G. G. SCHROEDER.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED SEPT. 9, 1907. RENEWED MAR. 11, 1910.

955,288. **Patented Apr. 19, 1910.**

5 SHEETS—SHEET 1.

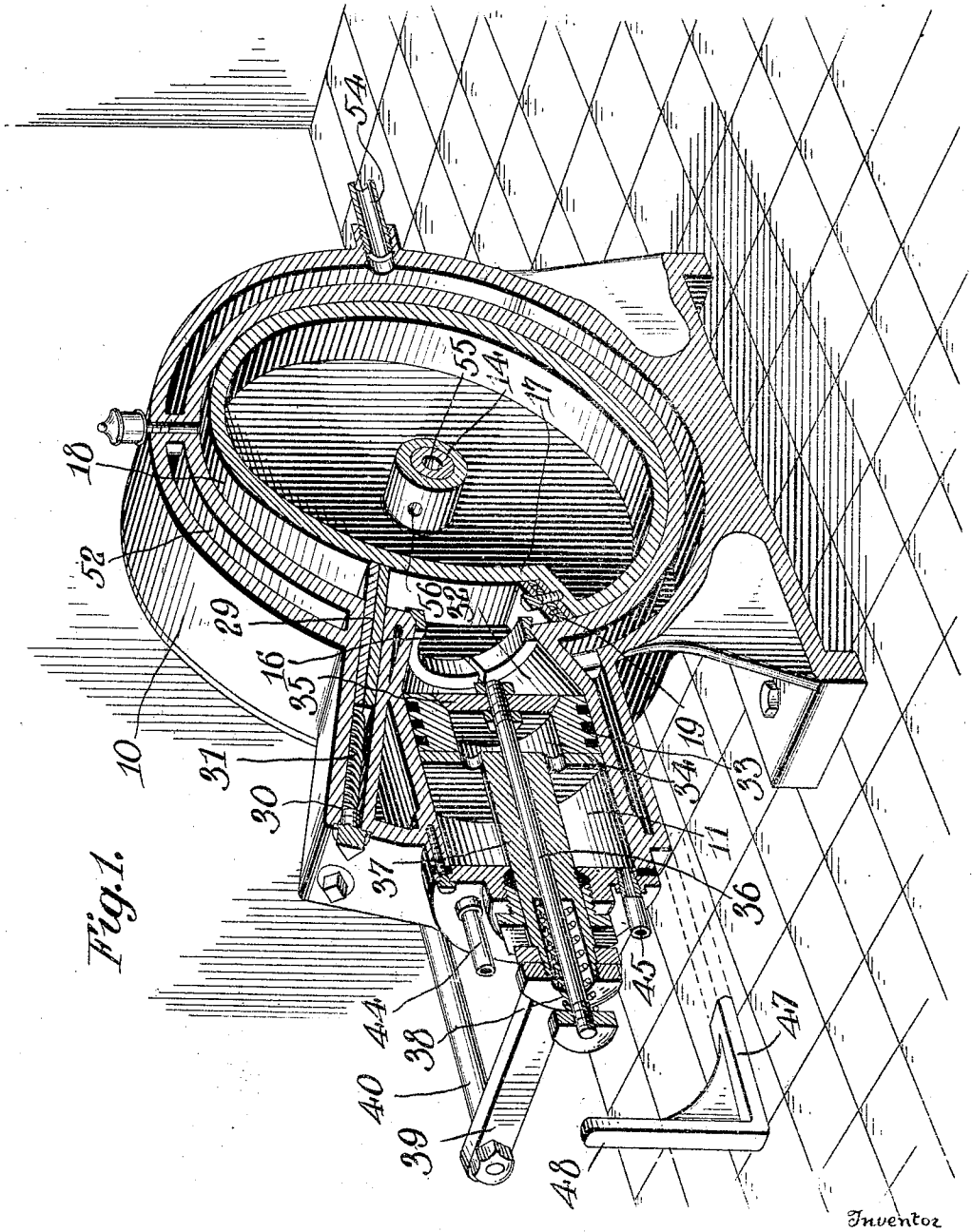

Fig. 1.

