No. 883,240. PATENTED MAR. 31, 1908.

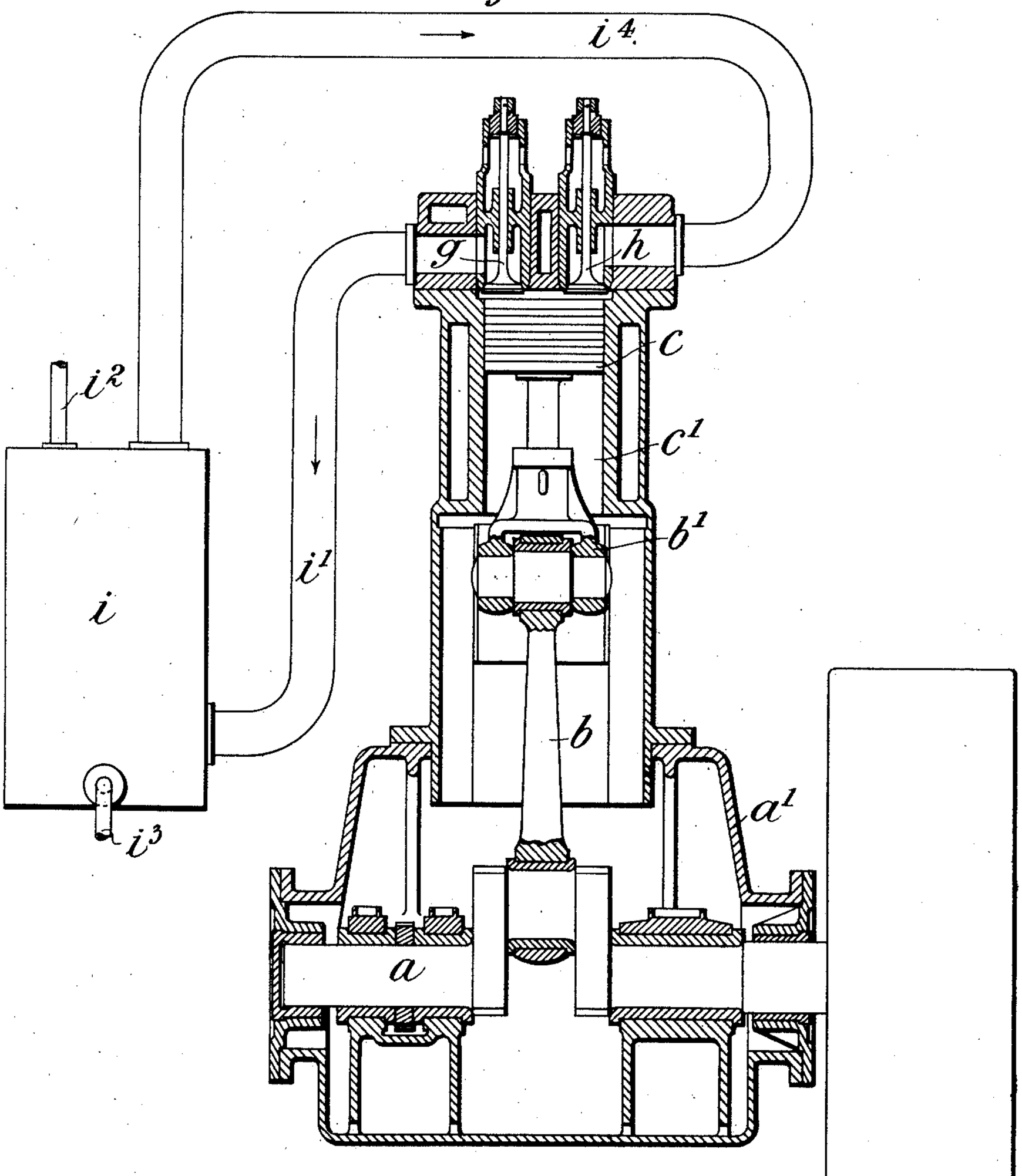
L. G. SABATHÉ.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED NOV. 23, 1905.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES.

Jean Séailles

Joseph Comte

INVENTOR.

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3 SHEETS—SHEET 2.

Fig. 2.

