No. 863,355. PATENTED AUG. 13, 1907.

M. J., J., J. E. & J. A. BURLAT.

ROTARY MOTOR OPERATED BY GAS OR HYDROCARBONS.

APPLICATION FILED SEPT. 27, 1906.

3 SHEETS—SHEET 1.

FIG 1

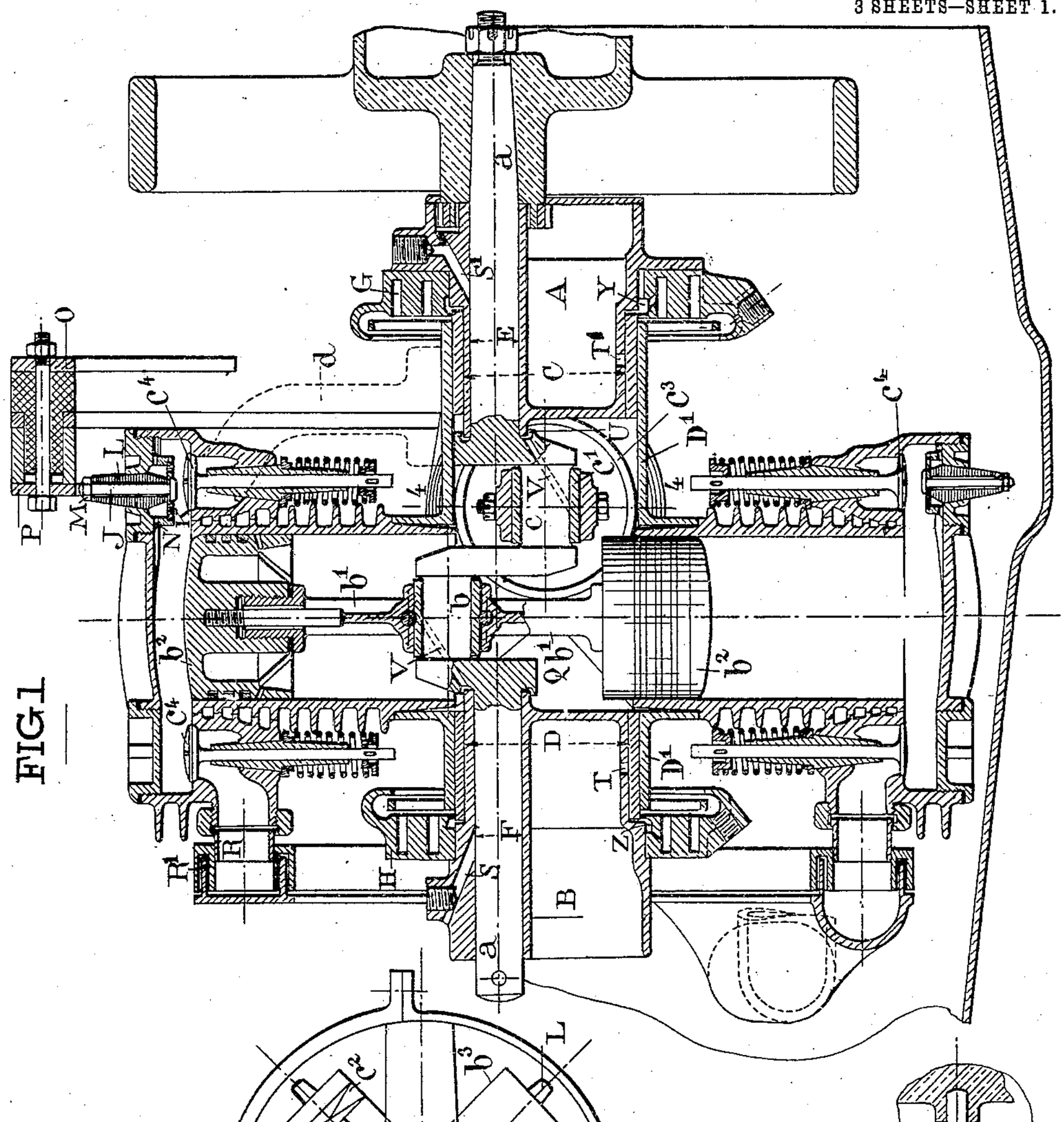


FIG. 2

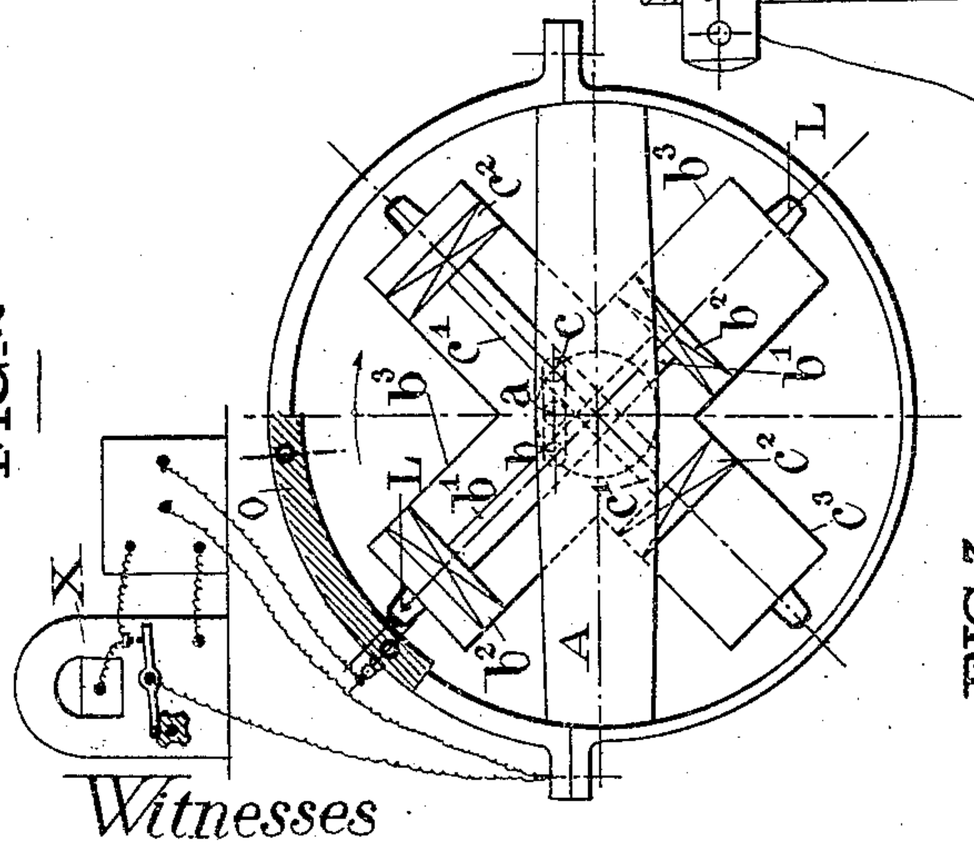
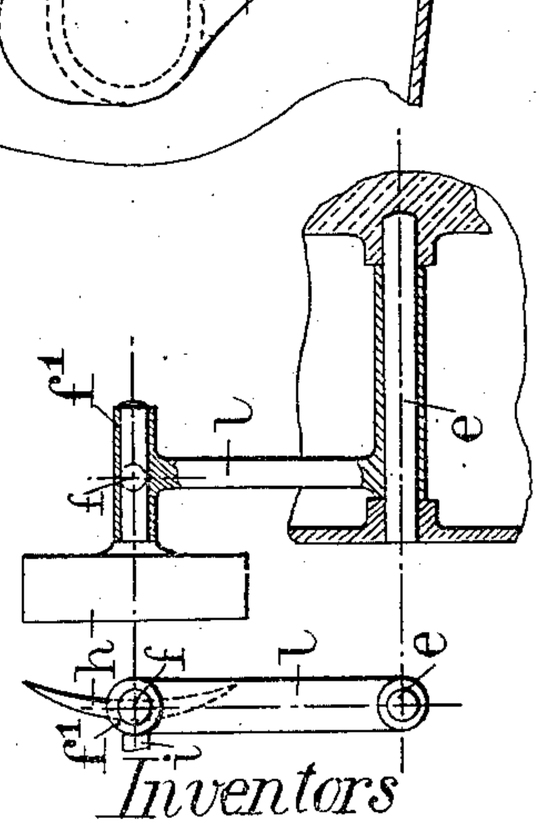


