G. SCHULZ.

ROTARY ENGINE.

APPLICATION FILED FEB. 27, 1909.

939,751.

Patented Nov. 9, 1909.

2 SHEETS—SHEET 1.

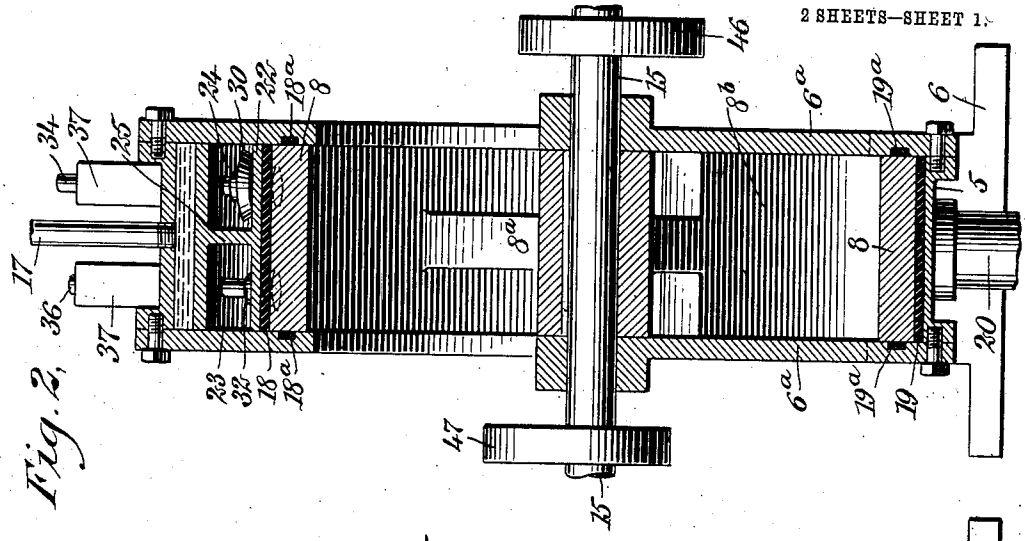

Fig. 2.