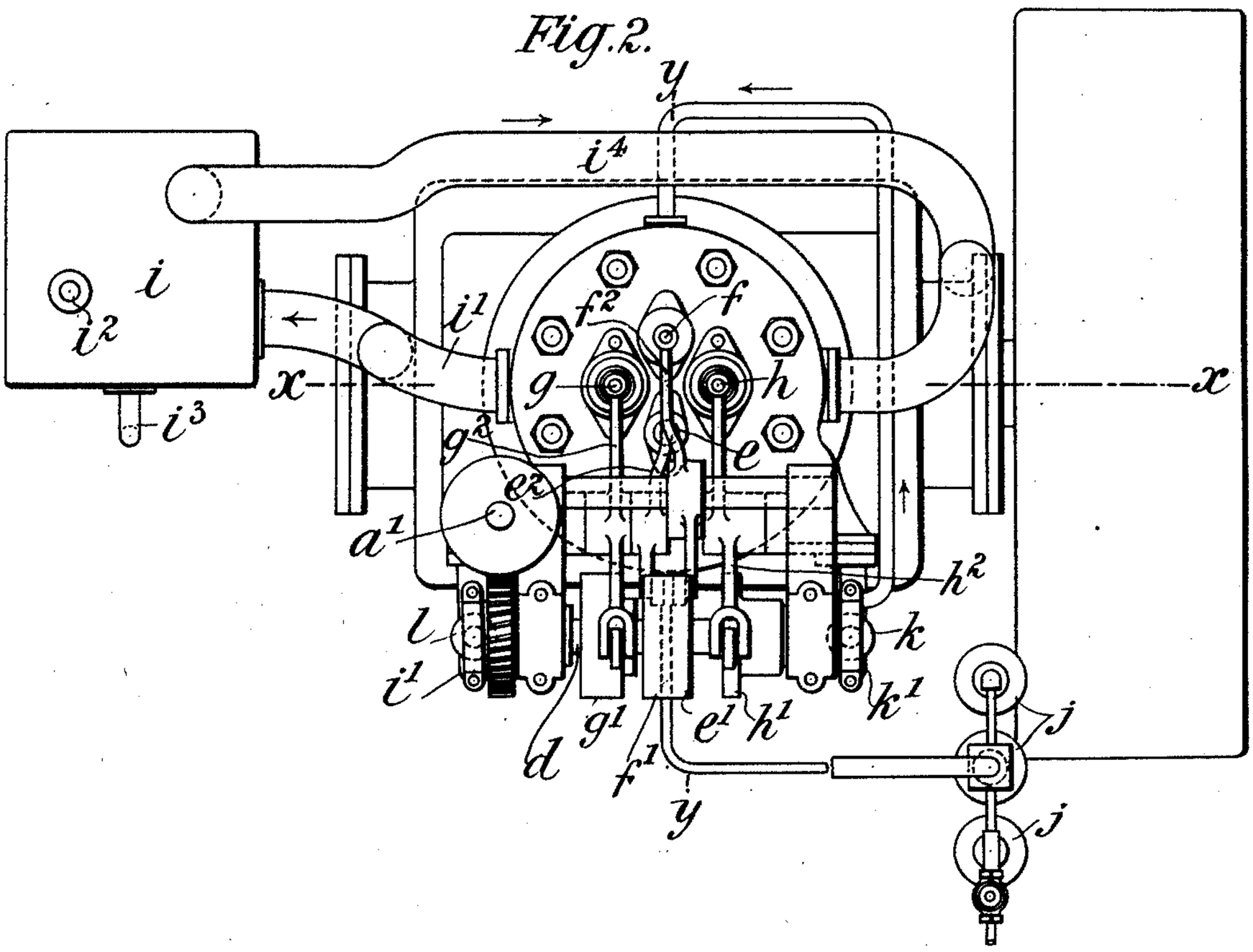


Fig. 4.