FIG. 3



Witnesses

Jean Germain

Hippolyte Villelongue

Inventors

Mathieu Joseph Burlat

Joannis Burlat

Joannes Eugene Burlat

Joseph Antoine Burlat

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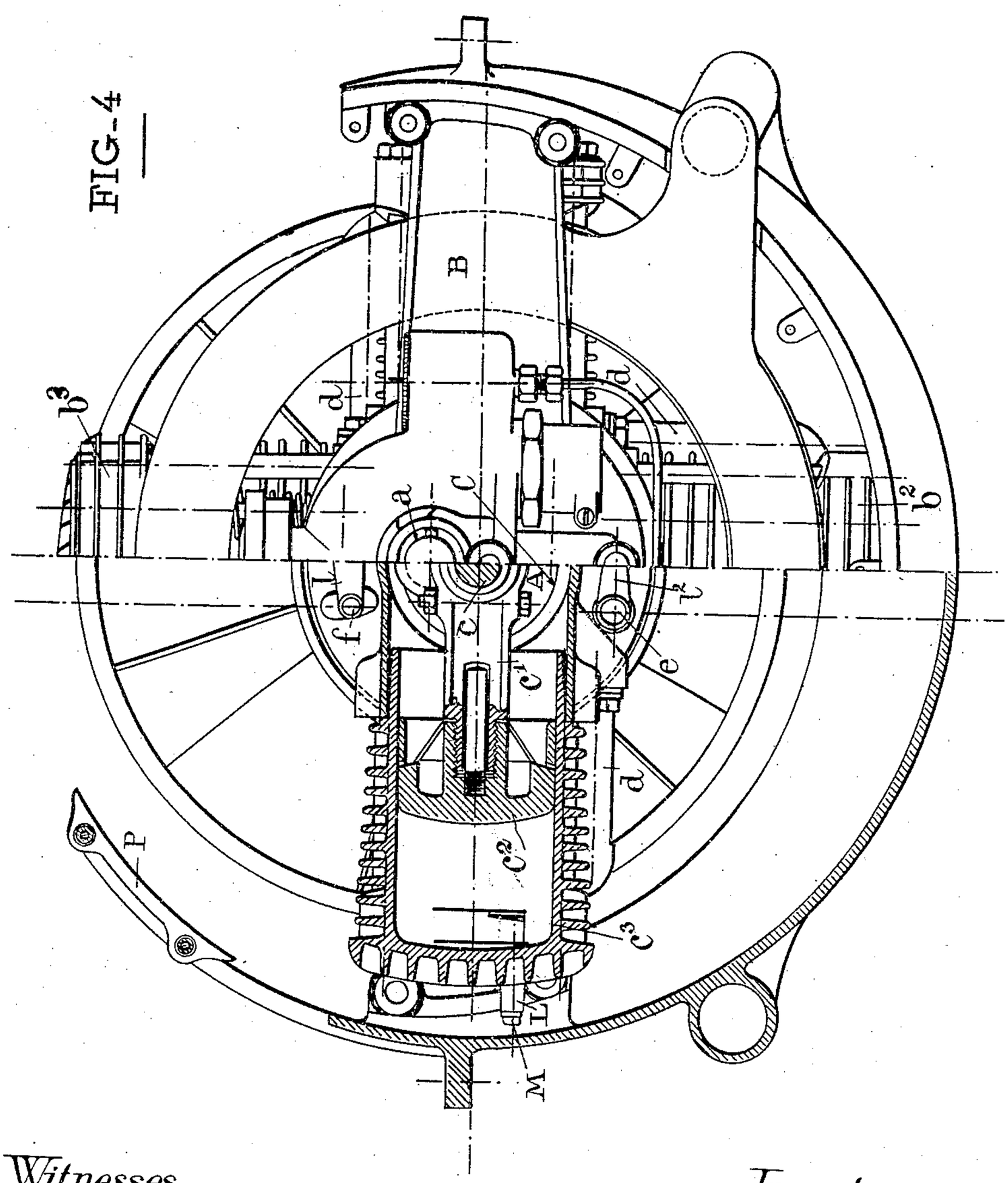
3 SHEETS—SHEET 2.

FIG. 4



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3 SHEETS—SHEET 3.