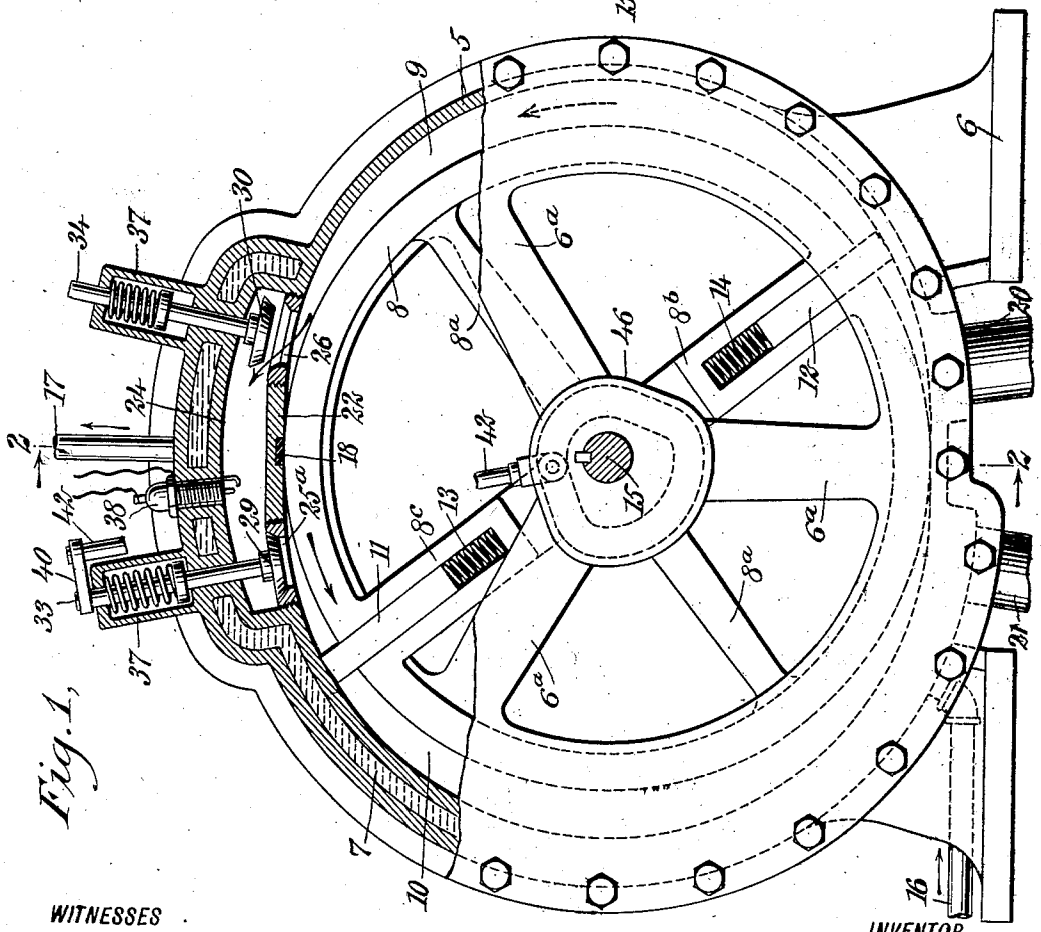

Fig. 1.

WITNESSES

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Fig. 3

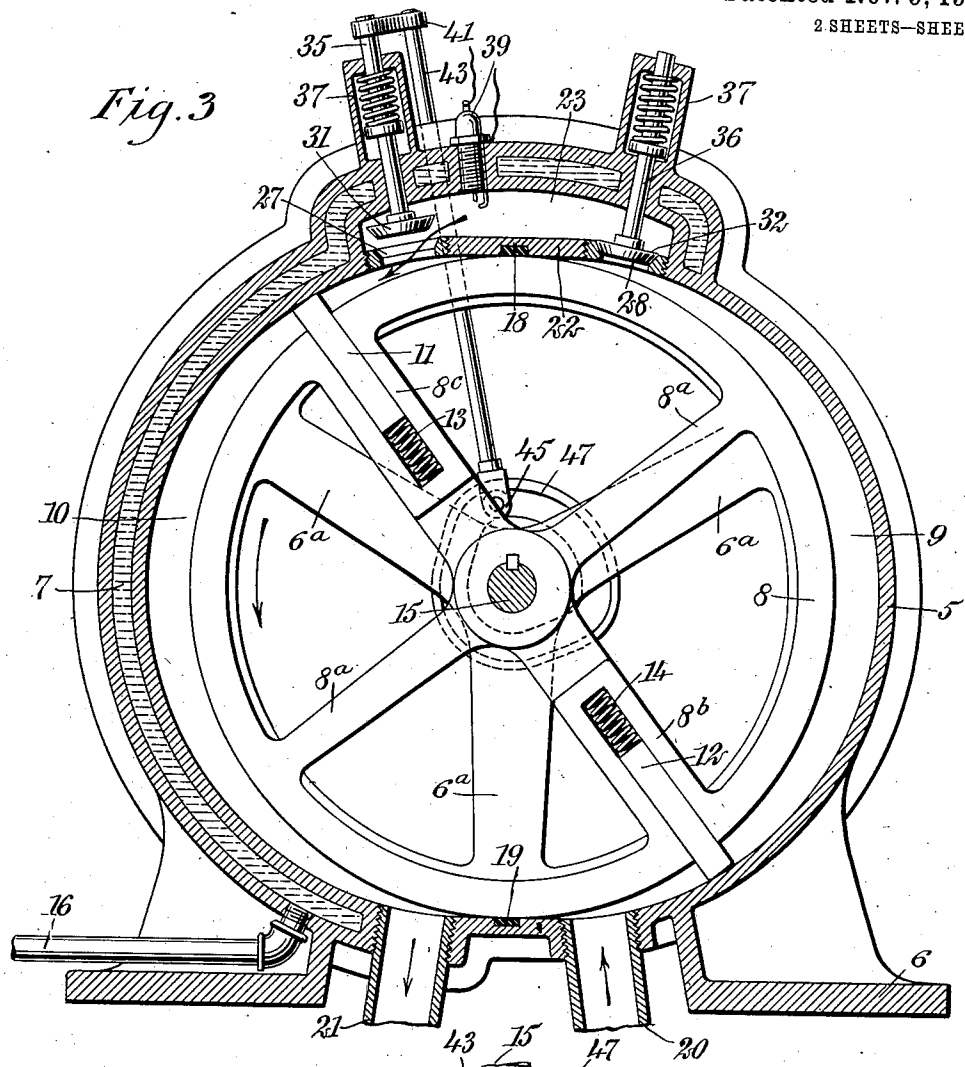
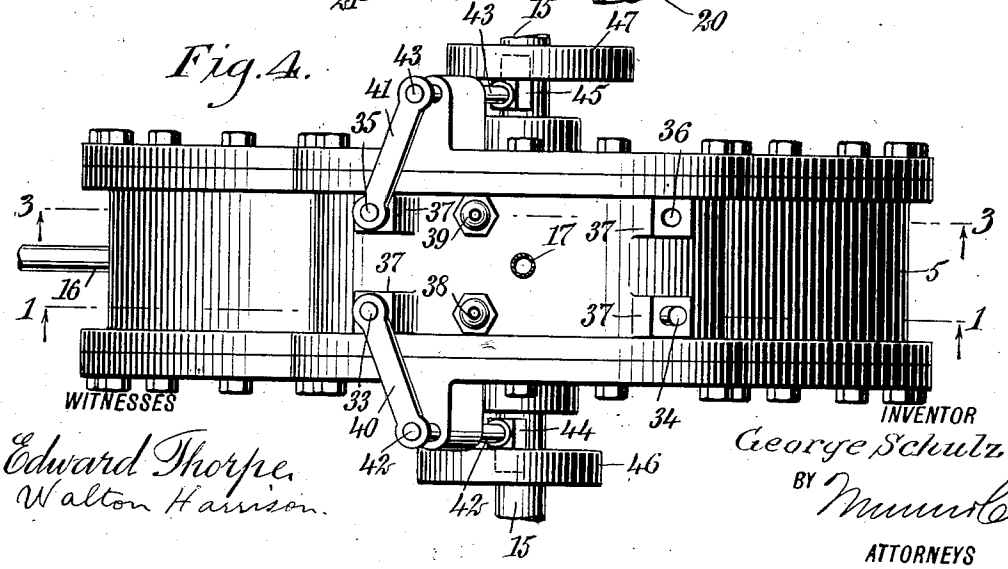


Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE SCHULZ, OF NEW YORK, N. Y.

ROTARY ENGINE.

939,751 Specification of Letters Patent. Patented Nov. 9, 1909.

Application filed February 27, 1909. Serial No. 480,352.

To all whom it may concern:

Be it known that I, GEORGE SCHULZ, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

My invention relates to rotary engines, my more particular purpose being to provide a type of rotary engine in which an explosive charge is first compressed by the immediate and direct action of the engine, and is then exploded so that advantage is taken of its expansibility.

My invention further relates to provision for exploding one charge while another charge is being compressed and thus made ready for explosion.

My invention further comprehends various improvements in construction, all looking toward the betterment of rotary engines and internal combustion engines.

Generally speaking, my engine comprehends a casing provided with a plurality of compartments used for compressing and exploding the explosive charges, the compartments being maintained entirely separate as regards the explosive mixture and the gases of combustion, yet the compartments serving to add their effects as regards the turning of the revoluble member of the engine.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a view partly in side elevation and partly in section upon the line 1—1 of Fig. 4, looking in the direction of the arrows, and showing one of the compartments together with the valve mechanism associated with it; Fig. 2 is a vertical section upon the line 2—2 of Fig. 1, looking in the direction of the arrows, and showing a part of the general construction including the arrangement of the two compartments employed in compressing and exploding the charges; Fig. 3 is a vertical section upon the line 3—3 of Fig. 4, looking in the direction of the arrows, and showing a compartment different from that appearing in Fig. 1; and Fig. 4 is a plan view of the engine.

A casing 5 is mounted upon a pedestal 6 and is provided with radially disposed portions 6^a forming spiders. The casing is further provided with a water jacket 7 whereby its excessive heating is prevented. A wheel 8 is mounted within the casing and is provided with spokes 8^a, 8^b, 8^c. The wheel 8 being circular and the casing 5 having in cross section the general form of an oblate spheroid, compartments 9, 10 are formed between the wheel 8 and the adjacent portions of the casing. Slidably mounted within the spokes 8^b, 8^c are pistons 11, 12 and compression springs 13, 14 which tend normally to force the pistons radially outward. The wheel 8 is keyed firmly upon a shaft 15 which turns with it.

