(No Model.) 4 Sheets—Sheet 1.

E. ETÈVE & J. A. DE BRAAM.

CARBURETED AIR ENGINE.

No. 309,835. Patented Dec. 30, 1884.

FIG 1

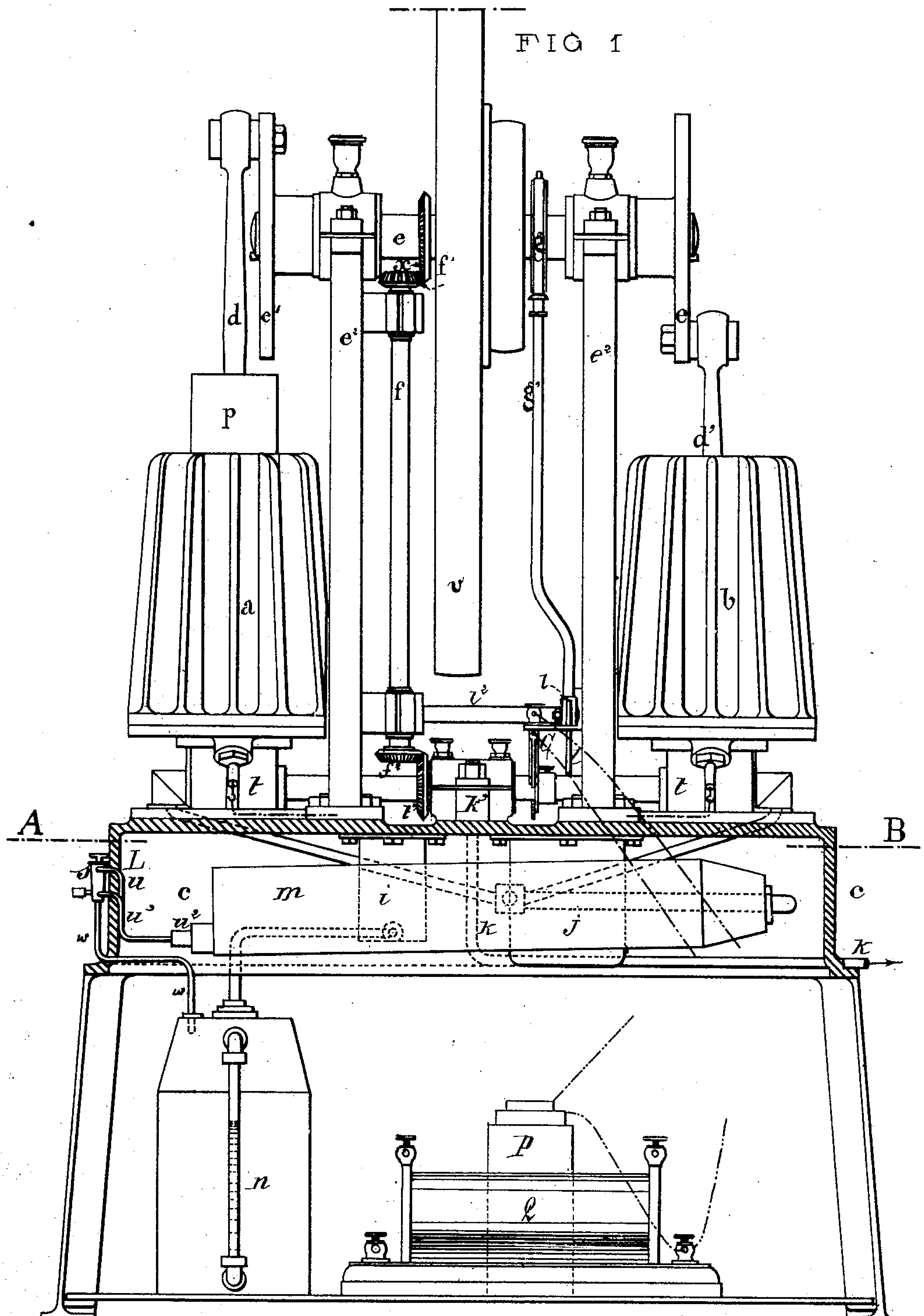

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