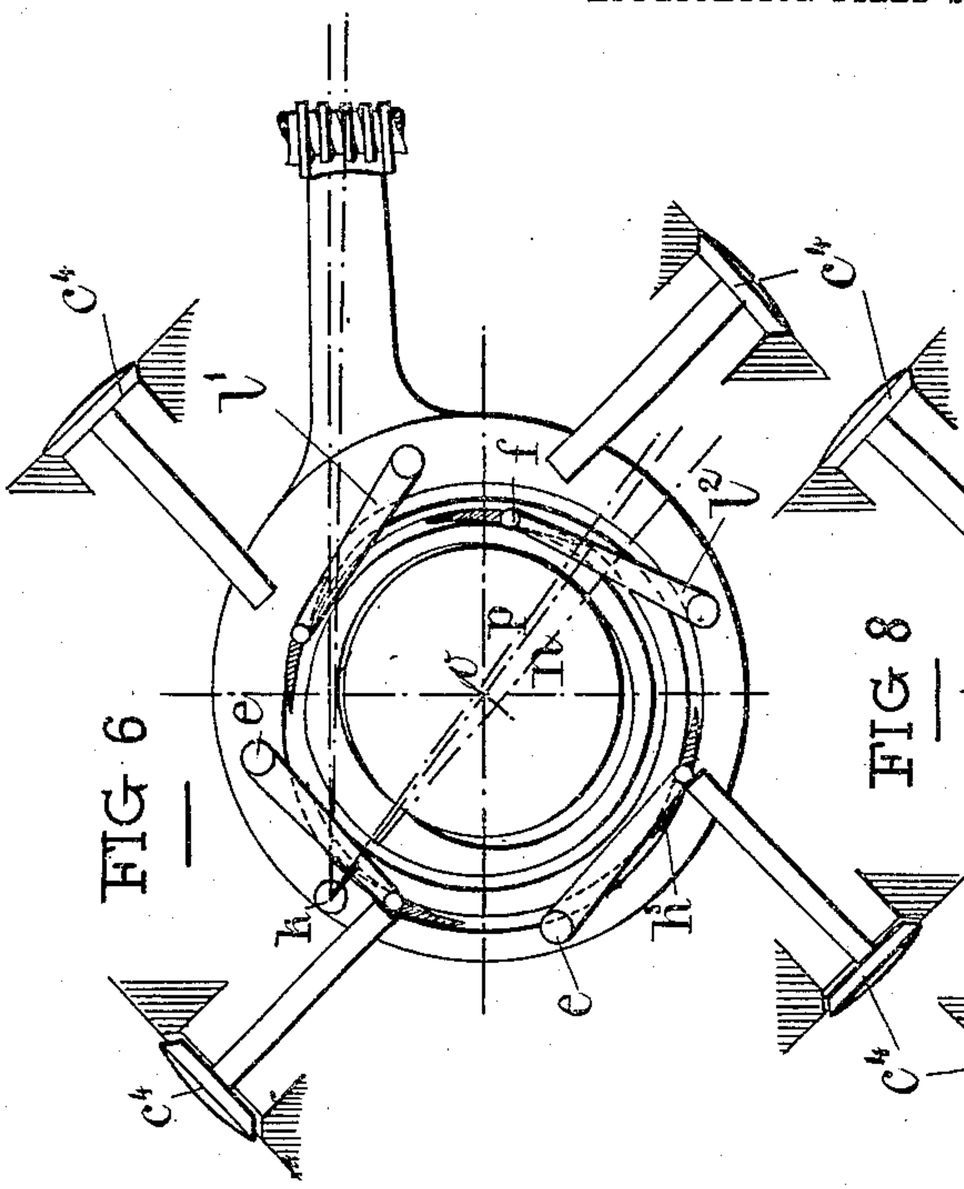

FIG 6

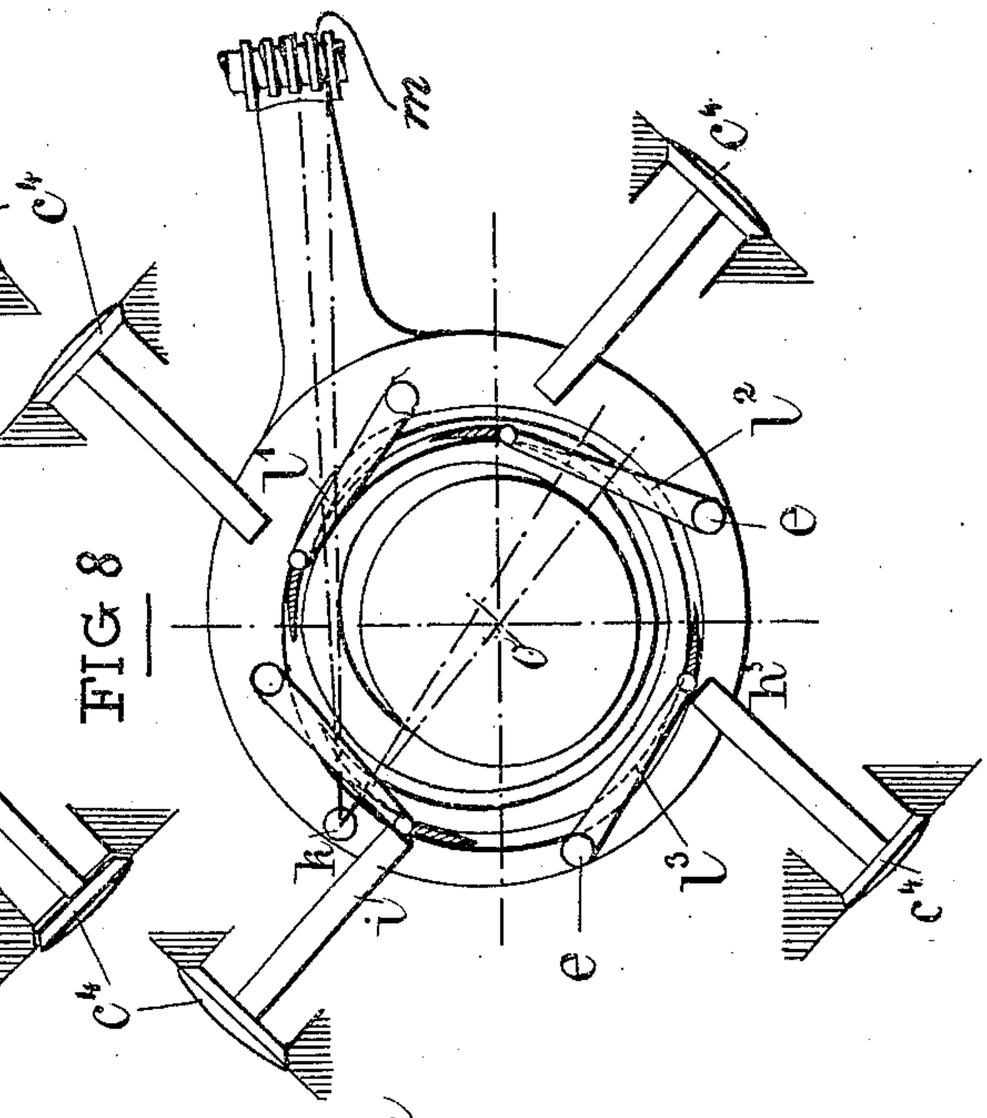

FIG 8

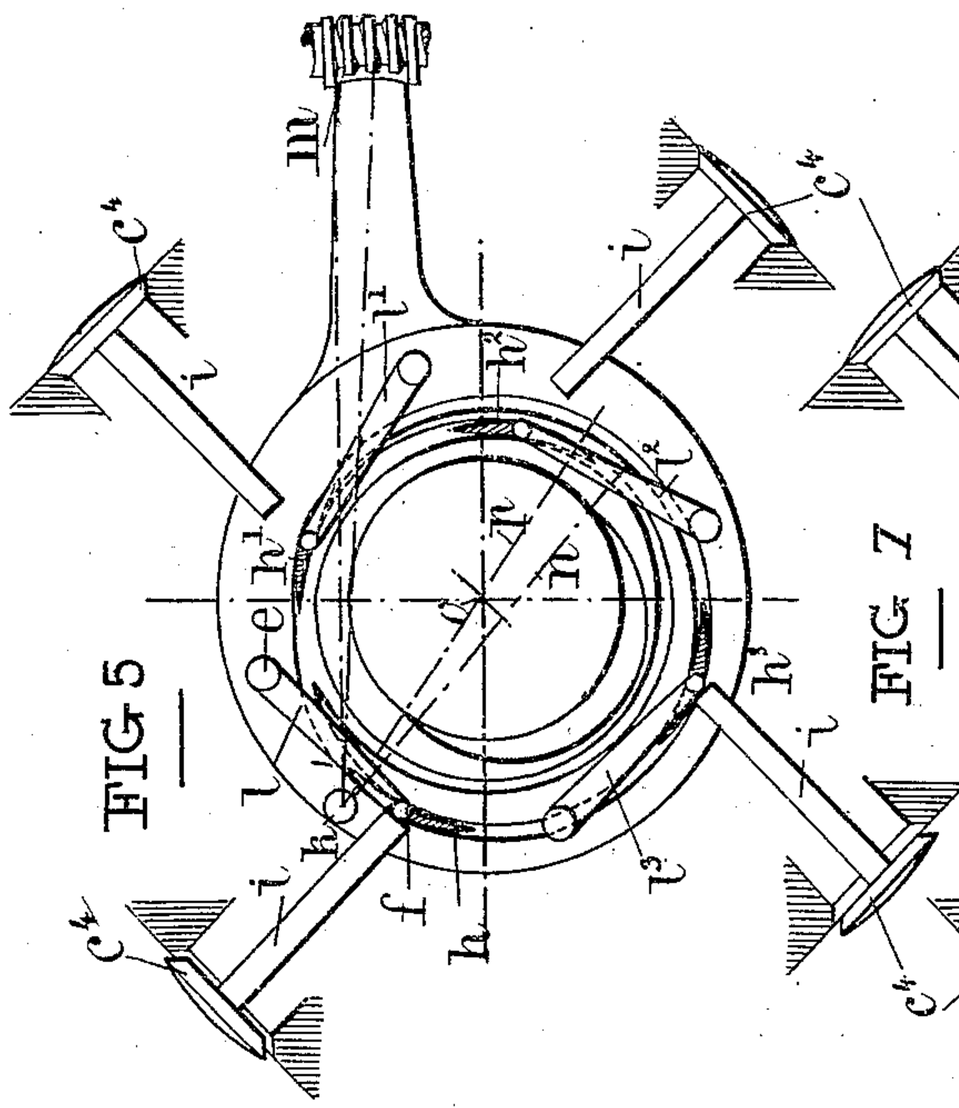

FIG 5

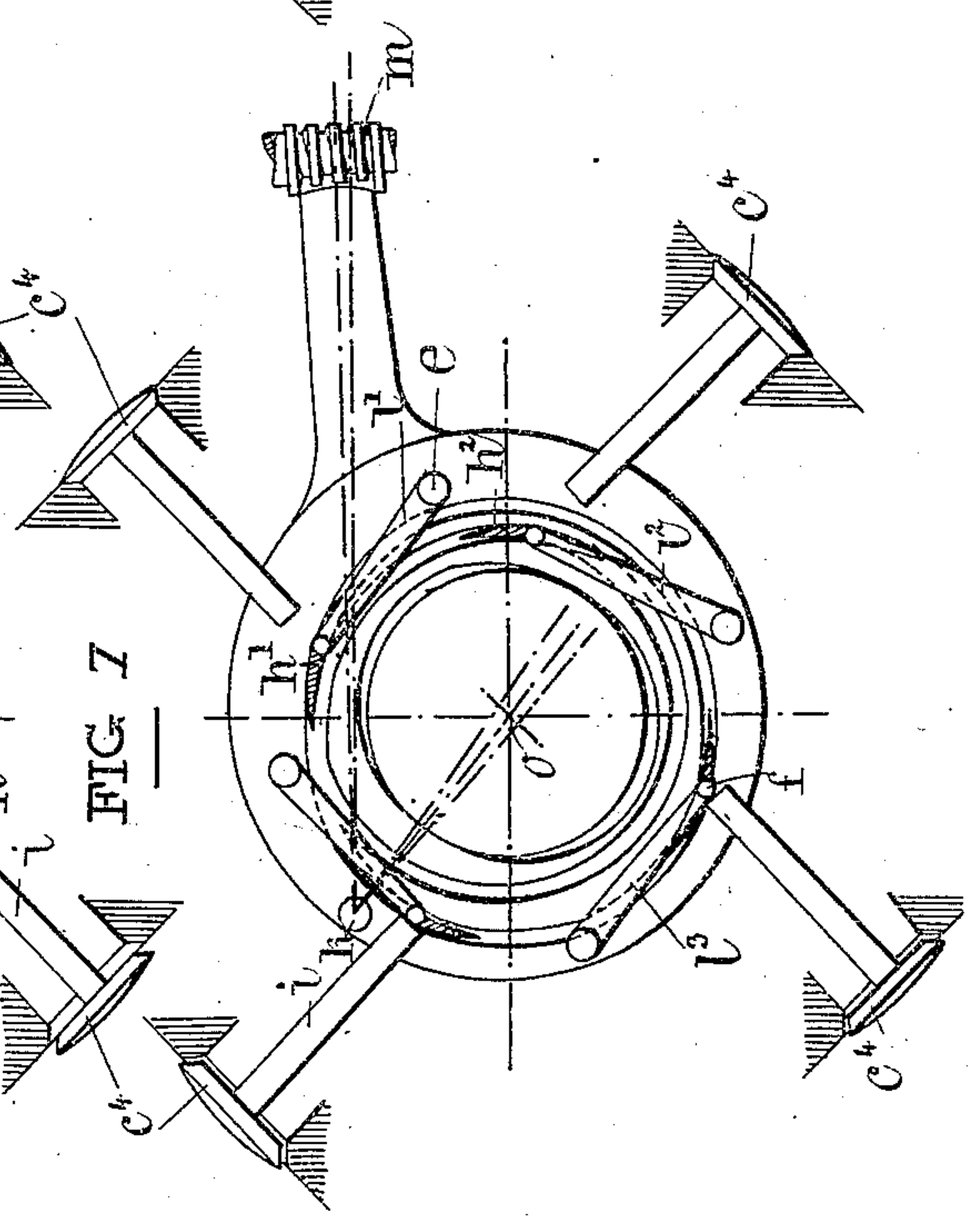

FIG 7

Witnesses

Jean Germain

Hippolyte Villelongue

Inventors

Mathieu Joseph Burlat

Joannis Burlat

Joannis Eugène Burlat

Joseph Antoine Burlat

UNITED STATES PATENT OFFICE.

MATHIEU JOSEPH BURLAT, JOANNÉS BURLAT, JOANNÉS EUGÈNE BURLAT, AND JOSEPH ANTOINE BURLAT, OF VILLEURBANNE, FRANCE.

ROTARY MOTOR OPERATED BY GAS OR HYDROCARBONS.

No. 863,355. Specification of Letters Patent. Patented Aug. 13, 1907.

Application filed September 27, 1906. Serial No. 336,492.