At 16 is a pipe for admitting water into the water jacket, and at 17 (see Figs. 1, 2) is a pipe for discharging this water.

At 18, 19 (Fig. 3) and at 18^a, 19^a (Fig. 2) are packings.

An inlet for an explosive mixture is shown at 20 and an outlet for the gases of combustion is shown at 21.

At the top of the casing 5 is a wall 22, and above the latter are two compartments 23, 24 separated from each other by partitions 25. The wall 22 is provided with valve seats 25^a, 26, 27 and 28, and these valve seats are mated by valves 29, 30, 31, 32. For the purpose of guiding and handling these valves I provide valve stems 33, 34, 35, 36 and encircling these valve stems are housings 37. Two spark plugs 38, 39 are provided, the spark plug 38 extending into the compartment 24, while the spark plug 39 extends into the compartment 23. These spark plugs are independent of each other to the extent that they act alternately and, of course, at different moments of time.

The valve stems 33, 35 are connected respectively with plates 40, 41, the plate 40 being carried by a cam rod 42 and the plate 41 being similarly mounted upon a cam rod 43. The cam rods 42, 43 are provided at their lower ends with bosses 44, 45, and engaging these bosses are cams 46, 47, these cams being fixed relatively to each other upon the shaft 15 and so disposed that one occupies a position 180 degrees ahead of the other. By this means the cam rods move independently and substantially in opposite directions, so that when one of the valves 29, 31 is open, the other is usually closed.

When the parts are in the positions which they occupy in Figs. 1 and 3 (the positions being the same in both these views) the

valve 31 is open and the valve 29 is closed, these two valves being held positively by the action of the cams controlling them; the valves 30, 32 being free, however, to respond to such pressure as may be caused to play upon them, as hereinafter described.

The operation of my device is as follows: When the engine is in the position indicated in Figs. 1 and 3, an explosion has just taken place in the compartment 23. Since, as above stated, the valve 31 is now open, the gases of combustion can readily pass from the compartment 23 in which the explosion has just taken place, through the valve seat 27 and into the compartment 10 at a point above the piston 11. This drives the piston downward and turns the wheel 8. As soon as the piston 11 arrives at or near the bottom of the casing, the gases of combustion from the compartment 10 pass through the exhaust pipe 21 and make their escape. The descent of the piston 11 thoroughly drives out any portion of the gases of combustion which might otherwise tend to remain in the compartment 10. This compartment is thus thoroughly scavenged after each filling. In the meantime, when the piston 11 begins to descend, the piston 12 (see Fig. 3) begins to rise and to draw in behind it by suction, an explosive charge. Immediately in front of this piston (that is obliquely to the right above it, according to Fig. 3) there is in the compartment 9 an explosive charge left there by the pressure action of the piston 11 acting precisely as the piston 12 now acts. As the piston 12 rises, the charge in front of it (that is above it) is compressed and is moved upwardly. Since, however, the valve 28 is held down by the force of the explosion, which has just taken place in the compartment 23, and is held down immediately after the explosion by the pressure of the gases of combustion within this compartment, the valve 32 is pressed tightly upon its seat and is unable to open. Not so, however, with the valve 30 in the opposite compartment 24 (see Fig. 2). This valve has no pressure upon its upper surface, and consequently is easily lifted by the compressed charge passing upward from the compartment 9. Hence, the compartment 24 receives a charge of the compressed explosive mixture, and immediately after this occurs the valve 30 closes automatically. During the time while an explosive charge is being compressed into the compartment 24, the valve 29 is raised off its seat by the action of the cam 46 and cam rod 42, so that a portion of the explosive charge now passes through the valve seat 25^a and against the piston which, in this instance, happens to be the one numbered 12. The force of the explosion in the compartment 24 effectively prevents the valve 32 from opening, but is unable to close the valve 29 owing to the fact that this valve is held open positively by the action of the cam and its associated parts. The result is that the wheel 8 is again turned half a revolution, and in doing this it compresses another charge within the compartment 9, the charge in this instance, however, passing into the compartment 23 instead of into the compartment 24. This cycle of operations is repeated continuously. The compartments 23, 24 with their circumscribing walls, together constitute mixing chambers which also serve as explosion chambers.