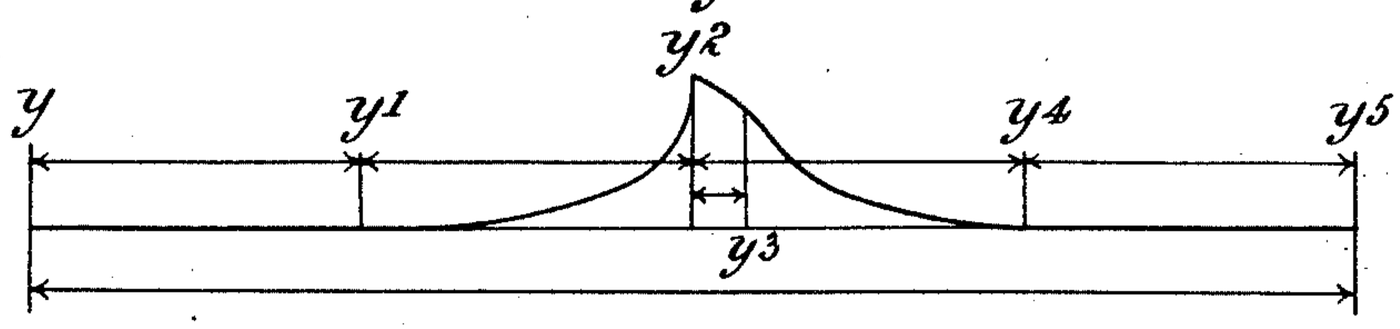
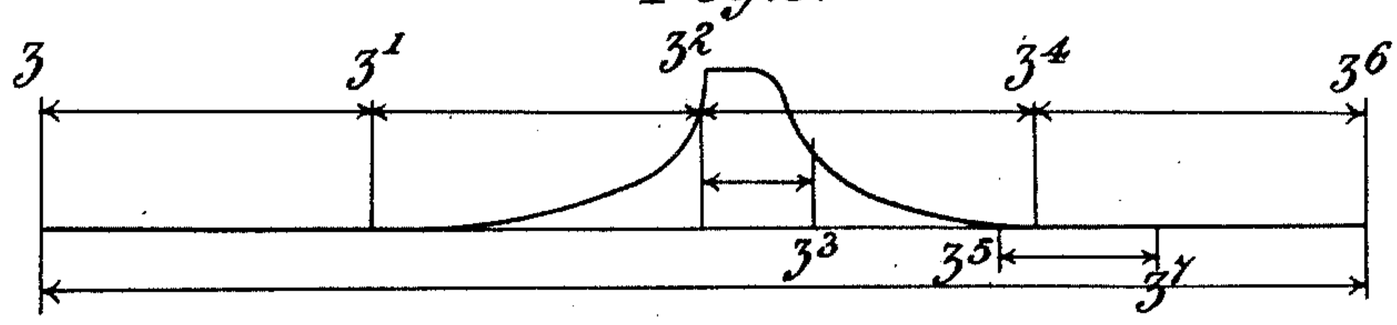


Fig. 5.



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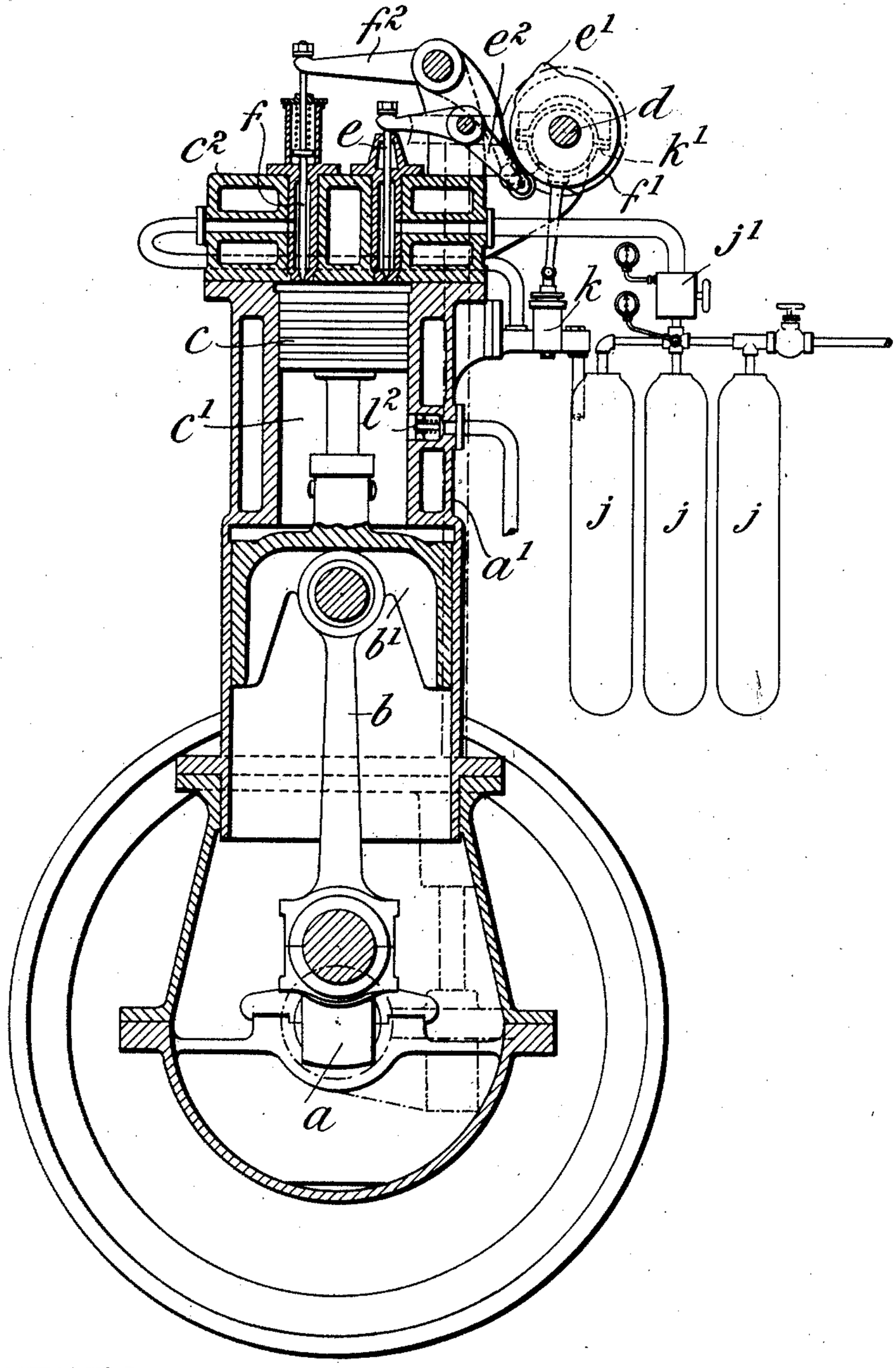
3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

