(Model.)

E. ETÈVE & C. C. LALLEMENT.

GAS ENGINE.

No. 272,130. Patented Feb. 13, 1883.

FIG. 3.

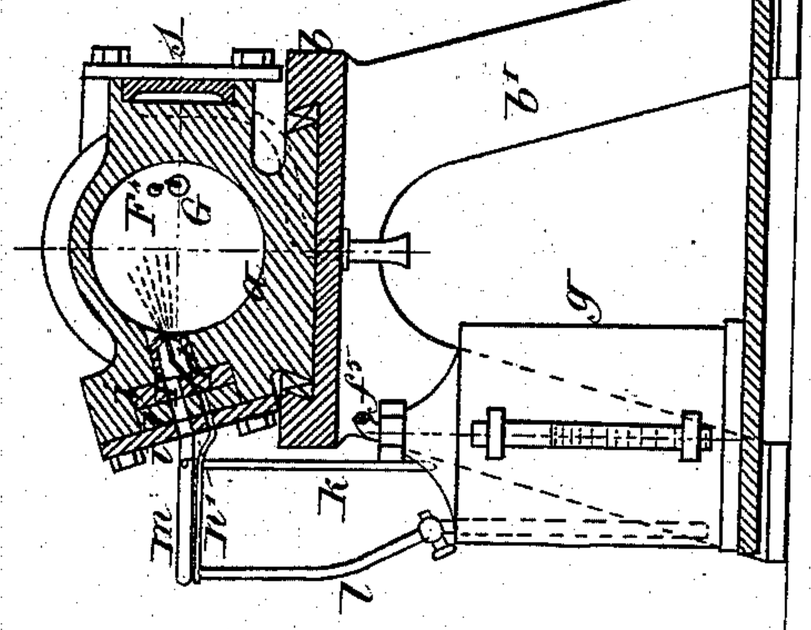


FIG. 1.