Witnesses

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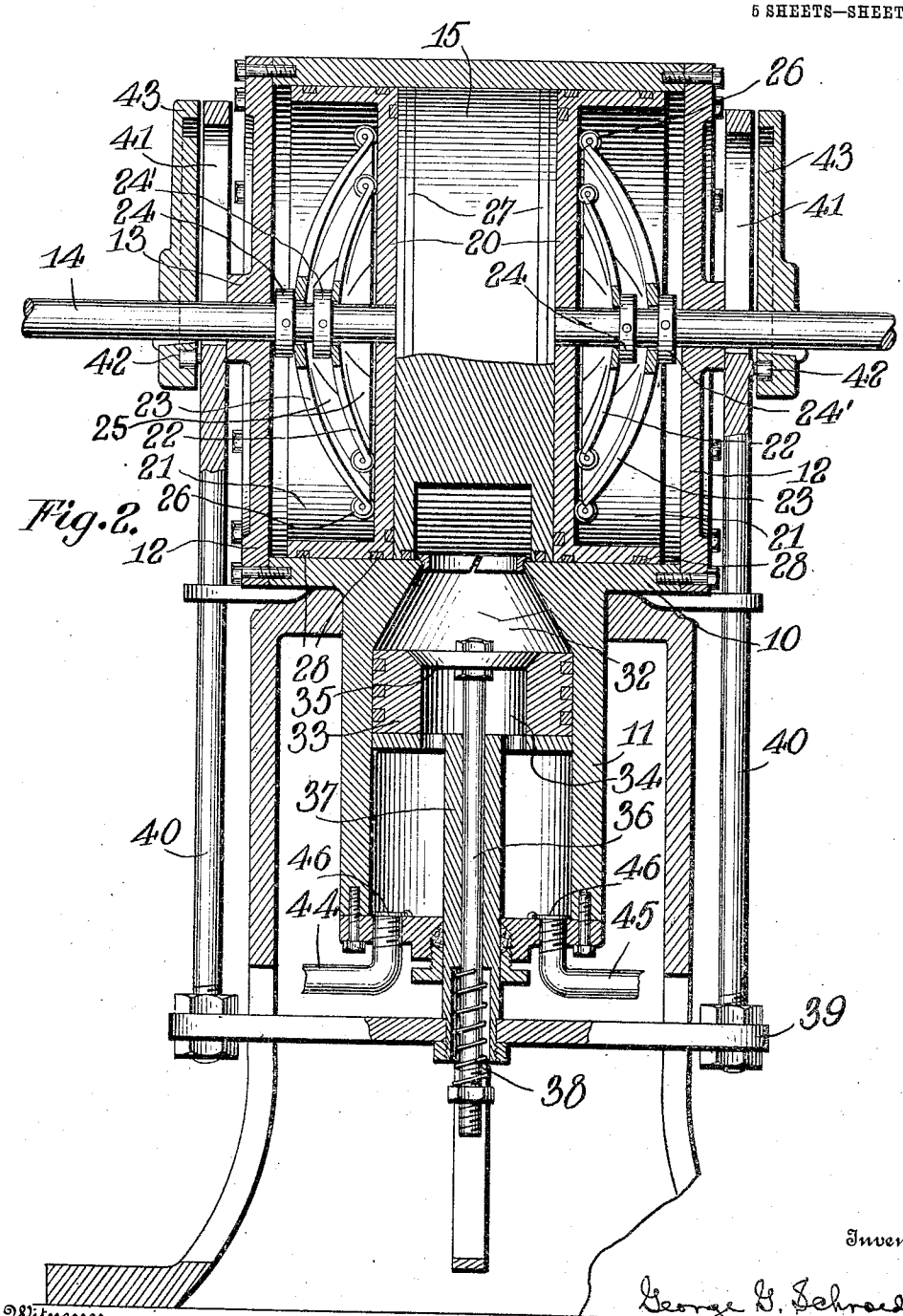

Fig. 2.