LOUIS GASTON SABATHÉ, OF PARIS, FRANCE.

INTERNAL-COMBUSTION ENGINE.

No. 883,240. Specification of Letters Patent. Patented March 31, 1908.

Application filed November 23, 1905. Serial No. 288,712.

To all whom it may concern:

Be it known that I, LOUIS GASTON SABATHÉ, of 38 Rue des Intrepreneurs, Paris, in the French Republic, a citizen of the French Republic, have invented a certain new and useful Improved Internal-Combustion Engine, of which the following is a specification.

This invention relates to a method of producing motive power according to which an indissociable inert gas is employed as the vehicle of heat; thus enabling the units of heat produced by the complete combustion of a solid, liquid, or gaseous combustible, introduced into and burned in the inert gas by pure oxygen, to be utilized.

With this object, the inert gas alone is compressed to a sufficient degree to afford an efficient "cycle." The combustible and the pure oxygen are then introduced, either together or separately, into the compressed inert gas, and the mixture is ignited. Where, however, the combustible has been introduced alone into the inert gas, prior to the admission of the oxygen, the introduction of the latter is sufficient to cause ignition of the combustible; the employment of any other igniting device being thereby dispensed with. The heat generated by the combustion is absorbed by the inert gas and yielded as energy upon the expansion of the working charge. This method of working diminishes the loss of heat, first: through the walls of the cylinder, since the inert gas absorbs the heat produced at the moment of combustion; and secondly, by way of the exhaust, since the inert gas is able to expand until it has reached a temperature approximating that of the ambient atmosphere.

The invention also relates to a method whereby the inert gas may, after being freed from the products of combustion, be continuously reëmployed. The method of forming the subject of the present application thus differs essentially from the Diesel method, since the inert gas is separated, during the period of compression, from the oxygen. Thus, with this process, it is possible to have continuous action with the same quantity of inert gas, and to produce a motor in which the products of combustion are either pure water or are entirely soluble in water.

The power of all existing motors is determined by the weight of air introduced into the charge, as this weight of air limits the quantity of combustible which it is possible to burn. Under my new method, the weight of combustible burned may be considerable. The power is only limited by the quantity of oxygen introduced for effecting ignition and entire combustion. Thus, with this arrangement, it is possible to double, and even to treble, the power of the motor without changing the size of the cylinder or the piston speed, by simply increasing the combustible burned according to the quantity of oxygen introduced. This novel arrangement thus renders it possible to vary the power very rapidly and in considerable proportions, thereby affording a range of power-variability hitherto unrealized in internal combustion motors.