The igniters 38, 39 are energized alternately so as to bring about alternate explosions in the two mixing chambers, and as above described these chambers are alternately filled with explosive charges and they act alternately after the explosions, in the sense that first one of the explosion chambers directs a charge of burned gases against one of the pistons, and then the other explosion chamber directs another charge of burned gases against the other piston.

While after each explosion the gases of combustion passing through either of the valve seats 27 or 25^a, spread entirely across the face of the wheel 8 and act entirely across the end of the piston (11 or 12, as the case may be) yet there is no possibility of the burned gases passing downwardly through one valve and upwardly through another. This is because, at the instant when explosion takes place in one of the mixing chambers, the adjacent valve leading to the other mixing chamber is closed and held closed positively by the action of its cam, and owing to the packing 18 neither the force of the explosion nor the resulting gases of combustion can travel backwardly (to the right according to Fig. 3) so as to affect any other valve or valves communicating with either or both of the mixing chambers.

It will be noted that when compression takes place by aid of one of the pistons 11, 12, the explosive charge being compressed, though extending throughout the compartment 9 and acted upon by a piston which reaches entirely across this compartment, is unable to pass through but one of two valves, and that immediately after each compression by one of the pistons, the other piston, in compressing a similar charge, forces it through the other of the two valves last mentioned. It appears, therefore, that one of the explosion chambers, one of the valves 31, one of the pistons 11 and one of the valves controllable by pressure of an explosive charge are associated with one another, and that the other explosion chamber, the other piston, the other cam-operated valve, and the remaining pressure-controlled valve are all likewise associated with one another.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. The combination of a casing, a revoluble member mounted therein and provided with pistons adapted to revolve bodily within said casing, a plurality of explosion chambers connected with said casing and separated from each other, said explosion chambers being disposed abreast relatively to the general direction of rotation, separate valve mechanisms for opening and closing communication between each of said explosion chambers and said casing, and separate igniting devices for exploding charges contained in the respective explosion chambers.

2. The combination of a casing, a revoluble member mounted therein and adapted to be turned by pressure due to an explosion, an explosion chamber connected with said casing and adapted to receive therefrom an explosive charge under compression, a pressure-operated valve mounted within said explosion chamber for the purpose of opening and closing communication between said casing and said explosion chamber, and another valve mounted within said explosion chamber and actuated periodically by power and independently of explosions, for the purpose of opening when an explosion takes place within said explosion chamber, and of closing after said explosion takes place.

3. The combination of a casing provided with a plurality of compartments separate from each other, a revoluble member mounted within said casing and disposed intermediate said compartments, said revoluble member being provided with pistons movable relatively thereto and so spaced from each other as to be capable of extending into different compartments, a single explosion chamber common to said compartments, a valve so mounted as to be controllable by pressure of an aeriform body for opening and closing communication between said explosion chamber and one of said compartments, and a valve controllable positively by power for opening and closing communication between said explosion chamber and the other of said compartments.

4. The combination of a casing, an explosion chamber connected therewith, a piston disposed within said casing and separating the same into compartments disposed upon opposite sides of said piston, a valve for opening and closing communication between said explosion chamber and one of said compartments, means for actuating said valve, means for opening said valve positively by power and independently of explosions occurring within said chamber, and another valve for opening and closing communication between another compartment and said explosion chamber, said last-mentioned valve being free to open under pressure of an explosive mixture passing from said last-mentioned compartment into said explosion chamber.

5. The combination of a casing having generally an elliptical form, a revoluble member mounted within said casing and separating the same into two compartments, a pair of pistons carried by said revoluble member and adapted to enter opposite compartments at the same time, an explosion chamber provided with ports for communicating with different compartments upon opposite sides of said revoluble member, a valve for closing one of said ports, means for actuating said valve positively by power and independently of explosions, another valve disposed intermediate said explosion chamber and the opposite compartment, said last-mentioned valve being controllable by pressure of an aeriform body tending to pass from said last-mentioned compartment into said explosion chamber.

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

GEORGE SCHULZ.

Witnesses:

WALTON HARRISON,

EVERARD B. MARSHALL.