FIG_2_

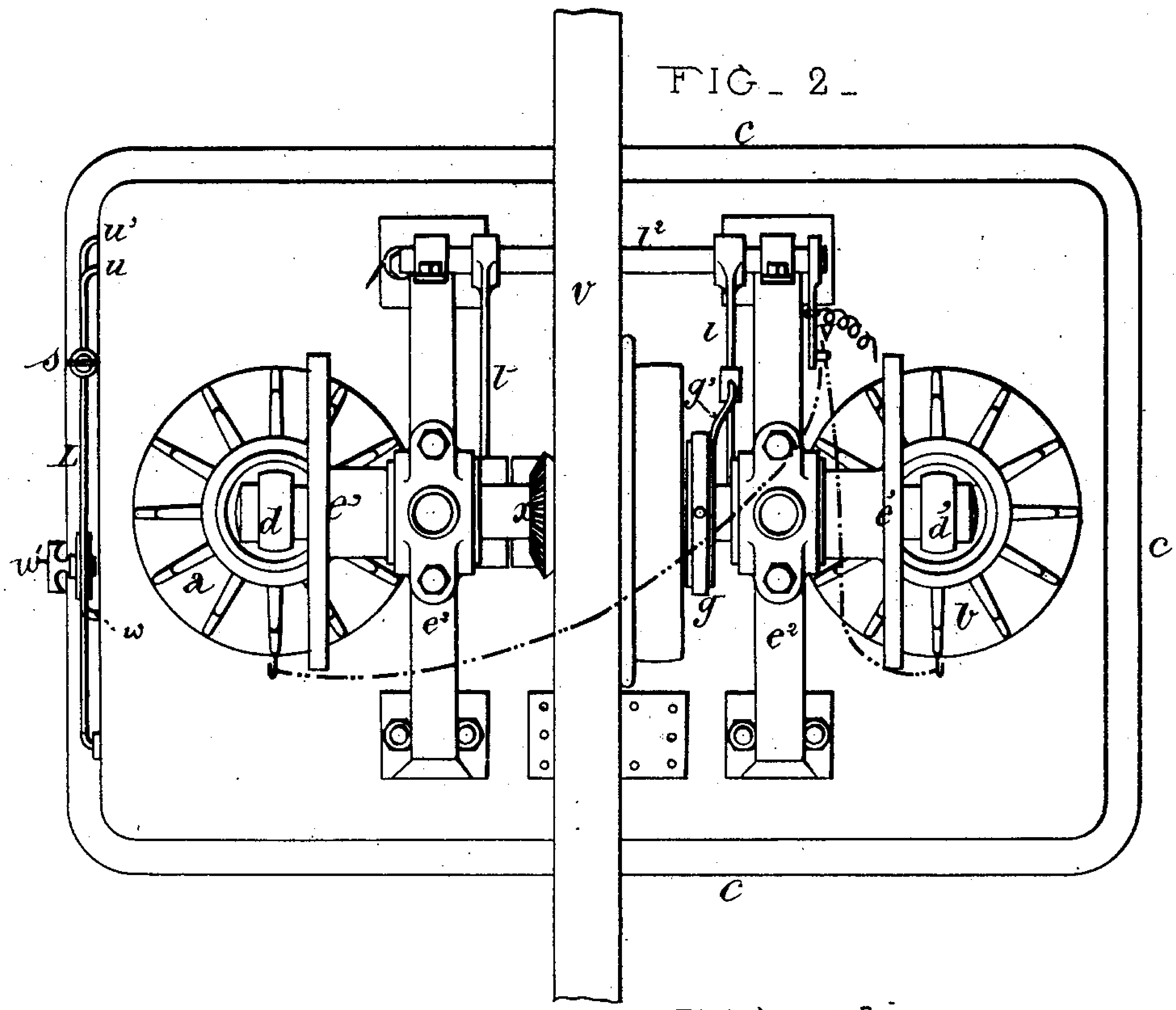
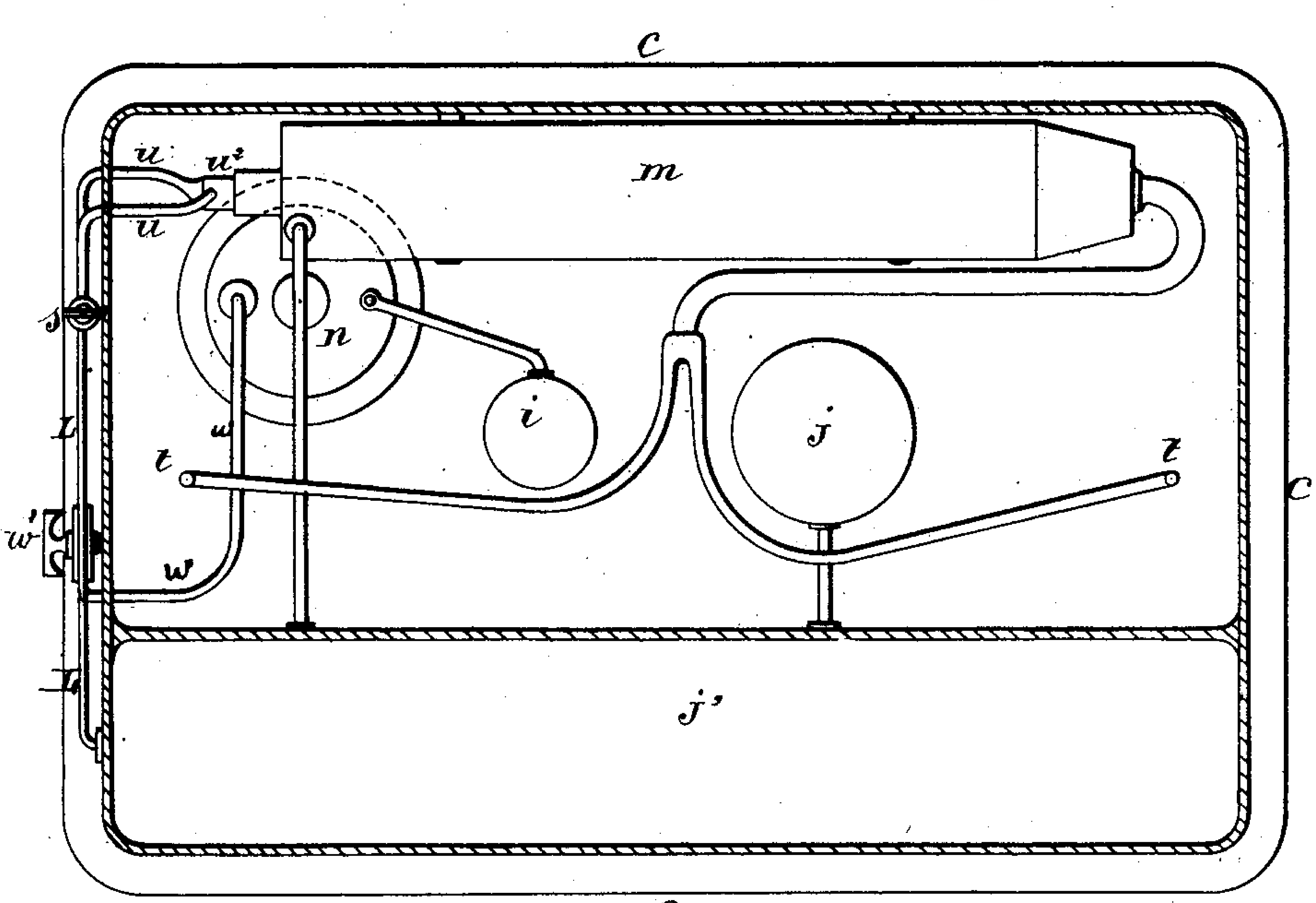