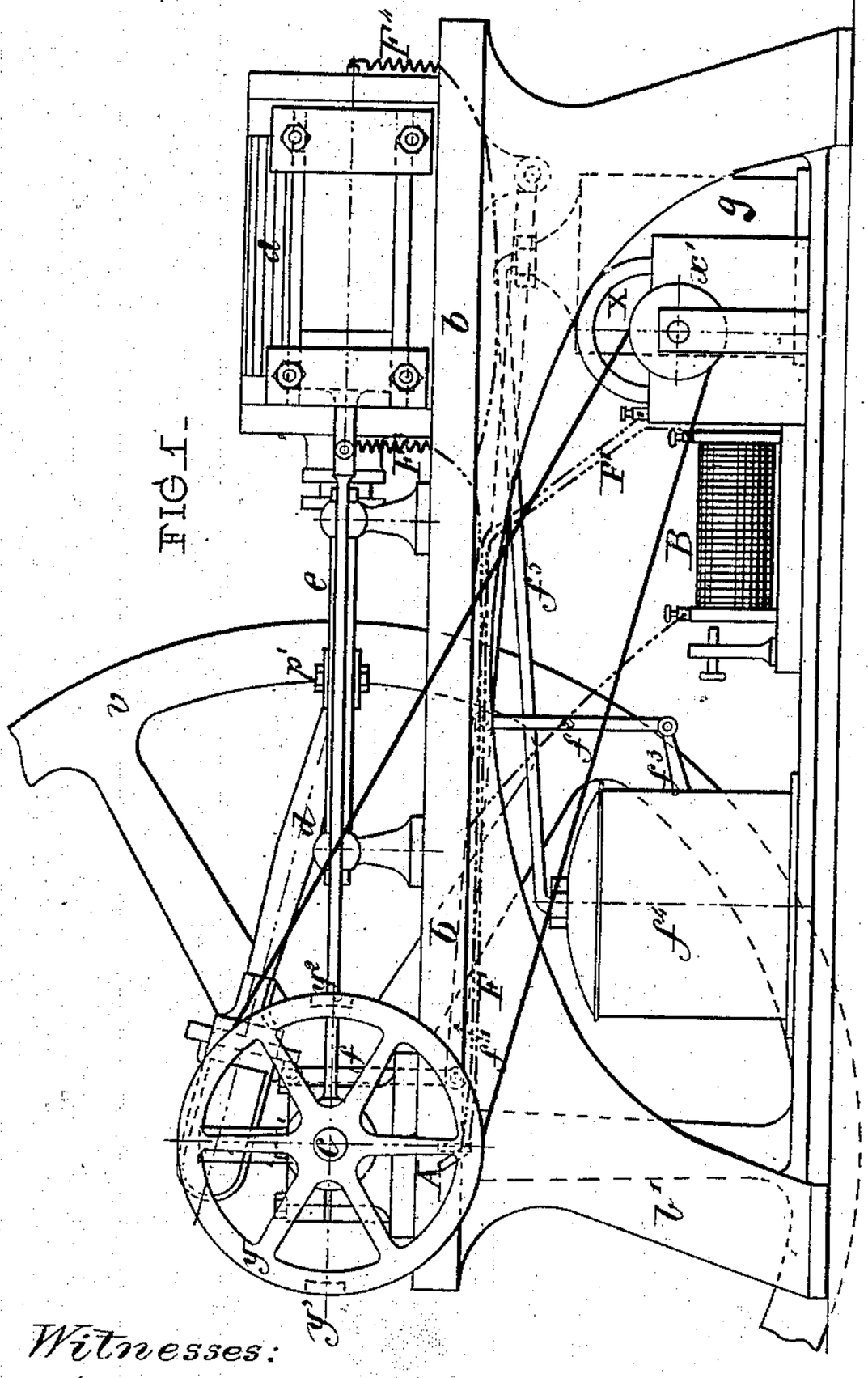
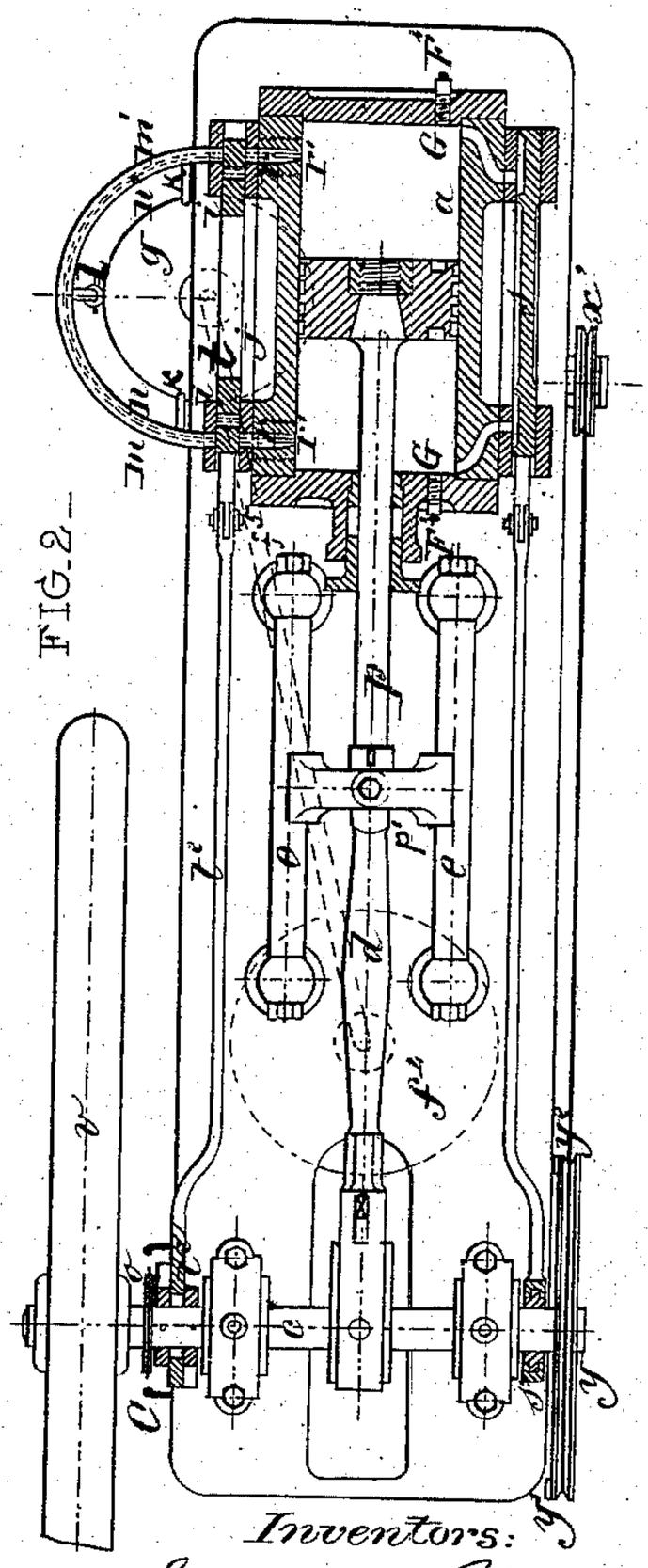