To all whom it may concern:

Be it known that we, MATHIEU JOSEPH BURLAT, JOANNÉS BURLAT, JOANNÉS EUGÈNE BURLAT, and JOSEPH ANTOINE BURLAT, citizens of the French Republic, residing at Villeurbanne, France, have invented certain new and useful Improvements in Rotary Motors Operated by Gas or Hydrocarbons, of which the following is a specification.

The rotary motor to which the present invention relates is based on the following known principle. If a circle is caused to roll inside another circle of double the diameter the hypocycloid described is a straight line. This principle has previously been applied to steam motors but not to explosion motors owing to difficulties in the ignition regulation and valve control and owing to the impossibility of producing a motor sufficiently balanced to permit rotation at high speed.

The above cited inconveniences are obviated by the particular arrangement and combination of the parts of the motor hereinafter described and claimed and illustrated in the annexed drawing, in which

Figure 1 is a longitudinal section of the motor. Fig. 2 is a diagram showing the supply of electric current to the sparking plugs of each cylinder. Fig. 3 is a detail view of one of the valve controlling levers. Fig. 4 is a sectional elevation showing on the left hand side a section on line 4—4 of Fig. 1, and on the right hand side an elevation of the front of the motor. Figs. 5, 6, 7 and 8 are diagrams showing the different positions of the valve controlling cam.

The motor is mounted on a frame forming the lower casing and to which are rigidly fixed two cross-bars A and B forming the supports for said motor. The said cross-bars each carry a trunnion C, D respectively serving as bearings for the rotary casing D^1 and are further bored at eccentric points E and F in order to form a bearing at each end, for the crank shaft *a*. Each crank pin *b* and *c* of said shaft is secured to a connecting rod b^1 c^1 connecting two oppositely arranged pistons b^2 c^2 working in cylinders b^3 c^3 during their rotation. The cylinders are four in number, and rigidly secured on the casing D^1 by bolts the whole being adapted to rotate about the trunnions C and D of the fixed cross-bars. The crank shaft *a* is mounted eccentrically with regard to the center of the casing this eccentricity being equal to a quarter stroke of the pistons or to the distance between the axes of the shaft *a* and crank pin *b*. Owing to this arrangement the axes of the crank pins *b* and *c* always coincide with the axes of the cylinders which permits of interconnecting two opposite pistons and of dispensing with oblique connecting rods.

The whole motor is rotatable and owing to the arrangement of the shaft *a* as described said shaft revolves at twice the speed of the cylinders. The valves c^4 of said cylinders are operated by means of levers *l*, l^1, l^2, l^3 mounted on the casing, the movement of these levers is effected by means of cams G H provided with grooved ways such grooved ways being on each cam a double loop.

The levers *l* l^1 l^2 l^3 are pivoted on axles *e* (see Fig. 3) mounted on the casing of the motor and each carries on a pin *f* at its upper end a crescent shaped sliding bl ck *h*, rotatable in a socket f^1 of said lever in order to permit it to follow the different curves of the cam grooves aforesaid to be traversed. The said levers on arriving below or in line with the spindles *i* of the valves, raise or open same when the curve of the cam groove causes a movement to take place so as to extend the distance between the socket *f* of the lever *l* and the center *o* of the motor.

Two examples may be given of the operation of the grooved cam.

Firstly, the cam is fixed and the groove has a double turn, the curves described by the groove G of this cam will give to the levers *l*, l^1, l^2, l^3 by means of the sliding blocks *h*, h^1, h^2, h^3 which traverse the groove when the motor is rotating a to and fro motion in accordance with the greatest and smallest radius which the curve of the groove takes with regard to the center *o* of rotation of the motor or of the turning part (Figs. 5 to 8). It is convenient to give to the groove such curve that the greatest radius, on a semi-circumference, terminates the stroke of the valve. In this manner the cam controls the four valves.

Secondly, if the cam is mounted so that its position can alter or be altered by being mounted so that it can oscillate on an eccentric pivot *k* to the extent for instance of the angle between the dotted lines *k*—*n* and *k*—*p* of the drawing, and that the greatest radius of the curve of the cam groove is on the side *k*—*n* proportionally to the approach of the line *k*—*n* to the center *o*, the greatest radius also approaching this center will diminish and the opening movement of the valves will be less. If on the other hand the great radius of the curve lies on the side of the pivot *k* by causing the cam to oscillate the complete closing of the valve takes place before the end of stroke of the piston and at points which vary according to the nature of the curve of the groove. The cam thus controls the action of the four valves and allows of regulating the opening movement of said valves.

Fig. 5 illustrates the cam in position for effecting the maximum of admission. Fig. 6 illustrates the opening of the valves diminished as compared to Fig. 5. In Fig. 7 the opening of the valves is still further lessened and in Fig. 8 the cam is sufficiently moved so that the valves are closed. The movement of the cam can be effected by means of an endless worm *m* or by an eccentric, cam, or any other suitable means. It can be

seen that by this means in accordance with the regulation of the opening of the valves, the speed of the motor can be regulated during action.