FIG_2 bis



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E. ETÈVE & J. A. DE BRAAM.

CARBURETED AIR ENGINE.

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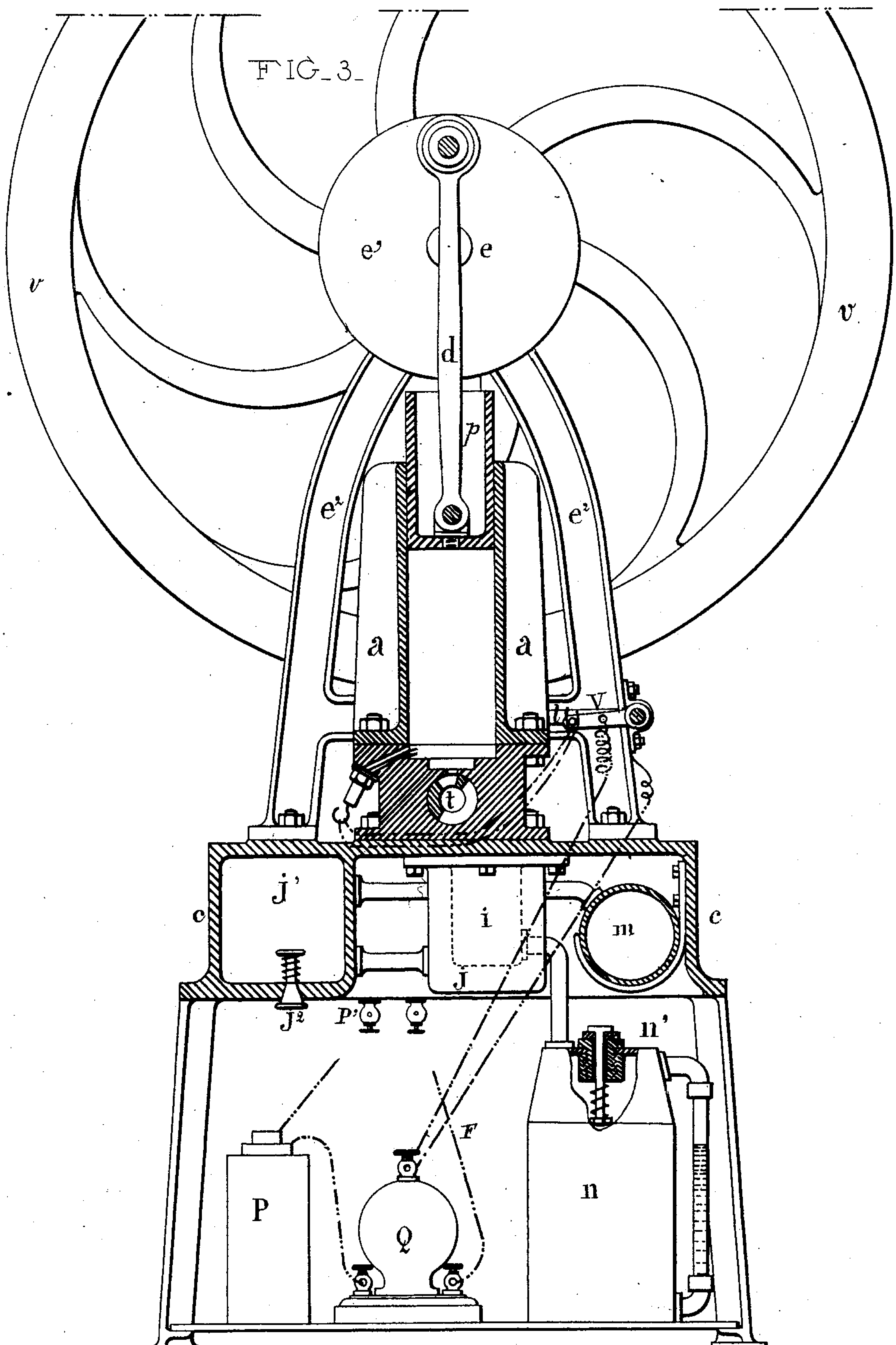
FIG_3_



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(No Model.) 4 Sheets—Sheet 4.

E. ETÈVE & J. A. DE BRAAM.

CARBURETED AIR ENGINE.

No. 309,835. Patented Dec. 30, 1884.

FIG. 4.

