charge at each end of the cylinder at requisite intervals. The cycle of operations gone through consists in alternately charging each end of the cylinder with a mixture of air and gas in quantities inversely-proportionate to the speed developed, highly-compressing each charge before igniting it, providing for a long range of expansion of the gaseous compound while burning, and quickly expelling the products of combustion. These operations are timed so that both series are completed and both ends of the piston receive a fresh impulse at every two revolutions of the driving-shaft.

Referring to the drawings for a more complete and detailed description of my invention, Figure 1 is a side elevation of my improved engine. Fig. 2 is a plan thereof. Fig. 3 is an end elevation of the same. Fig. 4 is a detailed view of the engine governor and the valve controlled thereby; and Fig. 5 is a sectional elevation, on an enlarged scale, showing the construction of the electric spark boxes and contact-makers.

The same parts are indicated by the same letters of reference in all the views.

A represents a double-chambered motor cylinder, which is water-jacketed at available points and may be mounted in any suitable manner.

Within the cylinder A travels a piston, B. This piston has no rod such as is commonly used, so that it moves always in a perfectly straight line, not being effected by that part of the connecting-rod which moves in a circle with the crank of the driving-shaft and—in other constructions—tends to wear out the cylinders oval. A full clearance is also effected on the return strokes, thereby affording facilities for sucking in a full charge of the working fluid, and favoring thorough admixture of the gases upon compression, adequate expansion after ignition and unimpeded exhaust. No stuffing-box is used, nor packing, thus reducing friction to a minimum and promoting high speed. Both ends of the piston carry pins, *b*, which alternately enter small boxes, *C C'*, communicating with the ends of the cylinder, and are connected by wires, *a*, to a small sliding-rod, D, moving parallel and together with the piston.

E is a bent arm grasping and secured to the piston at its central part and provided with a cross-head, F, fitted in slides, G, on the upper part of the cylinder. This arm moves to and fro with the piston and transmits the impulses received from it to a cranked shaft, H, through a connecting-rod, I. The shaft H is journaled in suitable bearings transverse of the engine and carries, as usual, a fly-wheel, J, at one end, and a driving pulley, K, at the other.

The working fluid is supplied through pipes, one of which, L, furnishes coal gas, carbureted air, or any desired combustible or explosive vapor, and the other, L', brings in a certain



proportion of atmospheric air. The gas and air intermingle in the upper part of a chamber or casing, M, divided into two compartments by a central diaphragm, *m*, having a port-hole controlled by a conical valve, N, which is operated by a sensitive ball governor, O, connected with the driving-shaft. The resulting mixture therefore passes into the lower compartment of M in greater or lesser volume according to the speed developed by the engine, and thence is distributed through pipes, P P', to both ends of the cylinder, entering by way of the boxes C C'. Check-valves are provided, at *p p'*, to stop or cut off the flow after each charge is drawn in.

The charges in each end of the cylinder are consecutively fired by electric sparks. By preference, I use a galvanic battery to generate the current necessary to induce the sparks and in connection with it a commutator, Q, which serves to make and break the electric circuit at the proper time. A wire, *a'*, leads from the positive pole of the battery to one blade of the commutator, the other blade of which is connected by a similar wire, *a''*, to a spring, R, constantly bearing on the sliding rod D and therefore in electrical communication with the piston and its terminals. The negative pole of the battery is likewise connected by wires, *a<sup>3</sup> a<sup>4</sup>*, to metallic pieces or springs, C<sup>2</sup>, located in the boxes C C' and adapted to come in contact with the projecting pins of the piston. The only thing then

required to complete the circuit is the joining of the two blades of the commutator, which is effected by means of eccentrics, S S', actuated by a toothed wheel, T, meshing into a pinion, U, carried by the driving-shaft. Proper insulation is provided for all the parts in the circuit so that the body of the engine conveys no electric current as in other machines of similar type. The boxes in which the electric sparks are produced and the contact-makers therein are cooled off, it will be observed, by the incoming fluid at each new charge. The burned gases are expelled through exhaust ports, V, at the sides of the cylinder, the eccentrics S S' opening the exhaust-valves oppositely to springs W, W'.

Having now described my invention, what I claim as new, and desire to secure protection in by Letters Patent of the United States, is—

The combination of the double-chambered cylinder having slides G on its upper side, the piston moving in the cylinder, the bent arm rising from the piston and having a crosshead moving on the slides G, the driving shaft, and the connecting rod between the driving shaft and the crosshead.

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

ERNEST NARJOT. [L. S.]

Witnesses:

H. P. TRICOU,

A. H. STE. MARIE.