Witnesses

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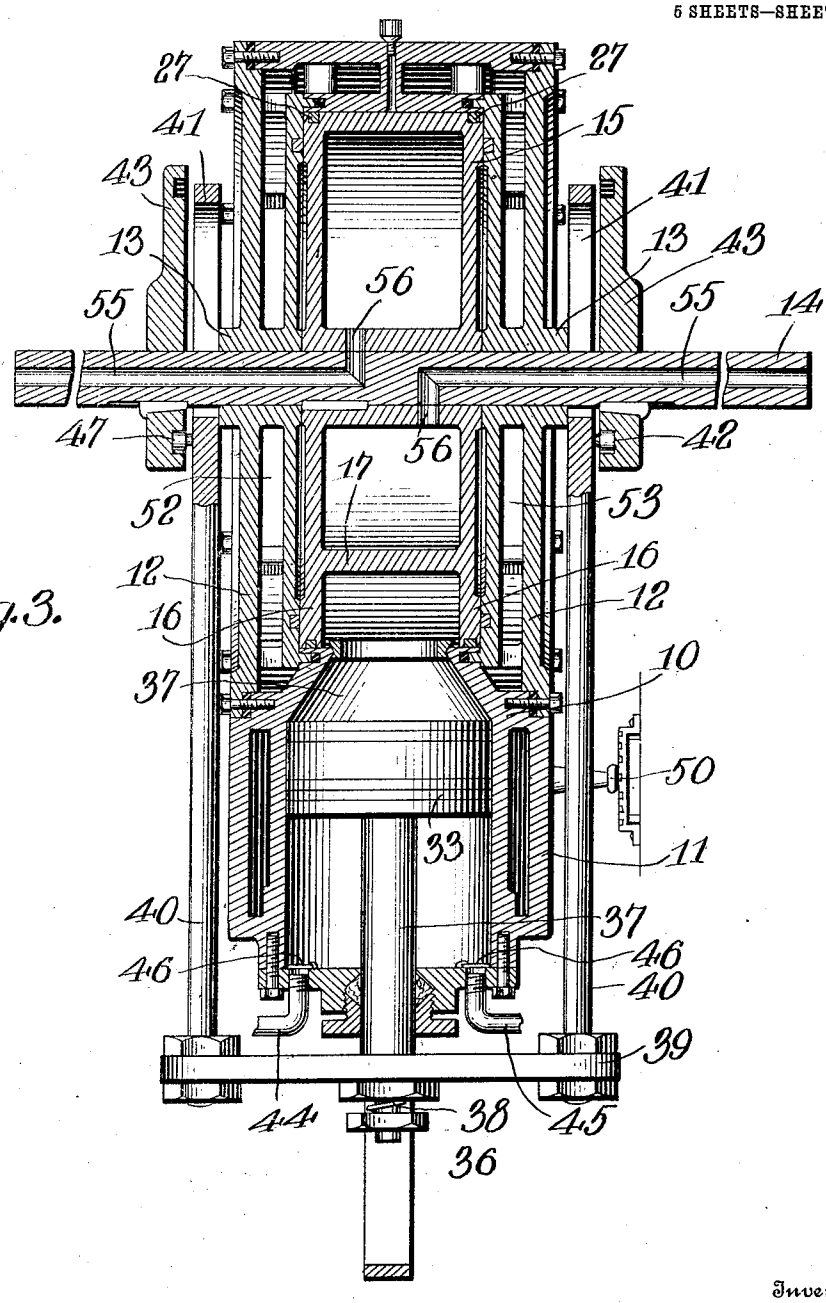

Fig. 3.

