No. 897,260. PATENTED AUG. 25, 1908.

C. H. LUTHER, Jr.

ROTARY ENGINE.

APPLICATION FILED JULY 16, 1907. 2 SHEETS—SHEET 1.

Fig. 2.

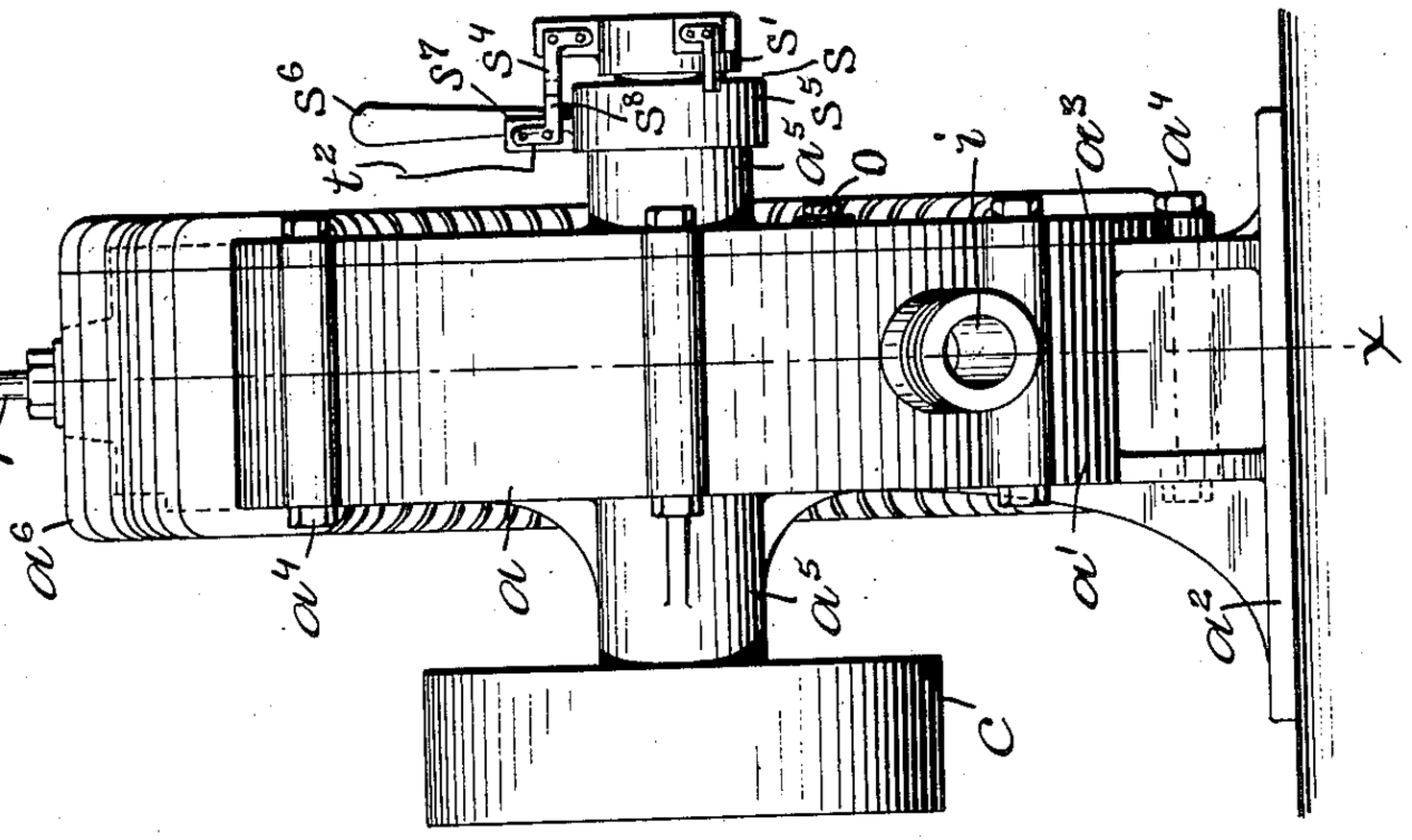

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 4.

