C. SELLA.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED OCT. 12, 1906.

917,165.

Patented Apr. 6, 1909.

4 SHEETS—SHEET 1.

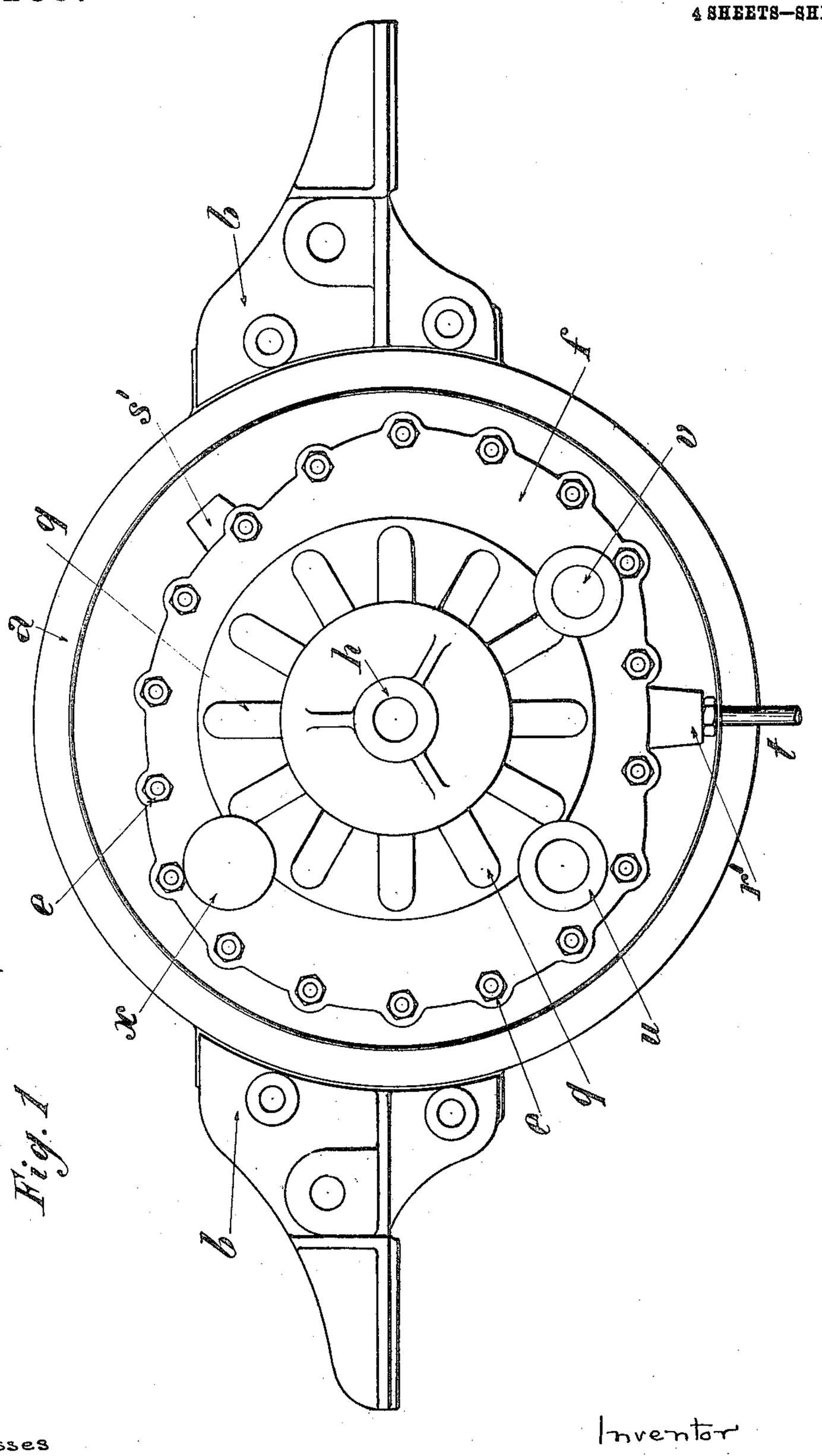

Fig. 1

Witnesses
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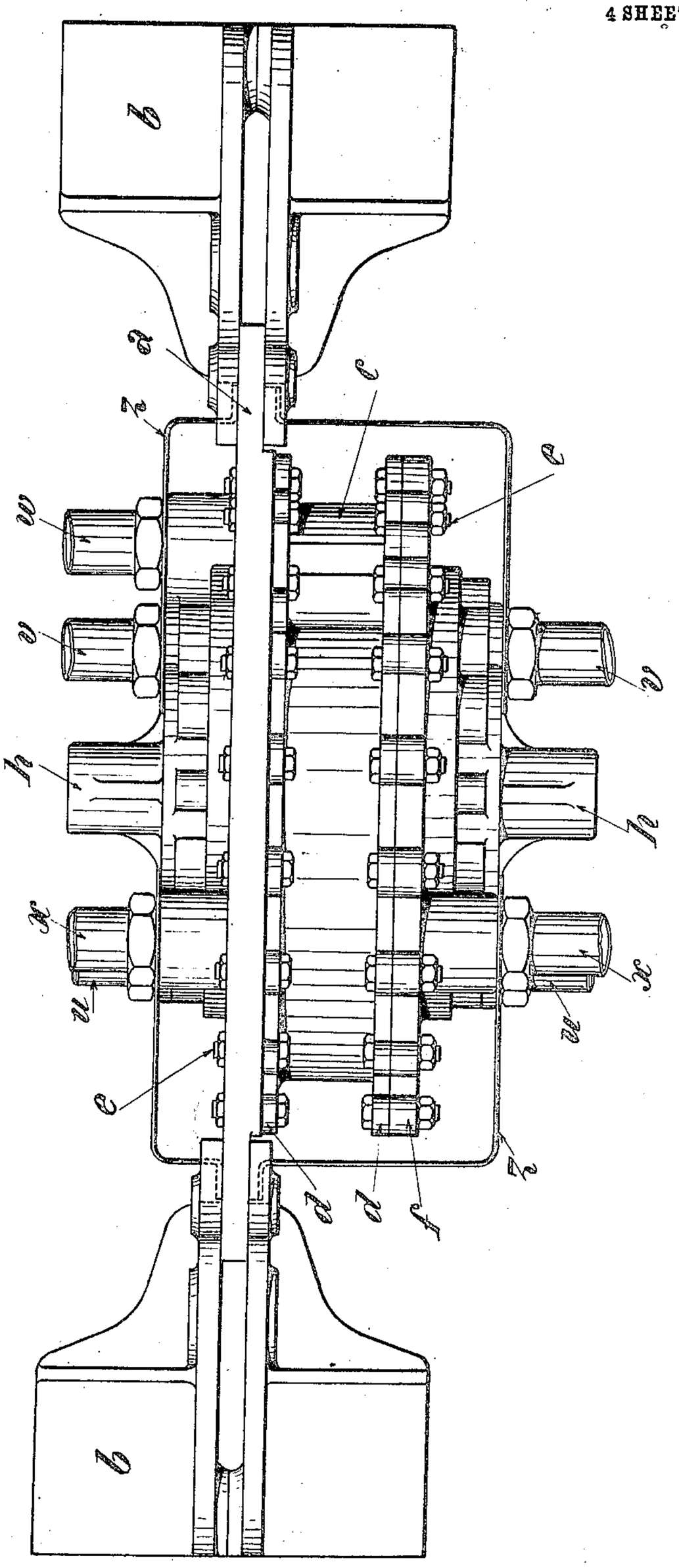

Fig. 2.