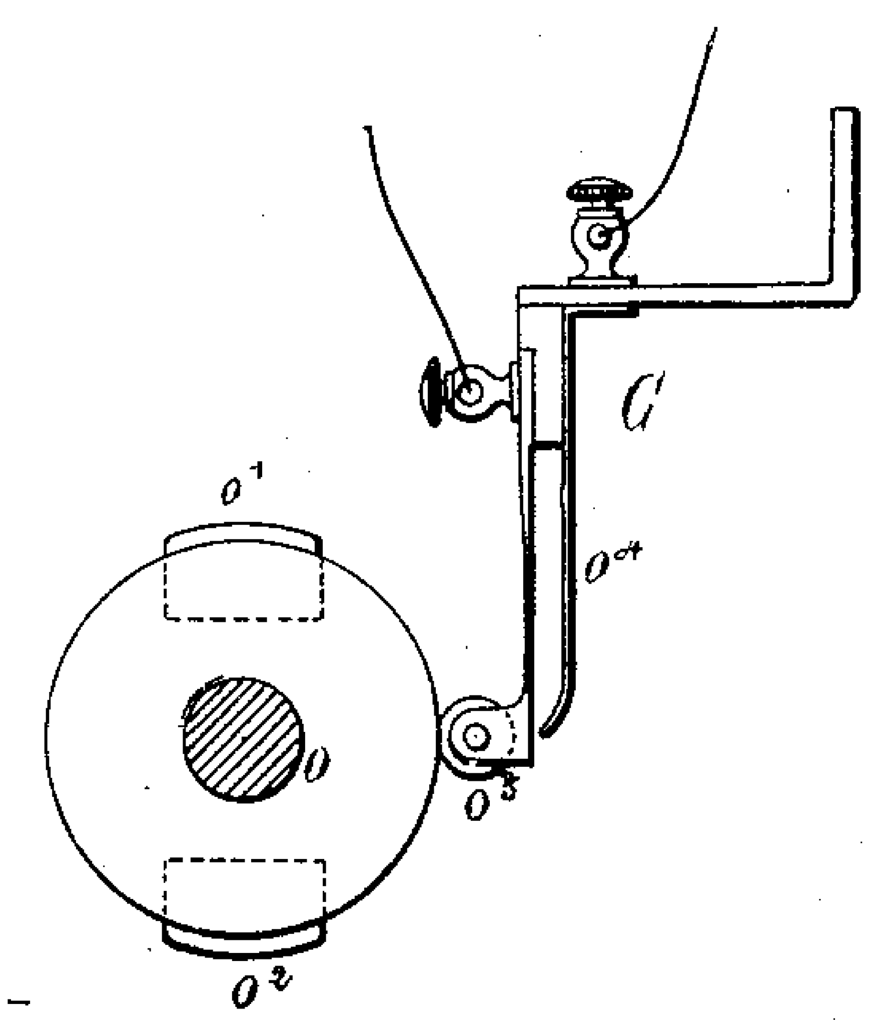


FIG. 6.

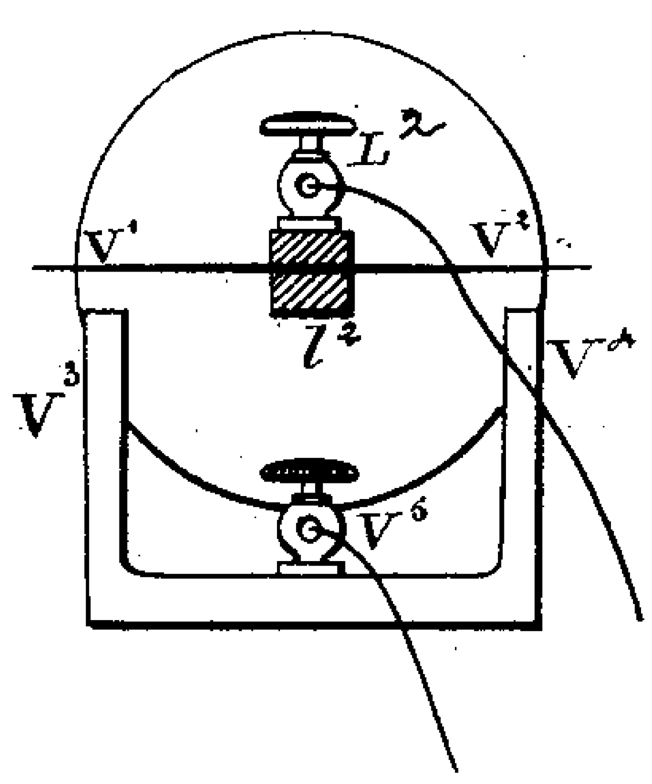


FIG. 5.