The supply to the motor of oxygen may be effected either by a compressor, or by an apparatus directly supplying oxygen under pressure in proportion as it is consumed. The oxygen may be stored in suitable receptacles under pressure and drawn therefrom as required; or it may be produced under pressure, either (*a*) by the decomposition of the alkaline peroxids in the presence of water in a suitable apparatus; or (*b*) by the combustion in a closed vessel of a mixture of alkaline chlorates and of a small quantity of combustible mixed, if necessary, with inert diluting substances intended to moderate the decomposition; or (*c*) by the decomposition of the alkaline chlorates by heat in a closed vessel.

The accompanying drawings illustrate a combustion engine adapted to work on my improved method.

Figure 1 is a vertical section on the line *x*—*x* in Fig. 2, Fig. 2 a plan, and Fig. 3 a section on the line *y*—*y* in Fig. 2. Figs. 4 and 5 are indicator diagrams hereinafter more particularly referred to.

The engine comprises the usual crank-shaft *a* working in a casing *a'*; connecting rod *b*, cross-head *b'* and piston *c* working in the cylinder *c'*. From the crank-shaft *a* is driven, by means of suitable gearing mounted at the extremities of a vertical shaft *a'*, a countershaft *d* on which are mounted the cams for operating the valves. These valves are mounted in the cylinder cover e^2 and comprise a valve *e* for admitting into the cylinder oxygen to support combustion, a valve *f* for admitting the combustible, a valve *g* for the exhaust, and a valve *h* for admitting the inert gas; these being respectively operated by cams *e'*, *f'*, *g'*, and *h'*, and by levers e^2, f^2, g^2, and h^2. The exhaust gases

pass into a tank i by way of a pipe i' where they are cleansed by passing through water which is admitted at i^2 and discharged at i^3. The oxygen may be stored under pressure in cylinders j and the supply to the engine regulated by a reducing valve j'. The engine cylinder is charged with the combustible by means of a pump k operated by an eccentric k'. A pump l operated by an eccentric l' is also provided for injecting water in the form of spray into the exhaust gases while in the cylinder, a non-return valve l^2 being mounted in the wall of the cylinder c' for this purpose.

The cycle of operations is as follows:—First, the inert gas is drawn into the cylinder by way of the valve h and the combustible may also be drawn in at this stage by way of the valve j; secondly, the inert gas and the combustible are compressed; thirdly, the oxygen is admitted by way of the valve e and effects the ignition of the compressed gases which thereupon expand; and fourthly, the exhaust valve g opens and the products of combustion are discharged into the tank i. The products of combustion, upon entering the tank, are brought into contact with a stream of cold water and cooled, the inert gas being at the same time separated from the products of combustion and led away from the tank i to the cylinder c' by way of a pipe i^4.

The power and the speed of the engine may be regulated by varying the supply of the combustible and of the combustive (oxygen). The supply of the combustible can be varied by regulating the lift of the suction valve in the pump k while the supply of oxygen is regulated by varying the pressure by means of the reducing valve j'.

Fig. 4 is an indicator diagram of a combustion engine of the Diesel type, the cycle of operations during ordinary working being as follows:—First stroke y to y', introduction of gas capable of supporting combustion; second stroke, y' to y^2, compression thereof (and of the inert gas remaining over from the previous cycle); third stroke, y^2 to y^3, introduction of combustible, and y^2 to y^4 expansion of the products of combustion; and fourth stroke, y^4 to y^5, the expulsion from the cylinder of the products of combustion.

Fig. 5 is an indicator diagram of a combustion engine working on my improved method, the cycle of operations being as follows: First stroke, z to z', introduction of inert gas and combustible, or the latter may be introduced in the second or the third stage; second stroke, z' to z^2, compression of these gases; third stroke, z^2 to z^3, introduction of combustive, z^2 to z^4 expansion of the products of combustion and at z^5 the introduction of a cold water spray or equivalent means for cooling the products of combustion; and fourth stroke, z^4 to z^6, exhaust from cylinder, the cold water spray being cut off at z^7.

What I claim as my invention, and desire to secure by Letters Patent, is:—

1. In an internal combustion engine the combination, with means for introducing a charge of inert gas, of means for subsequently and separately introducing a charge of combustible material and a charge of oxygen.

2. In an internal combustion engine, the combination with a cylinder and means for introducing into said cylinder a charge of gas incapable of supporting combustion, of means for compressing said gaseous charge, and means for separately introducing during the compression of said gaseous charge a charge of combustible gas or vapor, and a proportionate charge of oxygen.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LOUIS GASTON SABATHÉ.

Witnesses:
JEAN SEAILLES,
JOSEPH COMBE.