Witnesses

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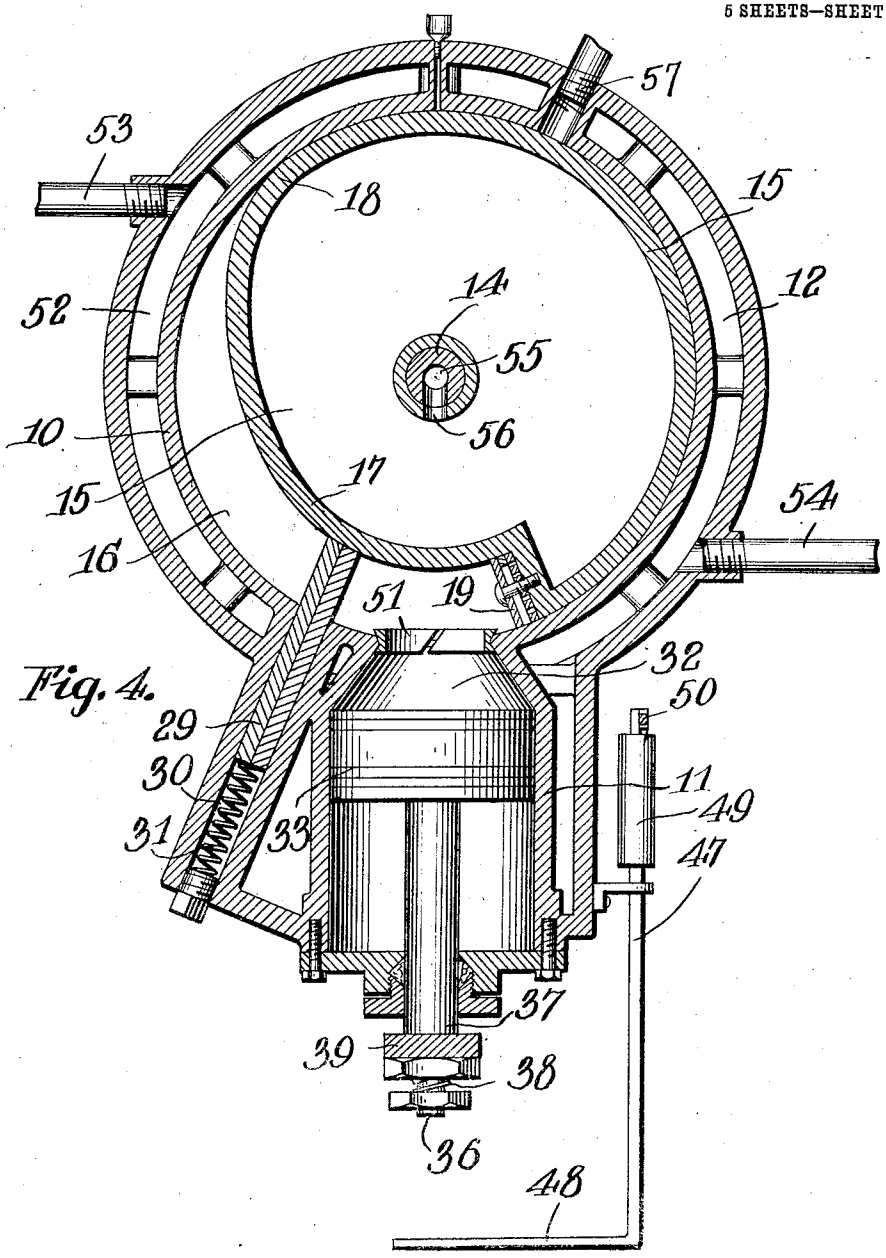

Fig. 4.

Witnesses

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5 SHEETS—SHEET 5.

Fig. 5.