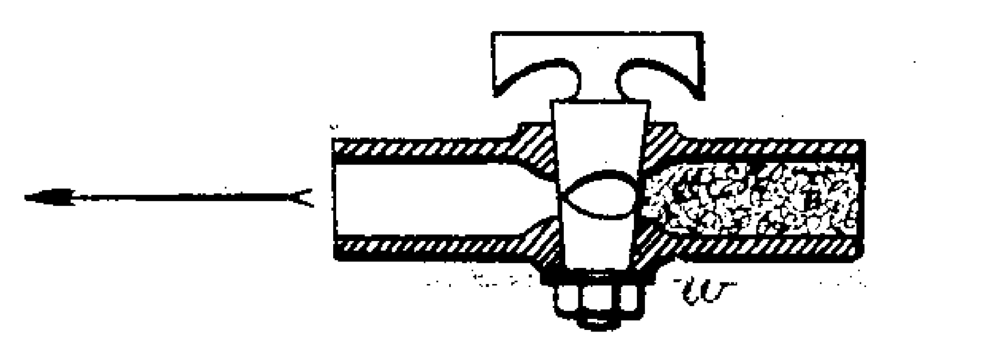


FIG. 8.

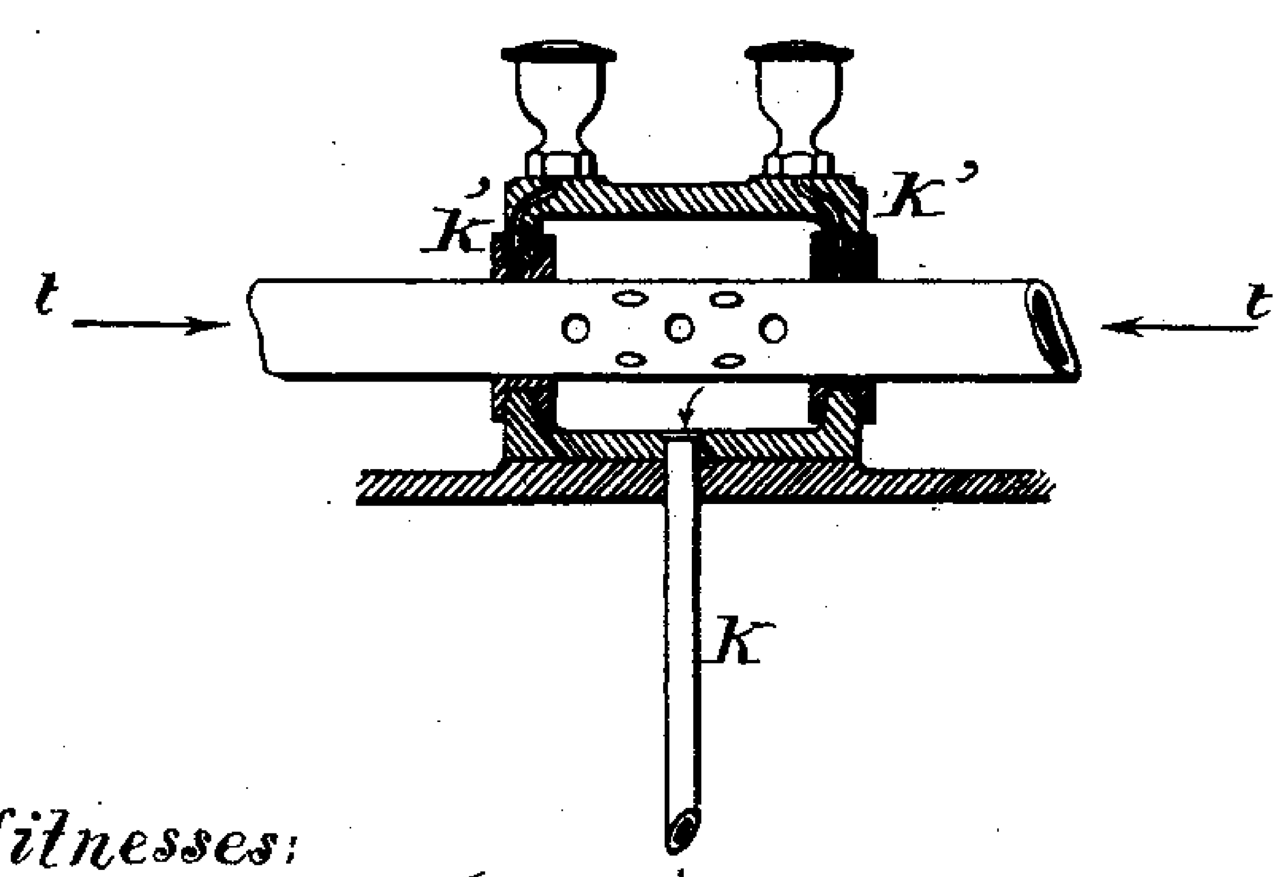
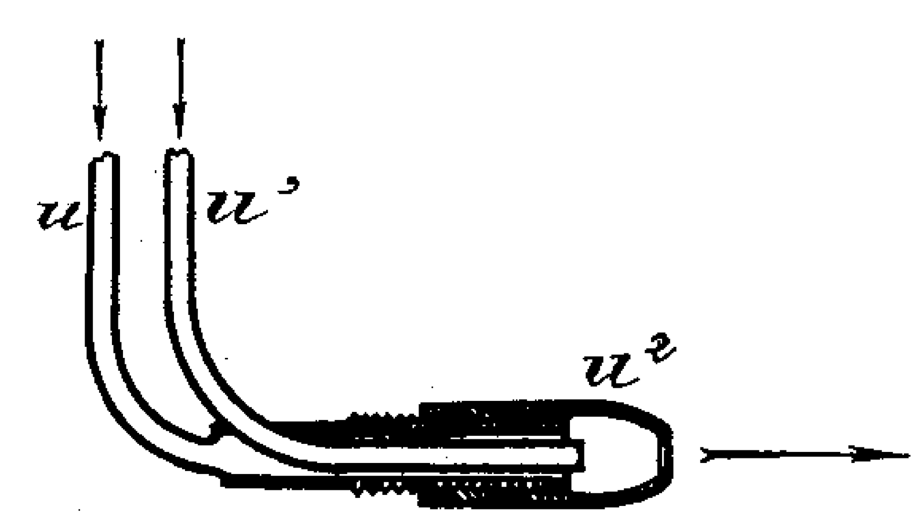


