No. 829,231. PATENTED AUG. 21, 1906.

A. PRIMAT.

ROTARY MOTOR.

APPLICATION FILED NOV. 17, 1904.

3 SHEETS—SHEET 1.

Fig. 1.

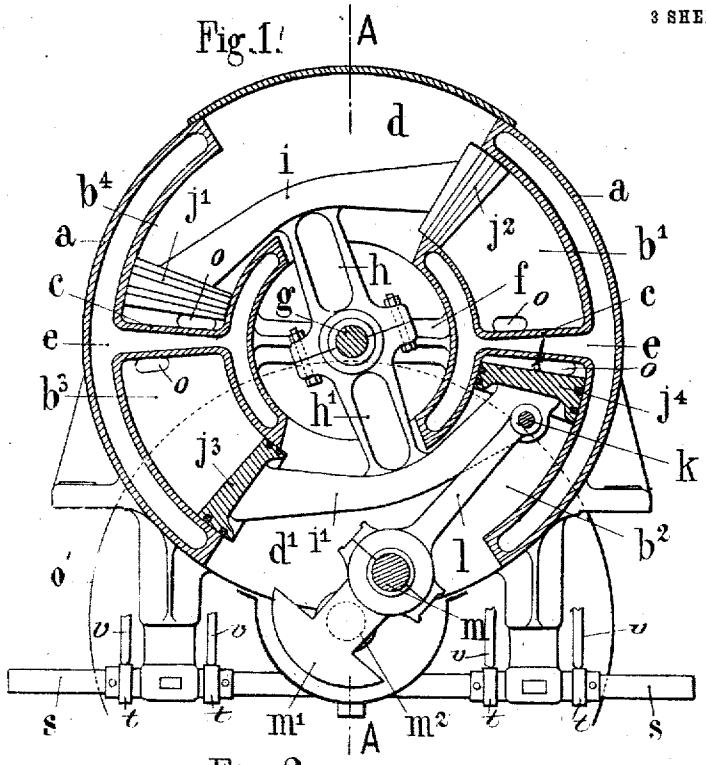
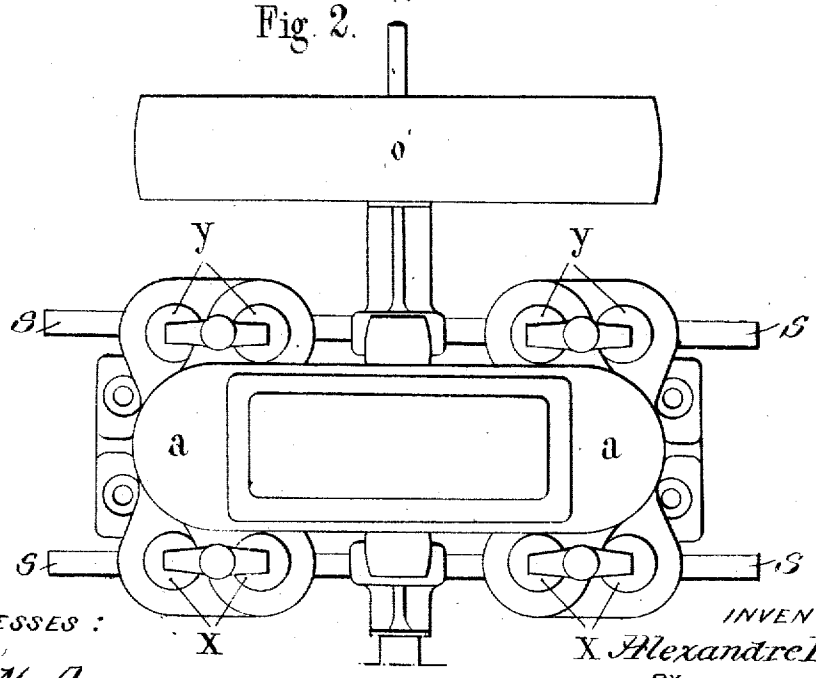