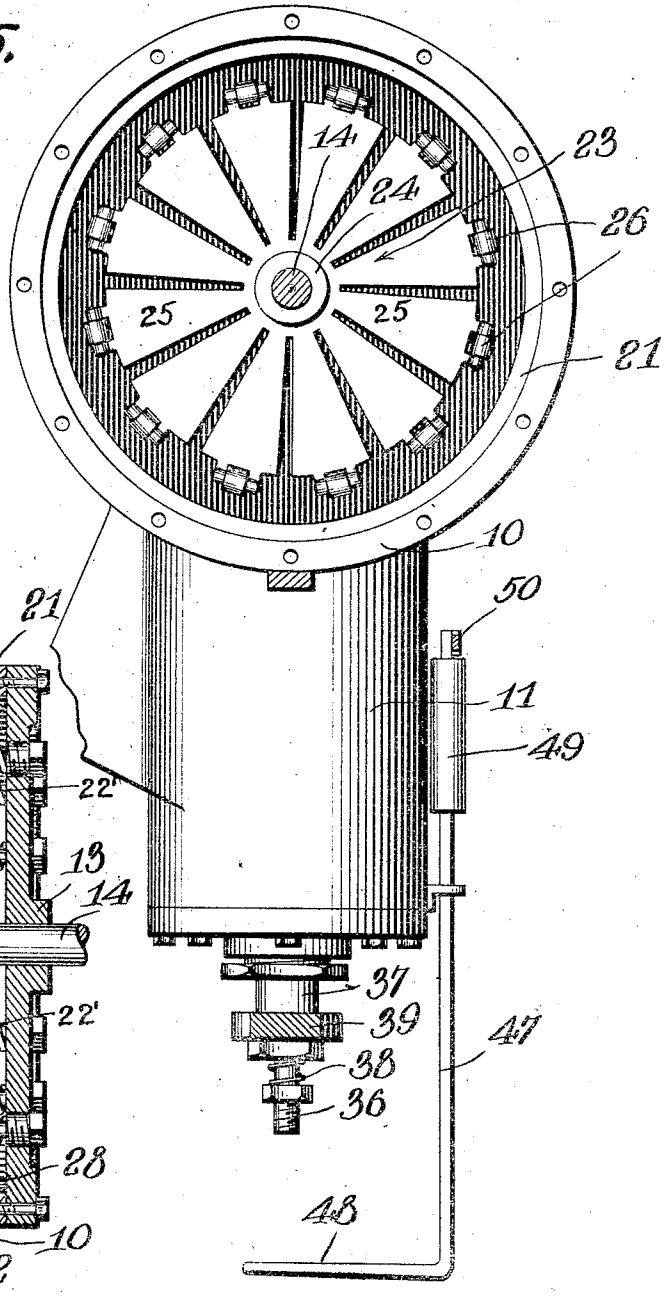
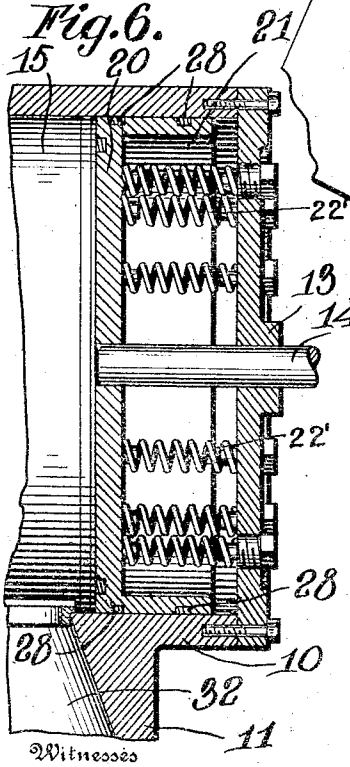


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE G. SCHROEDER, OF WASHINGTON, DISTRICT OF COLUMBIA.

ROTARY EXPLOSIVE-ENGINE.

955,288. Specification of Letters Patent. Patented Apr. 19, 1910.

Application filed September 9, 1907, Serial No. 392,011. Renewed March 11, 1910. Serial No. 548,719.

To all whom it may concern:

Be it known that I, GEORGE G. SCHROEDER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Rotary Explosive-Engines, of which the following is a specification.

This invention relates to certain new and useful improvements in explosive engines and pertains more particularly to that type of rotary engines operated by the impact from explosive gases.

The invention has for its object the production of a simple and inexpensive engine adapted particularly for the use of denatured alcohol as an explosive and in which the explosive gases are automatically compressed prior to the explosion thereof, although I do not desire to limit myself to any particular hydrocarbon fluid.

A further object is to produce an improved piston constructed to resist the lateral force of the explosive impact.

A further object is to provide a gas tight cylinder in which the parts will not bind when expanded under the heat generated by the explosions.

A further object is to provide means for cooling the cylinder and piston.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings:—Figure 1 is a perspective view of my improved engine with parts shown in section, the engine being illustrated in a horizontal position. Fig. 2 is a longitudinal sectional view of the engine in a vertical position, parts being shown in elevation. Fig. 3 is a view similar to Fig. 2, and illustrating a slight modification. Fig. 4 is a longitudinal sectional view the section being taken at right angles to Fig. 3. Fig. 5 is a side view, one end head being removed. Fig. 6 is a sectional view illustrating a slight modification.

Referring to the drawing, 10 designates the cylinder or casing provided with a cylindrical extension 11 removably secured thereto in any preferred manner. The casing 10 is cylindrical in cross section and provided with end heads 12 removably secured in position and provided with bosses 13 which serve as bearings for the shaft 14 on which is secured the piston 15. Said piston is also cylindrical in contour to conform to the contour of the casing 10 and has its periphery channeled out to form an explosion chamber 16 the bottom 17 of which is curved inwardly on an eccentric line leading in from the point 18 of the said periphery and terminating in a perpendicular impact face 19.