FIG. 7.



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UNITED STATES PATENT OFFICE.

EUGÈNE ETÈVE AND JEAN ANDRÉ DE BRAAM, OF PARIS, FRANCE.

CARBURETED-AIR ENGINE.

SPECIFICATION forming part of Letters Patent No. 309,835, dated December 30, 1884.

Application filed June 14, 1884. (No model.) Patented in Belgium December 8, 1883, No. 63,480; in France January 21, 1884, No. 159,841, and in England January 25, 1884, No. 2,135.

To all whom it may concern:

Be it known that we, EUGÈNE ETÈVE and JEAN ANDRÉ DE BRAAM, residing at Paris, in the Republic of France, have invented certain new and useful Improvements in Carbureted-Air Engines, (for which we have received Letters Patent in England No. 2,135, dated January 25, 1884, for fourteen years; in France for fifteen years, dated January 21, 1884, No. 159,841, and in Belgium for fifteen years, dated December 8, 1883, No. 63,480,) of which the following is a specification.

This invention relates to a new engine which is adapted to be actuated by an explosive mixture acting alternately on opposite faces of the piston. The explosive mixture is air charged with hydrocarbon vapors, and is stored in a reservoir separate from the cylinder or cylinders, so that its ignition can be effected beneath either of two pistons alternately.

The improvements are equally applicable to rotary engines.

Figure 1 is a front elevation, partly in section, of the machine. Fig. 2 is a plan of the same. Fig. 2^{bis} is a horizontal section of the same on the line A B, Fig. 1. Fig. 3 is a vertical section through the axis of one of the cylinders. Figs. 4 to 8 are detail views, hereinafter more fully referred to.

The cylinders *a* and *b* have refrigerating wings or ribs, and are supported by the frame *c*, which may be of any desired form or dimensions, the better to arrange the grouping of the various parts forming the apparatus. The pistons *p* are directly connected by the rods *d d'* to the cranks *e' e'* of the driving-shaft *e*. Upon this shaft is mounted the fly-wheel *v*, the transmitting pulley or pulleys, and a conical pinion, *x*, which transmits the motion of the shaft by the aid of a similar pinion, *f'*, to the vertical shaft *f*. This shaft *f* at its lower end actuates the circular slide-valves *t* of the cylinders *a b* by means of pinions f^2 *t'*. These valves are cylindrical, and receive the carbureted air in the center and admit it to the cylinders at the first one-fifth of the forward stroke of each piston. Escape is effected into the open air (at the one-half return-stroke of the piston) through the pipe *k*, which communicates with the chamber *k'*, into which the valves discharge the said air by the hollow shaft on which they are mounted. Fig. 8 shows this chamber *k'* in section. The driving-shaft *e* is supported by the frame e^2 e^2. An eccentric, *g*, mounted on the driving-shaft *e* imparts, by means of the rod *g'*, oscillatory motion to a lever, *l*, mounted on a shaft, l^2, and which imparts its motion to another lever, *l'*, Fig. 2, that is also secured to the shaft l^2. The lever *l'* works a double-action pump, *j*, which forces air into a receiver, *j'*, (see Figs. 3 and 2^{bis},) and thence to the intermediate reservoir, *m*, in which the explosive mixture is made, which is then distributed to each of the cylinders.