FIG. 2.



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EUGÈNE ETÈVE AND CHARLES CLÉMENT LALLEMENT, OF PARIS, FRANCE.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 272,130, dated February 13, 1883.

Application filed August 9, 1881. (Model.) Patented in France May 16, 1881, No. 142,877; in Belgium May 18, 1881, No. 54,668; in England July 16, 1881, No. 3,113; in Italy July 23, 1881, XXVI, 244, and in Germany July 27, 1881, No. 18,688.

To all whom it may concern:

Be it known that we, EUGÈNE ETÈVE and CHARLES CLÉMENT LALLEMENT, mechanical engineers, of Paris, in the Republic of France, have invented an Improvement in Gas-Engines, (for which we have obtained Letters Patent of France for fifteen years, dated May 16, 1881, No. 142,877;) and we do hereby declare that the following is a full and exact description thereof, reference being made to the accompanying drawings.

It is a known fact that gas-motors have the advantage that they dispense with fire-places, with special attendance and watchfulness, and that they consume fuel only when in actual use. They are, however, inconvenient in requiring special and costly apparatuses for generating the gas, and therefore their application has been restricted almost entirely to large cities or towns.

Attempts have heretofore been made to burn hydrocarburets; but it was found that the feeding of the machines was at least as expensive as that of gas-machines, and that they were unsafe and liable to explode.

The new motive-power engine which forms the object of our invention offers all the advantages of those worked by gas, without their inconveniences, or those using hydrocarburets. It is of a simple and economical construction, very similar to that of a steam-engine. It produces the hydrocarbureted fluid which is wanted for operating it, and consequently cuts off its consumption as soon as it stops.

The production of the hydrocarbureted fluid consists in injecting a stream of compressed air into a recipient which contains any kind of hydrocarburets—such as petroleum, for instance, or any other equivalent material—and to mix this hydrocarburet with the compressed air within the cylinder, so that the mixture will be in the space adjoining the piston. An electrical spark causes the ignition of the contents, and its immediate expansion moves the piston, the power being still increased by increasing the pressure of the air admitted. The quantity of hydrocarburet in each cylinder is very small—only enough to render the mixture inflammable. The generator occupies but a small space and may be easily removed from one place to another. All care and watchfulness may be dispensed with, as all its doings are automatic, so that the most inexperienced hand may set it to work or stop it, as desired. The more the resistance increases the longer will the inlet-ports for the hydrocarbureted air remain open, and consequently the combustion and the power of the mixture thus introduced will augment in the same proportion.

The drawings forming part of this specification are intended merely to demonstrate the application of the system of our new motor, and it is obvious that the general arrangements, as well as the new organs of this engine, may undergo such changes in form and construction as engines are usually subjected to.

Figure 1 is a side elevation. Fig. 2 is a top view partly in section. Fig. 3 is a vertical section across the cylinder.