The piston 15 is mounted to rotate between guides 20 which are concentric with the cylinder and provided with annular flanges forming outer chambers 21. Said guides are free to move longitudinally of the shaft 14 and are normally held in contact with the ends of the piston by means of concaved spring disks 22, 23 each mounted on the shaft 14 and held in position by adjustable collars 24, 24′. Each of said disks is split radially to form arms 25, antifriction rollers 26 being mounted in the free ends of said arms at the point of contact with the piston. Said collars 24′ also serve to resist the end thrust of shaft 14. In order to prevent leakage around the several parts, the piston is provided with packing rings 27 and the guides 20 with packing rings 28. A reciprocating abutment 29 is arranged in a radial chamber 30, being normally projected into the explosion chamber by a spring 31. In Fig. 6 I have illustrated the guides 20 as held in position by coil spring 22′.

The extension 11 is provided with a cylindrical bore 32 tapered at the end adjacent the cylinder and communicating with the explosion chamber 16. Within the cylindrical portion of extension 11 is mounted a piston 33 provided with an interior chamber 34 normally closed by a valve 35. Said valve is provided with a stem 36 passed down through the hollow stem 37 of the piston 33, and is held normally to its seat by a spring 38. The piston 33 is reciprocated by means of a cross head 39 supported by links 40 slotted at 41 to receive shaft 14 and each provided with a pin 42 working in the groove of a cam 43 secured to said shaft. The charge is fed to the interior of extension 11 through conduits 44, 45, each provided with a suitable check valve 46. In order to regulate the operation of valve 35 I provide a reciprocating bar 47 having a lateral projection 48 to intercept valve stem 36. The upper end of said rod fits within a tube 49 forming an air tight joint therewith, said tube being manipulated by a handle 50. In order to avoid escape of gases around that portion of the piston opposite chamber 16 I

provide the packing ring 51, which may be of any preferred construction. I have found, however, that the split ring illustrated is very efficacious, the top edge thereof projecting beyond the plane of extension 11.

Where it is desired to cool the engine I provide casing 10 with a water jacket 52 provided with inlet and outlet conduits 53, 54 and I also fill the interior of piston 15 with water through an inlet conduit 55 formed in shaft 14 and having a port 56 registering with a corresponding opening in the hub of the piston. An outlet port 56′ is arranged to register with an independent outlet conduit 55′ whereby circulation is maintained.

The exhaust for the engine is illustrated at 57.

In operation, the charge is ignited by any suitable ignition device (not shown), and the impact of the explosion acting on the face 19 serves to impel the piston 15, the piston 33 being immediately lowered. The valve 35 is unseated by projection 48, permitting the explosive mixture below said piston to enter the compression chamber above the same. The return movement of the piston compresses the charge, the maximum compression being reached just as the impact face 19 passes the opening in the end of the compression chamber. At this moment the charge is ignited and the cycle of operation is repeated.

The advantages of my improved explosive engine will be readily apparent from the foregoing. It will be particularly noted that the lateral walls of the explosion chamber being integral with the piston, displacement of the parts due to the impact of the explosion is impossible. It will also be noted that by means of the guides and spring disks the cylinder is rendered gas tight and yet said guides will automatically accommodate themselves to any expansion or contraction of the piston. It will be further observed that I have provided simple and efficient means for feeding and compressing the explosive gases.

I claim as my invention:—

1. In an explosive engine, a cylinder, a piston mounted therein and provided with a peripheral explosion chamber, guides engaging the ends of said piston, and annular spring disks acting upon said guides.

2. In an explosive engine, a cylinder, a piston mounted therein and provided with a peripheral explosion chamber, a shaft to which said piston is secured, guides engaging said piston, and annular spring disks carried by said shaft and acting upon said guides.

3. In an explosive engine, a cylinder, a piston mounted therein and provided with a peripheral explosion chamber, guides engaging said piston, and spring disks provided with radial arms acting upon said guides.

4. In an explosive engine, a cylinder, a piston mounted therein and provided with a peripheral explosion chamber, guides engaging said piston, a shaft to which said piston is secured, split disks mounted on said shaft and provided with radial arms engaging said guides, and means for adjusting said disks.

5. In an explosive engine, a cylinder, a piston mounted therein and provided with a peripheral explosion chamber, guides engaging said piston and provided with annular flanges forming exterior chambers and spring disks located in the chambered portions of said guides and acting to hold the latter in contact with the ends of said pistons.