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

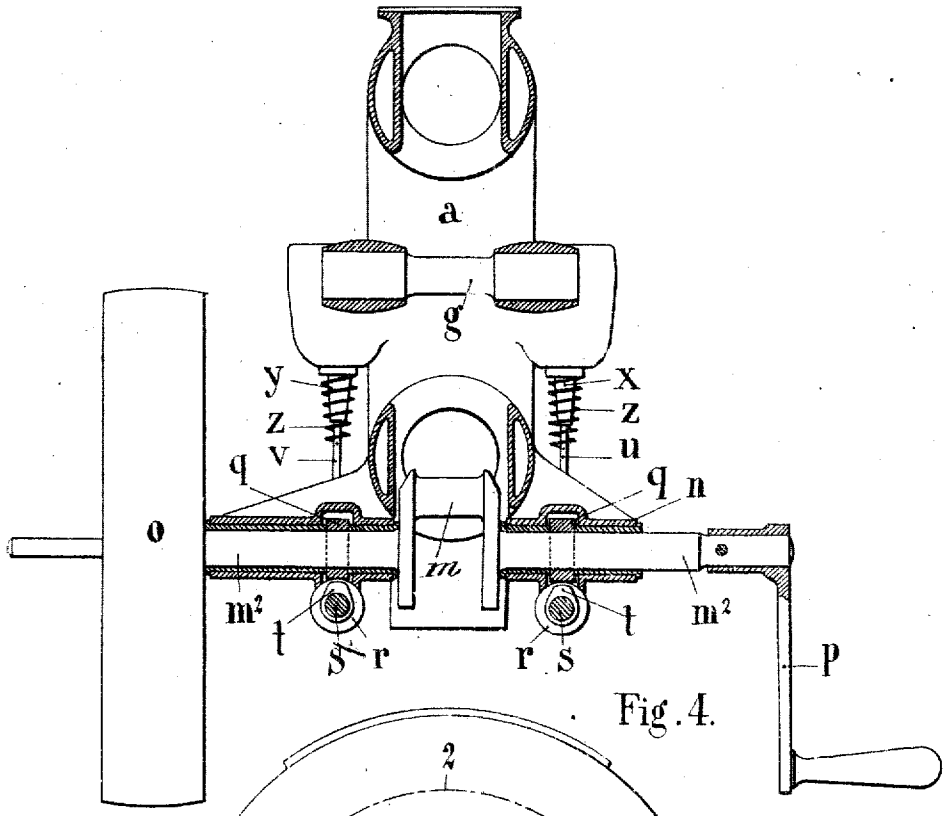
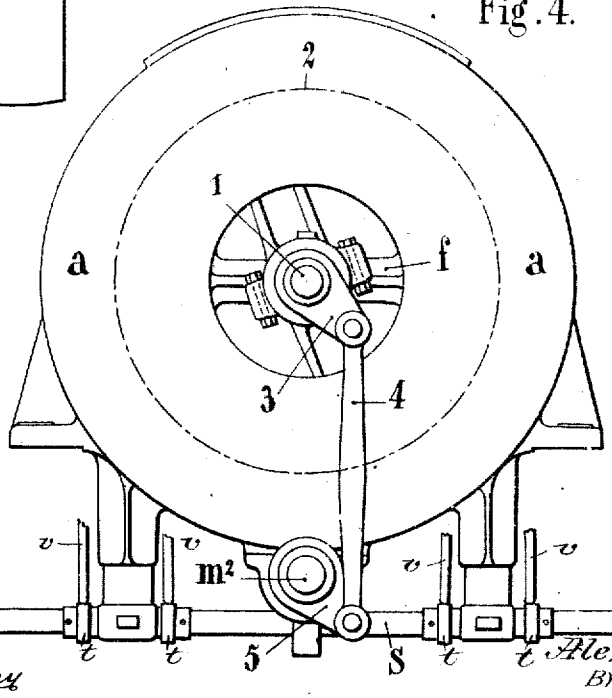


Fig. 4.