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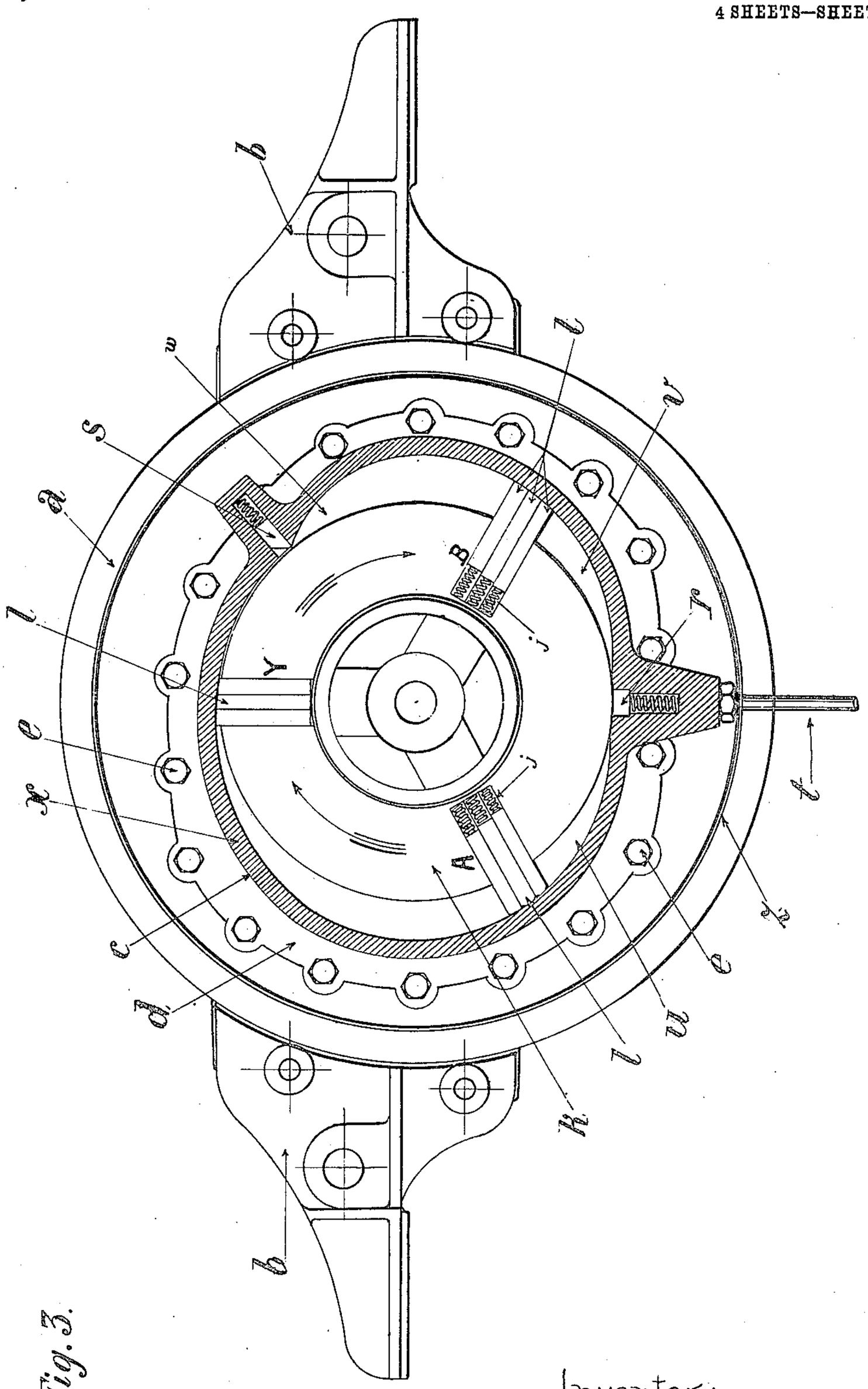

Fig. 3.