In the annexed drawing the opposite valves are not represented on the same axis and together they occupy a tangential position. This arrangement has been adopted so as to avoid the sliding of the lever under the valve while it raises it. The cam H is fixed and the stroke of the valves is constant. The springs of the valves are calculated so as to act as regulators to the motor, and allowing of a certain maximum speed which it can not exceed. The sparking plugs consist of a central insulated rod J which carries at one end a star K of nickel.

The rod J is insulated by means of a covering of mica which incases it for its whole length. Surrounding this covering is a series of mica collars or washers L which are compressed and held in position by a metallic washer and a nut M. The mica collars have exteriorly when in position a conical form and the whole is held in position in the casing without the aid of screw threading. Small openings N are provided to allow of the outflow of oil which may penetrate to the plug. The current at high tension reaches the plugs by two fixed sectors O, P, insulated from the frame and which receive the current from a magneto X or from an accumulator coil. The sparking plugs pass at a distance of about one millimeter from these keys and take the current during the revolution of the motor so as to effect the explosion at the proper moment.

The carbureted gases pass into the chamber Q of the casing by means of openings in the trunnion D. They are then led under the valves through pipes *d* which distribute them. The escaping gases are led to a circular passage-way R formed of two portions one of which is fixed being attached to a pipe leading to the outside; the other half being connected to the cylinders and rotating with the same. The connection of the two portions is made by means of flanges R^1 of the one portion engaging in guides of the other.

The starting of the motor is done as in motors generally by means of a handle for starting the crank shaft. The fly wheel which can be utilized for driving a coupling belt has its arms or spokes constructed so as to have a suction effect on the atmosphere. It thus renews during the action of the motor the air inclosing the cylinders thus acting to cool said cylinders. For lubricating the rotary parts the oil from the lubricator is conducted to the crank shaft *a* through the channels S and S^1 and to the trunnions C and D through the channels T and T^1.

The oil conducted to the crank shaft owing to the aspiration of the gases in the casing does not flow outside. When it arrives against the collar of the crank shaft the centrifugal force projects it to the bottom of the opening U whence it is led on to the crank pins through the channel V. It is then projected on to the pistons lubricating same and also the cylinders.

The oil which acts for lubricating the trunnions C and D passes out at each side, some runs in the casing and serves for lubricating the cylinders; the remainder passing through the ports Y or Z and lubricates the grooves of the cams G and H. The motor is described as having four cylinders arranged at angles of 90° but it could be provided with six arranged at 60°

What we claim as our invention and desire to secure by Letters Patent of the United States is:—

1. In a rotary gas or hydrocarbon motor the combination of a plurality of cylinders located radially about and adapted to revolve around a center, inlet and exhaust valves communicating with said cylinders, oscillatable cams having double eccentric grooves, slidable blocks engaging said grooves, levers in connection with said blocks adapted to operate the valves during the rotation of the cylinders and means for adjusting the position of said cams to regulate the stroke of the valves, substantially as described.

2. In a rotary gas or hydrocarbon motor the combination of a plurality of cylinders located radially about and adapted to revolve around a center, pistons working in said cylinders, connecting rods secured to said pistons, a crank shaft to which said rods are coupled in pairs, said crank shaft having its axis eccentric to said center to an extent equal to a quarter stroke of the pistons aforesaid, inlet and exhaust valves communicating with said cylinders, eccentrically grooved cams, and means engaging the grooves in said cams for operating the valves during the rotation of the cylinders, substantially as described.

3. In a rotary gas or hydrocarbon motor, the combination of a plurality of cylinders located radially about and adapted to revolve about a center, pistons working in said cylinders, connecting rods secured to said pistons, a crank shaft to which said rods are coupled in pairs, said crank shaft having its axis eccentric to said center equal to a quarter stroke of the pistons, inlet and exhaust valves communicating with the cylinders, oscillatable cams having double eccentric grooves, slidable blocks engaging said grooves, levers in connection with said blocks adapted to operate the valves during the revolution of the cylinders, means for adjusting the position of said cams to regulate the stroke of the valves, sparking plugs located in the cylinders, a source of electric current and stationary conductive sectors adapted to transmit the current from said source of electricity to the sparking plugs during the revolution of the cylinders aforesaid, substantially as described.

In witness whereof we have signed this specification in the presence of two witnesses.

MATHIEU JOSEPH BURLAT.
JOANNÉS BURLAT.
JOANNÉS EUGÈNE BURLAT.
JOSEPH ANTOINE BURLAT.

Witnesses:
JEAN GERMAIN,
HIPPOLYTE VILLELONGUE.