Of the pump *j* only the outer shell is represented in the drawings, as it is not deemed necessary to illustrate in detail a mechanism of such well-known construction. The receiver *j'* is supplied with a safety-valve, j^2, to prevent the injected air exceeding a fixed pressure. A small pump, *i*, which is operated by the lever *l*, is single-acting. It forces air into a petroleum-reservoir, *n*, having a safety-valve, *n'*, which allows the compressed air to escape when the internal pressure exceeds a certain limit, appropriately determined and slightly superior to the pressure of the air compressed by the pump *j*. The air thus compressed in the reservoir *n* passes through the pipe *w*, filters through sponges placed in a regulating-tap, *w'*, (shown in section, Fig. 5,) then travels to another tap, *s*, which also receives another compressed-air pipe, L, from the receiver *j'*. From the tap *s* the two pipes *u u'* lead, one, *u'*, conducting the hydrocarburet from pipe *w*, the other, *u*, the compressed air from pipe L. The pipe *u'* leads into an enlargement, u^2, which is formed on the pipe *u*, as shown in detail in Fig. 7. The hydrocarburet coming through pipe *u'* is projected through the enlargement u^2 by the air from the pipe *u* and vaporized. This mixture spreads and is stored in the receiver *m*, into which a certain quantity of air is also led directly from the reservoir *j'*, as already explained, for forming the explosive mixture. Pipes put the boxes of the valves *t* in communication with the receiver *m*, which pipes may have gauze diaphragms, (not shown,) in order to prevent ignition of the contents of the receiver.

From the slide-valves *t* the explosive mixture is led to the cylinders a and b, where it is electrically ignited as follows: One or more batteries, P, conduct the electric fluid to a terminal, P′, of the frame. It is again taken by a wire, F, which leads it to a terminal of the induction-coil Q for producing the sparks. The other terminal leads the current to a commutator, G, Fig. 4. The current passes over these two conducting-wires whenever one or other of the cheeks o' o^2 of the disk o (mounted on the shaft of the slide-valves) crowds a small roller, o^3, which is at the end of one of the wires, against a plate, o^4, that connects with the other wire. A fourth wire leaving the induction-coil is connected to a crank, V, keyed to the shafts of the pumps. (See Fig. 3.) The wires starting from each of the cylinders come in front of an arm of the crank V, which in its oscillatory movement communicates with each of them successively.

Fig. 6 shows another method of producing the electric contacts by means of the blades V' V^2, which balance with the oscillating shaft l^2 of the pumps and establish the current on one or the other of the "touches" V^3 V^4. These have a support common with a terminal, V^5, in communication with the battery by a wire. The blades V' V^2 are fixed to the shaft l^2 by means of the terminal L^2 with a wire from the induction-coil. As the two ends of the shaft l^2 bear this arrangement, a continuity of the current is established in the battery. The current being established with the commutator, the electric spark is produced either in the cylinder a or b, according as the button on the crank touches one or the other of the wires communicating with their respective cylinders.

What is claimed as the invention, and is desired to be secured by Letters Patent, is—

1. The reservoir m, combined with the reservoirs j' and n, one or more cylinders, a b, piston p, and connecting-conduits, all arranged to operate substantially as herein shown and described.

2. The tap s, combined with pipes w L, pipes u u', and enlargement u^2, substantially as and for the purpose herein shown and described.

3. The combination of two air-pumps, i j, for compressing the air taken from the atmosphere, with the reservoirs j' and n and final receiving-reservoir m, and with the pipes w L u u' and enlargement u^2, as specified.

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Witnesses:
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