Witnesses:
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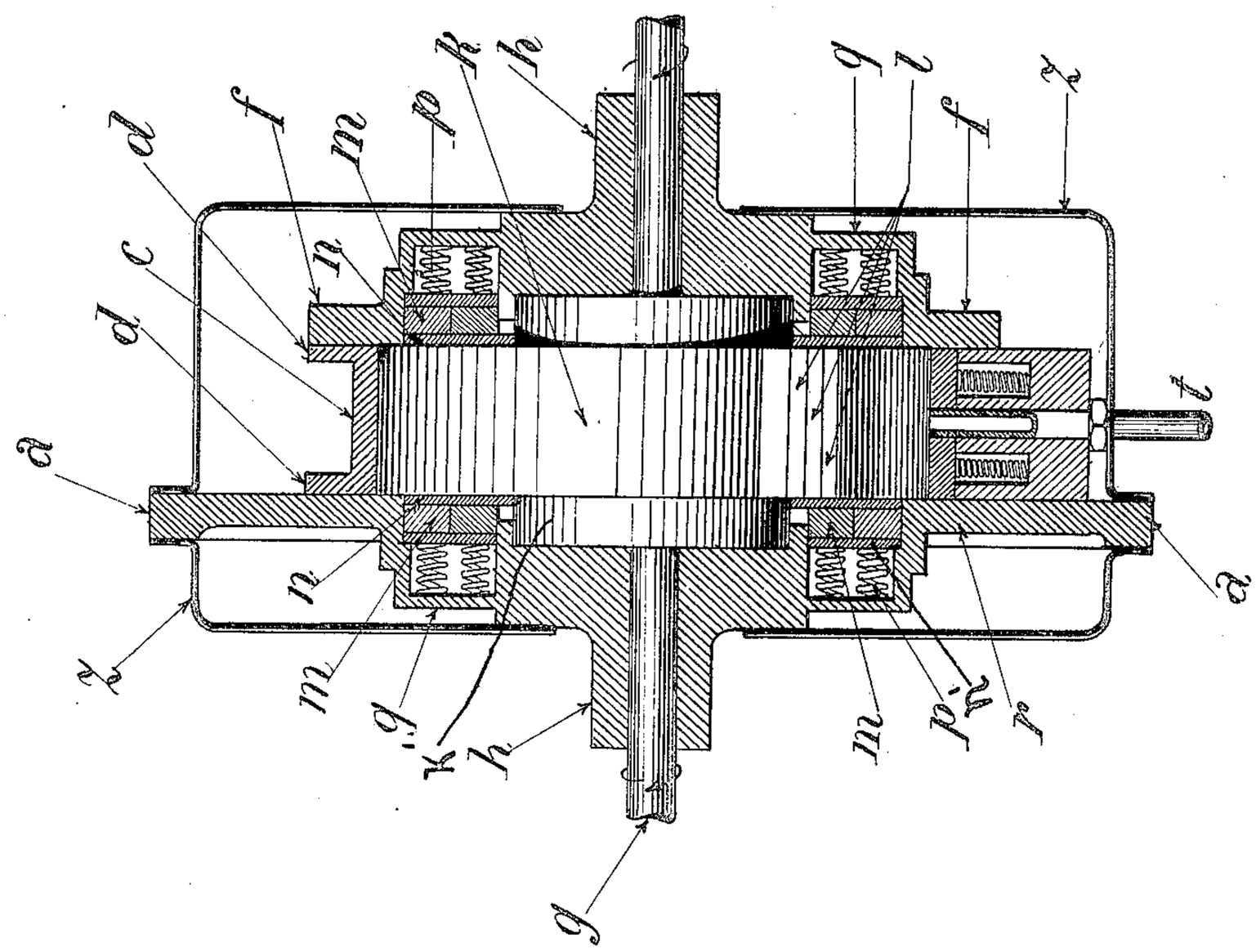

Fig. 4.

Witnesses:
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UNITED STATES PATENT OFFICE.

CARLO SELLA, OF BIELLA, ITALY.

ROTARY EXPLOSIVE-ENGINE.

No. 917,165. Specification of Letters Patent. Patented April 6, 1909.

Application filed October 12, 1906. Serial No. 338,647.