The cylinder *a* is secured upon the bed *b*, which stands on legs *b'*. The crank-shaft *c*, which rests in bearings that may be cast on the bed or joined to it, is connected to the cross-head *p'* of the piston-rod *p*, which moves in guides *e e*. A fly-wheel, *v*, is keyed on said shaft. The crank-shaft *c*, or the head of the connecting-rod, connects by suitable links or levers, $f' f^2 f^3$, with the piston of a suitable air-compressor, f^4, of ordinary construction. The compressed air of the air-compressor f^4, by means of tube f^5, is let to the generator *g* of hydrocarbureted air, into which is poured either petroleum or any other equivalent hydrocarburets, and into which enter two tubes, the one, *k*, leading to the upper, and the other, *l*, leading to the lower part of vessel *g*. The pipe *k* is above the recipient *g*, divided into branches *m m'*, (see Fig. 2,) that end in the collector of the slide-valve *t* or distributer. The tube *l* is in like manner divided into two branches, *n n'*, that enter the same collector. The slide-valve *t* moves between two glass plates, *i* and *j*, the latter being fixed to the cylinder, close to its apertures *r r'*, one of which is intended for the air and the other for the petroleum. The rod t^2 of the slide-valve is conducted by one or two eccentrics of shaft *c*. The escapement is regulated by a second slide-valve, *s*, which is commanded by the eccentric *s'* on shaft *c*.

It remains to be explained how the engine

produces the electric sparks. Beneath the cylinder is a magnet, *x*, the pulley *x'* of which receives its movement by a larger one, *y*, fixed upon the shaft *e*, and which is provided on its edges with two contacts nearly opposite each other. $y' y^2$, the one for the forward and the other for the backward movements. These contacts are intended for pressing upon a commutator, A, with which one of the wires, F, is united, the other wire, F', of the magnet being in direct relation with an induction-bobbin, B. This bobbin through wire sends back the fluid into the bed *b*, and by a second wire into another commutator, C, Fig. 2, which corresponds with a small disk, *o*, on shaft *c*. The disk *o* is made of hardened or vulcanized rubber, in which is enrolled a copper wire with two contacts, one for the forward and the other for the backward movement. Two wires, F^3 F^4, extend from the contacts of this disk *o* to the cylinder's heads at the points G. The electro-magnet might be replaced by a pile, but the induction-bobbin will distribute the electrical fluid all the same.

Functions of the engine.—For the starting it is necessary to impart to the fly-wheel several rotations for the purpose of generating a small quantity of air under pressure. A stop-cock on the pipe *k* acts upon the compressor f^4 and causes the generation to be without the aid of the hydrocarburet. If we suppose that the piston is shown backward, then the slide-valve will show the corresponding openings, *r r'*, so as to admit into the cylinder *a* air under pressure and petroleum; but as a consequence of the pressure of the air itself, and even of the aspiration by the piston, the hydrocarburet projects itself and pulverizes within the cylinder, and instantaneously and impalpably the fluid is mixing with the air. When arrived at the two-fifths of the stroke of the piston the slide-valve shuts the openings, and instantly one of the contacts of the pulley *y* presses upon the commutator A, which leads the magnetic fluid into the induction-bobbin, and at the same time the other commutator, C, generates the spark within the cylinder. The ignited gases expand and violently push the piston ahead during the remaining three-fifths of the stroke. When the piston makes its back motion the slide-valve *s* opens the recess of the rear for the purpose of exhausting the burned gases, while the distribution is accomplished at the opposite face of the piston in the same way by the reversed working of the valve *t*. After a few rotations the engine is started and does not require any more care or watching. Whenever the resistance increases the speed of the piston diminishes, and the inlet-ports remain open for a greater length of time, so as to admit a larger quantity of hydrocarburet and air, which causes a more powerful effect from every piston-stroke. After a few rotations the engine regulates its movement according to the resistance and works regularly. The pressure of the air, which is to be admitted into the recipient of the hydrocarburet, might be regulated so as to admit at any time such quantity of hydrocarburet as is desired to do the work at the time.

We claim—

1. The combination of the cylinder *a* and its piston with the shaft *c*, air-compressing apparatus, f^4, means, substantially as described, for operating said air-compressing apparatus, connection f^5, mixing-chamber *g*, pipes *k* and *l*, slide-valve *t*, and spark-generating apparatus B C *o*, all arranged substantially as herein shown and described.

2. The combination of the cylinder *a* with the magnet *x*, pulleys *x'* and *y*, shaft *c*, commutator A, conductors F F', induction-bobbin B, commutator C, disk *o*, and conductors F^3 F^4 for operation, substantially as herein shown and described.

3. The cylinder *a*, combined with two slide-valves, *s* and *t*, and with the inlet-pipes *m*, *m'*, *n*, and *n'*, and electric conductors F^3 and F^4, substantially as herein shown and described.

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