6. In an explosive engine, a cylinder, a piston mounted therein and provided with a peripheral explosion chamber, chambered guides engaging said piston, and spring disks acting on said guides and provided with radial arms projected into the chambered portions thereof.

7. In an explosive engine, a cylinder, a piston mounted therein and provided with a peripheral explosion chamber, guides engaging said piston, spring disks provided with radial arms acting on said guides, and rollers on the free ends of said arms.

8. In an explosive engine, a cylinder, a piston mounted to rotate therein, and spring pressed guides engaging the ends of said piston and provided with annular flanges.

9. In an explosive engine, a cylinder, a piston mounted to rotate therein, guides engaging the ends of said piston, and spring disks acting on said guides.

10. In an explosive engine, a cylinder, a piston mounted to rotate therein and having its periphery channeled out to form an explosion chamber, and spring pressed guides engaging the ends of said piston and provided with annular flanges.

11. In an explosive engine, a cylinder, a piston mounted therein and provided with a drive shaft, guides mounted on said shaft and engaging the ends of said pistons, said guides being provided with annular chambers, and spring members carried by said shaft and extending into said chambers to engage said guides.

12. In an explosive engine, a cylinder, a piston mounted therein and provided with a drive shaft, guides mounted on said shaft and engaging the ends of said piston, and annular spring disks carried by said shaft and engaging said guides.

13. In an explosive engine, a cylinder, a piston mounted therein and provided with a drive shaft, guides mounted on said shaft and engaging the ends of said pistons, and disks mounted on said shaft, said disks be-

ing split radially to form spring arms the terminals of which are in engagement with said guides.

14. In an explosive engine, a cylinder, a piston mounted therein and provided with a drive shaft, guides mounted on said shaft and engaging the ends of said piston, annular spring disks carried by said shaft and engaging said guides, and means for varying the tension upon said disks.

15. In an explosive engine, a cylinder, a piston mounted therein and provided with a drive shaft, guides mounted on said shaft and engaging the ends of said piston, and annular concaved disks carried by said shaft and having their peripheral edges in engagement with said guides.

16. In an explosive engine, a cylinder, a piston mounted therein and provided with a drive shaft, guides mounted on said shaft and engaging the ends of said piston, and concaved disks mounted on said shaft, said disks being split radially to form spring arms the terminals of which are in engagement with said guides.

17. In an explosive engine, a cylinder, a hollow piston mounted therein and provided with a hollow shaft, means for introducing a cooling fluid to the interior of said piston through said shaft, and spring pressed guides engaging the ends of said pistons and provided with annular flanges fitting within said cylinder.

18. In an explosive engine, a cylinder, a piston mounted to rotate in said cylinder, annular guide members mounted in said cylinder, one on each side of said piston with their peripheries in contact with the inner wall of the cylinder, and forming a gas-tight joint therewith, and yieldable means for holding said guide members at all times in engagement with the sides of the piston.

19. In an explosive engine, a cylinder, a piston mounted to rotate therein, annular guide members mounted in said cylinder, one on each side of said piston and free to move longitudinally of the cylinder, packing between the peripheries of said guide members and the inner wall of said cylinder, and yieldable means for holding said guide members at all times in engagement with the opposite sides of said piston.

20. In an explosive engine, a cylinder, a rotatable shaft extending therethrough, a cylindrical piston carried by said shaft and provided with an explosion chamber in the periphery thereof and between the edges thereof, annular guide members in said cylinder, one on each side of said piston, packing between the peripheries of said disks and the inner wall of the cylinder, packing rings between the inner faces of said disks and the sides of said piston, and yieldable means for holding said guide members in engagement with the sides of the piston.

21. In an explosive engine, a cylinder, a hollow piston arranged to rotate in said cylinder, and provided with an explosion chamber in the periphery thereof, means for supplying a cooling fluid to the interior of said piston, annular guide members positioned within the cylinder, one on each side of said piston, said guide members being free to move longitudinally of the cylinder, and the peripheries thereof forming with the inner walls of the cylinder gas-tight joints, and yieldable means for holding said guide members at all time in engagement with the sides of the piston.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE G. SCHROEDER.

Witnesses:
F. LIEBSCHUTZ,
JNO. B. FLICK.