To all whom it may concern:

Be it known that I, CARLO SELLA, a subject of the King of Italy, residing at Biella, in the Kingdom of Italy, have invented certain new and useful Improvements in Rotary Explosive-Engines, of which the following is a specification.

My invention relates to rotary explosive-engines of the compression type in which a cycle of actions is completed with each revolution of the piston; and the objects of my improvements are the provision of a simple, smooth-running, and durable engine, adapted to operate under a fixed or predetermined compression, whereby an economic utilization of the gaseous mixtures is effected.

To these ends, my invention consists in the novel construction whereby the desired effects are obtained, as particularly described in the following specification and the accompanying drawings forming a part thereof.

In the drawings, which serve to illustrate an engine embodying the preferred form of my invention: Figure 1 is a front elevation of an engine detached from its bed-plate; Fig. 2 is a plan view of the same; Figs. 3 and 4 represent a central longitudinal-section and a central cross-section, respectively.

Referring to the specific construction shown in the drawings in detail, the supporting frame *a* is provided with diametrically opposed extensions or hangers *b*, which serve to support the engine from any suitable bed-plate. The casing, or so-called "cylinder" C, is of a substantially elliptical longitudinal-configuration externally. Internally it is transversely rectilinear and longitudinally of an irregular curvilinear configuration, in accordance with a special law which is peculiarly applicable to this type of rotary engine. As clearly indicated in Fig. 3, the curvature of the inner face of the cylinder C varies constantly from point to point and this variation is so pronounced at one point as to form a substantial abutment, as hereinafter described. Peripherally extending flanges *d*, integral with said cylinder and provided with openings adapted to receive suitable bolts *e*, afford means whereby said cylinder may be secured respectively to the disk *a*, hereinafter termed a "cylinder-head" and the end-plate or the other "cylinder-head" *f*, both of which cylinder-heads are provided with openings to receive the bolts *e* and are adapted to register with each other when the parts are properly assembled.

A crank-shaft *g* is centrally mounted in suitable bearings *h*, formed in the opposing cylinder-heads *a* and *f*, respectively, and keyed thereon is a drum *k*, having reduced ends or hubs *k'* said drum *k* being hereinafter termed the "piston". Said piston is provided with three transversely elongated radial recesses, peripherally disposed at angles of 120° with respect to each other. These recesses are of sufficient size to snugly receive vanes or plungers A, B and Y, which as shown are capable of being radially projected to different degrees by coil-springs *j*, positioned in the respective bottoms of the recesses. The plungers are composed of a plurality of plates *l*, each independently mounted on a separate spring *j*. The faces of each plate preferably are provided with a movable section, which is composed of rigid material, said section being caused to frictionally engage with either the opposing face of an adjoining plate, or with the walls of the recesses, by the action of coil springs mounted in recesses (not shown) in each plate *l*. Suitable packing rings are preferably interposed between the aforesaid movable portions of the faces of plates *l* and supplemental bearing plates against which the said springs exert a constant pressure. Thereby said springs and also springs *j* are effectively protected from the action of deleterious gases, owing to the snug engagement of the respective plates as well as that of the outer faces of the plungers and the walls of their respective grooves.

In order to effectively pack the compression- and explosion-chambers against the escape of deleterious gases, and especially to amply protect the bearings of the piston, suitable packing rings *m* are interposed intermediate the annular disk *n* which is secured intermediate the hubs *k'* and the wall of an annular recess containing coil-springs *p*. The disk *n* is preferably rigid and is actuated by the coil-springs *p* which exert pressure upon a supplemental disk *n'*, also preferably of rigid material, and thence impart pressure, through the packing rings *m*, to the disk *n*, which is thereby caused to snugly engage with the squared faces of the piston. The hubs *k'* are also suitably packed so as to snugly engage with the walls of the recesses into which they project and thus the escape of all deleterious

gases into the vital parts of the engine where the action of said gaseous mixture would be objectionable is prevented.