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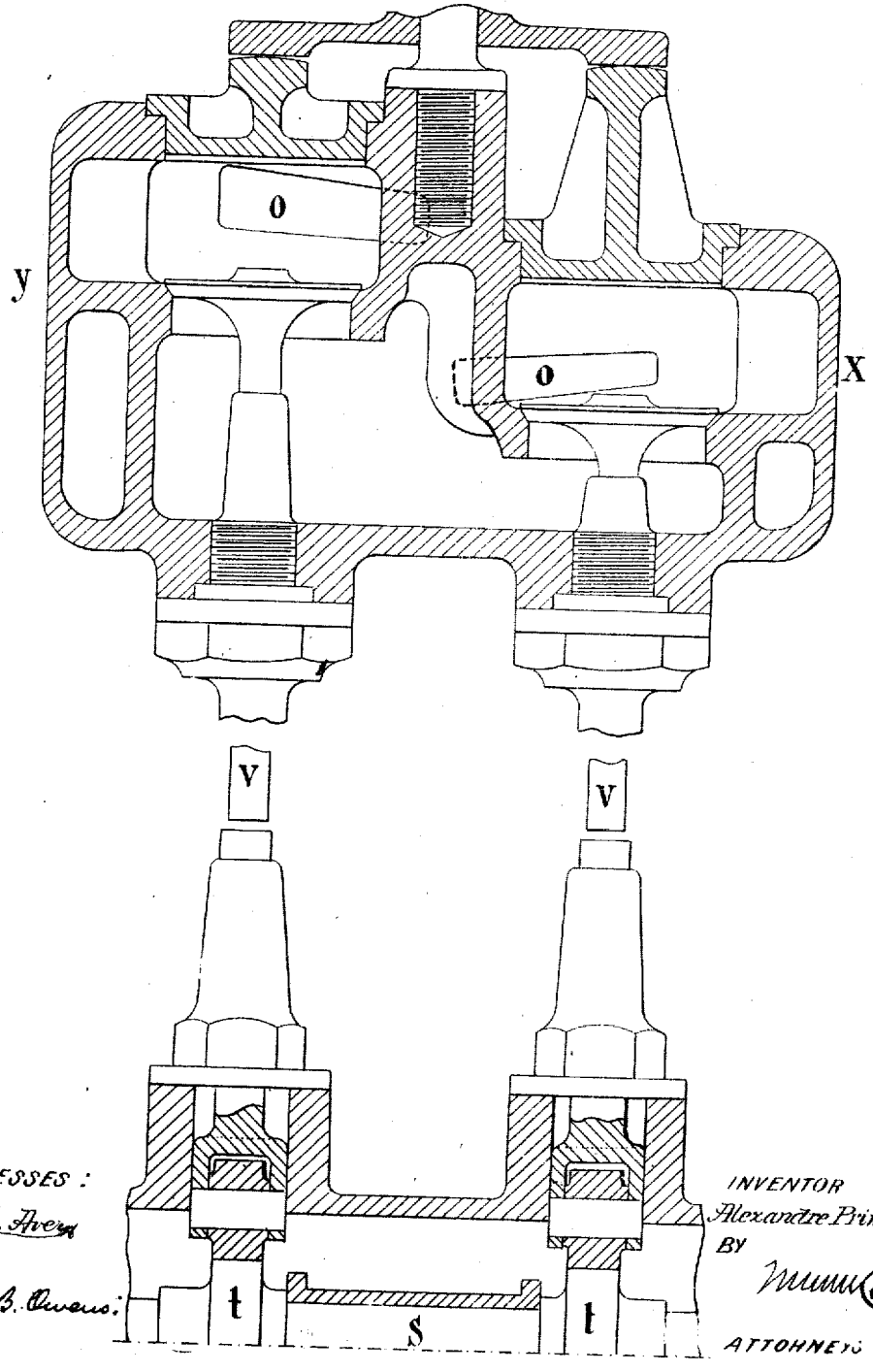
3 SHEETS—SHEET 3

Fig. 5.



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UNITED STATES PATENT OFFICE.

ALEXANDRE PRIMAT, OF PARIS, FRANCE.

ROTARY MOTOR.

No. 829,231. Specification of Letters Patent. Patented Aug. 21, 1906.

Application filed November 17, 1904. Serial No. 233,110.

To all whom it may concern:

Be it known that I, ALEXANDRE PRIMAT, formerly glover, actually motor manufacturer, of 103 Rue Lafayette, in the city of Paris, Republic of France, have invented Improvements Relating to Rotary Motors, of which the following is a full, clear, and exact description.

This invention has for its object a rotary motor operating, for example, by means of petroleum spirit or of alcohol and characterized by the combination of four rigidly-connected pistons coupled in pairs by means of arms and cross-pieces in such a manner that all four are able to rock around a central point, moving in cylinders arranged circularly in the casing of the motor, cast in a single piece, this rocking movement being converted into a continuous circular movement by means of a peculiarly-arranged connecting-rod and crank, while the explosive mixture is conducted alternately into each of the four cylinders in such a manner that an explosion takes place for each reciprocatory movement, while the suction, compression, and the exhaust of the burnt gases take place alternately in each of the other cylinders, owing to the provision of a set of valves appropriately arranged and operated.

This invention is hereinafter described with reference to the accompanying drawings, illustrating a four-cycle motor, in which drawings—

Figure 1 represents this motor in vertical section along the axis. Fig. 2 is a plan view of the motor. Fig. 3 is a vertical section through the motor on the line A A of Fig. 1. Fig. 4 illustrates a modification of the said motor, and Fig. 5 is a section through the exhaust-valves.