Owing to the peculiar construction which requires but three reciprocating plungers to effectively operate the piston *k*, even in spite of the fact that both the compression-chamber and the explosion-chamber are of such a size as to be incapable of including but two plungers simultaneously therein, and capable of spanning an arc of the piston-periphery, in excess of 120°, it is necessary to provide means to cut-off completely all communication between the compression chamber and the explosion chamber. For this purpose a spring-actuated sluice-valve *r*, positioned in the extension *r'* of the cylinder walls, is employed, the same being adapted to exert constant pressure upon, and form an air-tight joint with, the inner periphery of the cylinder *k*. A similar sluice-valve *s*, serves to prevent communication between the said chambers at the opposite ends thereof, said sluice-valve being positioned within an extension *s'*. This latter valve is provided with an oblique or beveled face at the outer end, in lieu of a square face such as that of the valve *r*, the highest point of said oblique face being adjacent the explosion-chamber. The effect produced by the oblique face of said valve is of an automatic nature, and consists in the periodic operation of the valve, in advance of, and without, the contact of a plunger therewith whenever the pressure of the compressed gaseous mixture on the oblique face of the valve *s* reaches a fixed or predetermined degree.

The movable elements of the engine are suitably lubricated through the oil-duct *t*, which is adapted to supply oil under pressure as required. An inlet-port *u*, serves to supply a suitable mixture of explosive gases, to the compression chamber and an exhaust-port *v*, in turn, serves to effect the complete removal of the products of combustion from the explosion-chamber.

To prevent premature ignition of the charge a safety-valve *x* is arranged adjacent the outlet end of the compression chamber, whereby in the event of the failure of the sluice-valves to prevent communication being established between the compression-chamber and the explosion-chamber, the cylinder C will not be fractured by an explosion resulting from the accidental ignition of the charge, by the candle or similar firing-tool *w*. A water jacket *z*, comprising preferably a sheet-iron casing or envelop, serves to continuously circulate sufficient cold water as may be required to reduce the temperature of the cylinder.

The operation is initiated by "cranking" the engine externally, or in any other desired manner, in such a direction as to impel movement of the piston in the direction of the arrows shown in Fig. 3. The effect of such an impulse, as is evident, is to cause a partial vacuum behind a plunger in the position of plunger A immediately it passes the inlet-port *u*, with the result that the desired amount of an explosive mixture will be aspirated through said inlet, the compression-chamber becoming eventually filled therewith. Upon a plunger, such for example as B, being projected into the compression-chamber, the gaseous charge entrapped between its front face and the rear face of the plunger A, or on the other hand of the valve *s'*, will be highly compressed. When this compression reaches the predetermined degree which is required to operate the valve *s*, said valve will be automatically raised and a definite charge under a fixed compression will be delivered into the explosion-chamber, where it is ignited by the igniter-candle at the desired moment. The rear face of the plunger A will receive the full impact of the explosion and since the counter-pressure on the front face of the plunger B has been relieved by the operation of the valve *s*, the piston *k* will receive a maximum impulse in the direction of the arrows and simultaneously the plunger Y will pass over the valve *r* and effect the introduction of a new gaseous charge into the compression-chamber, in the manner described. Immediately upon the passage of the plunger A beyond the exhaust-port *v*, the gaseous combustion products escape from the explosion-chamber and the cycle of actions is completed. The plunger A is then in position to initiate a new cycle of actions.

The increased angular curvatures of the inner face of the cylinder at the beginning of the explosion-chamber, as compared with the angular curvatures of the inner face of the cylinder at the end of the compression chamber, not only results in the formation of the desired abutment, but also, the increased capacity of the explosion-chamber at its inlet-end in combination with the peculiar configuration thereof, results in a pronounced cushioning of the concussions and secures the swift and uninterrupted motion of the piston.

Having thus described my invention, I claim:

1. In an explosive-engine, the combination, comprising a cylinder; a rotary piston mounted therein and provided with a plurality of elastically mounted plungers arranged to reciprocate radially and to intimately engage the inner face of said cylinder continuously during the revolution of said piston; and a plurality of chambers in said cylinder, intermediate the periphery of said piston and the inner face of the cylinder, each of said chambers being of sufficient size to include two of said plungers simultaneously, while being incapable of includ-

ing more than two of said plungers simultaneously and a sluice-valve intermediate said chambers normally preventing communication therebetween and adapted to reciprocate in advance of, and without, the contact of a plunger therewith and thereby admit of the escape of gases of a predetermined degree of compression from one of said chambers.

2. In an explosive-engine, the combination, comprising a cylinder; a rotary piston mounted therein and provided with plungers, elastically mounted therein and arranged to reciprocate radially and intimately engage the inner face of said cylinder continuously during the revolutions of said piston; and a plurality of chambers in said cylinder intermediate the periphery of said piston and the inner face of the cylinder, each of said chambers being of such a size as to be incapable of simultaneously including but two plungers therein and capable of spanning an arc of the piston-periphery in excess of 120° and a sluice-valve intermediate said chambers normally preventing communication therebetween and adapted to reciprocate in advance of, and without, the contact of a plunger therewith and thereby admit of the escape of gases of a predetermined degree of compression from one of said chambers.

3. In an explosive-engine, the combination, comprising a cylinder, a rotary piston mounted therein, and provided with a plurality of elastically mounted plungers, arranged to reciprocate radially and intimately engage the inner face of said cylinder continuously during the revolution of said piston; a plurality of chambers in said cylinder, adjacent the outlet-end of said piston and the inner face of the cylinder, each of said chambers being of sufficient size to simultaneously include two of said plungers while being incapable of simultaneously including more than two of said plungers; and sluice-valves normally preventing communication between said chambers and adapted to reciprocate in advance of, and without, the contact of a plunger therewith and thereby admit of the escape of gases of a predetermined degree of compression from one of said chambers.

4. In an explosive-engine, the combination, comprising a cylinder; a rotary piston mounted therein and provided with a plurality of elastically mounted plungers arranged to reciprocate radially and to intimately engage the inner face of said cylinder continuously during the revolution of said piston; a compression-chamber; an explosion-chamber; and sluice-valves intermediate said chambers adapted to normally prevent communication between said chambers, one of said valves being adapted to be automatically operated by the gases in the compression-chambers when the said gases attain a predetermined degree of compression.

5. In an explosive-engine, the combination, comprising a cylinder, having an inner face of variable curvature longitudinally and being rectilinear transversely; a rotary piston mounted therein; a compression chamber; an explosion-chamber, the inner face of the cylinder adjacent the inlet-end of said explosion-chamber being of sufficiently greater angular curvature than the angular curvature of the inner face of the cylinder, adjacent the outlet-end of said compression-chamber, to form a substantial abutment at the point of intersection of said curvilinear faces and a sluice-valve adjacent said abutment, normally preventing communication between said chambers and adapted to be automatically operated by the gases in the compression-chambers when the said gases attain a predetermined degree of compression.

6. In an explosive-engine, the combination, comprising a cylinder, having an inner face of variable curvature longitudinally and being rectilinear transversely; a rotary piston mounted therein, and provided with three elastically mounted plungers disposed at angles of 120° with respect to each other about the periphery of said piston and arranged to reciprocate radially and intimately engage the inner face of said cylinder continuously during the revolution of said piston; a compression-chamber; an explosion-chamber, the inner face of the cylinder adjacent the inlet-end of said explosion-chamber being of sufficiently greater angular curvature than the angular curvature of the inner face of the cylinder adjacent the outlet-end of said compression-chamber to form a substantial abutment at the point of intersection of said curvilinear faces; a plurality of sluice-valves intermediate said compression chamber and said explosion-chamber one of said valves being adapted to be automatically operated by gases of a predetermined degree of compression; an inlet-port in said compression-chamber; an exhaust-port in said explosion chamber; and means for periodically igniting the explosive charge in the explosion-chamber.

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

CARLO SELLA.

Witnesses:
LOUIS ALLAN,
BENITO ALESSRO. BOVI.