In these figures similar characters of reference are employed to designate like parts.

As shown in the drawings, this motor comprises an annular envelop or casing *a*, cast in one piece and in which cylinders $b' b^2 b^3 b^4$ are formed in groups of two, separated by means of a partition *c*, forming a common cylinder end, while two diametrically opposite recesses *d d'* separate the two groups. A water-jacket *e* surrounds these cylinders in order to insure their proper cooling. O, Figs. 1 and 5, indicates the exhaust-ports. Admission-ports are provided on the opposite sides of the cylinders. In the central portion of the annular casing is a cross-piece *f*, at the center of which is mounted a horizontal shaft *g*, arranged in such a manner as to remain fixed and receive two arms *h*, connected one with the other by means of bolts. These arms, adapted to oscillate freely upon the shaft *g*, are provided with cross-pieces *i i'*, connecting the pairs of pistons $j' j^2 j^3 j^4$ rigidly. The assemblage composed by the arms *h h'* and the cross-pieces *i i'* constitutes a beam. The lower cross-piece *i'* receives, by means of an articulation *k*, a connecting-rod *l*, embracing by the other extremity a crank-pin *m*, with counterpoise *m'*, forming part of the driving-shaft m^1. This shaft, arranged in a sleeve *n*, receives at one end the pulley fly-wheel *o'* and at the other end a starting-crank *p* and two helicoidal gear-wheels *q*, arranged in an intermediate position. These gear-wheels act upon other helicoidal gear-wheels *r*, rigid with the shaft *s*, in order to transmit their movement to these latter and displace the cams *t*, with which these shafts are provided. The cams *t*, suitably regulated, control, by means of the rods *u v*, the lip of the suction-valves *x* and exhaust-valves *y*, arranged on the sides of the envelop and communicating with the interior of the cylinders by means of the admission and exhaust ports before referred to. Spiral springs *z* maintain the valve-rods constantly in contact with the cams *t* and insure their closing.

The operation of my improved motor is as follows: Assuming, for example, that the explosion takes place on the piston j^2, the opposite piston j' of the same pair will compress the explosive mixture during this time, while the piston j^4 of the second pair will suck the fresh mixture, and the piston j^3 will expel the burnt gas of the preceding explosion, and so on in succession alternately. Considering each of the pistons separately, we therefore have, first, suction by forward displacement of the piston; second, compression of the mixture by return movement of the piston; third, work effected by forward movement of the piston under the action of the explosion; fourth, exhaust by return movement of the piston immediately before the admission of the fresh mixture.

The forms, details, accessories, materials, and dimensions of this motor may of course vary without thereby altering in any way the principle of the invention. Thus, for example, as shown in Fig. 4, the driving-shaft 1, with pulley fly-wheel 2, might be arranged at the center of the motor, upon

which the beam would be mounted loosely. This shaft in this case is displaceable and is provided with two cranks 3 and two connecting-rods 4, upon which act the cranks 5, forming part of the intermediate shaft m^2, receiving the movement of the connecting-rod l, as above stated. The shafts s for operating the valves are provided as before likewise.

This motor may be operated by steam, compressed air, or gas, the required detail changes of course being made.

I claim—

1. In an engine, the combination of a curved cylinder, a piston operating therein, a rocking member to which the piston is connected, a crank-shaft located at one side of said rocking member, a connection between the rocking member and crank-shaft, a valve at each side of the said cylinder, means for operating said valves, such means including a cam-shaft for each valve, the cam-shafts extending across the crank-shaft, and gearing for driving the cam-shafts from the crank-shaft.

2. In an engine, the combination of a curved cylinder, a frame on which the same is mounted, a piston operating in the cylinder, a crank-shaft mounted in the frame, a connection between the piston and crank-shaft, a valve at each side of the cylinder, means for operating the valves, said means comprising a cam-shaft for each valve, the cam-shafts being located at the respective sides of the cylinder and extending across the crank-shaft, and gearing for driving the cam-shafts from the crank-shaft.

3. In an engine, the combination of a curved cylinder, a piston operating therein, a crank-shaft having its crank intermediate its ends, a connection between the piston and crank-shaft, a valve at each side of the cylinder, means for operating the valves, comprising a cam-shaft for each valve, the cam-shafts being located at the respective sides of the cylinder and at opposite sides of the crank-shaft, and gearing for driving the cam-shafts from the crank-shaft.

The foregoing specification of my improvements relating to rotary motors signed by me this 2d day of November, 1904.

ALEXANDRE PRIMAT.

Witnesses:
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MAURICE U. PIGNET.