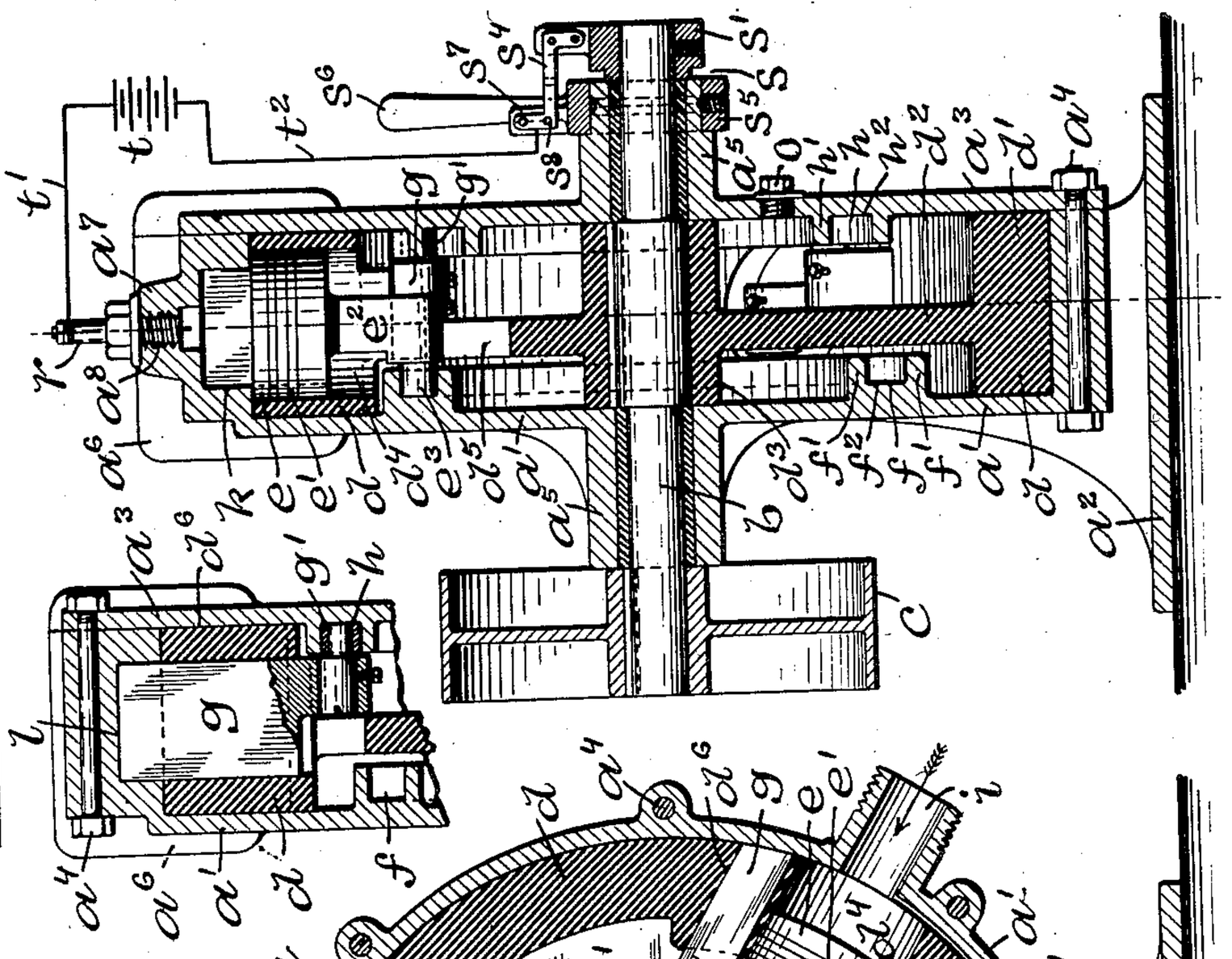

Fig. 5.

Fig. 3.

Fig. 6.

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CHARLES H. LUTHER, JR., OF PROVIDENCE, RHODE ISLAND.

ROTARY ENGINE.

No. 897,260. Specification of Letters Patent. Patented Aug. 25, 1908.

Application filed July 16, 1907. Serial No. 384,073.

To all whom it may concern:

Be it known that I, CHARLES H. LUTHER, Jr., a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Rotary Engines, of which the following is a specification.

This invention has reference to an improvement in rotary engines and more particularly to an improvement in rotary explosive engines.

In rotary explosive or gas engines as heretofore constructed, the functions of suction and compression are performed by auxiliary mechanism, such as a pump placed intermediate the source of gas supply and the engine and operated by the engine or an auxiliary power.

The object of my invention is to construct a rotary explosive engine with internal component parts adapted to perform the functions of suction, compression, explosion and exhaust, all within the casing of the engine, thereby constructing a rotary explosive engine complete in itself and eliminating all auxiliary mechanism.

A further object of my invention is to simplify the construction of a rotary explosive engine, whereby the number of parts are reduced, and in proportion to the horse power developed are extremely light in construction, making the engine particularly adapted for use in dirigible balloons, automobiles or power boats.

Another object of my invention is to so construct a rotary explosive engine that a multiple of the engines may be used on one driving shaft.

My invention consists in the peculiar and novel construction of a rotary explosive engine having internal component parts adapted to perform the functions of suction, compression, explosion and exhaust, all within the engine, as will be more fully set forth hereinafter.

Figure 1 is a vertical view looking at the pulley side of my improved rotary explosive engine. Fig. 2 is a vertical view looking at the inlet or suction port side of the engine. Fig. 3 is a vertical sectional view taken on line X X of Fig. 2, showing the cam for the sliding abutments in full lines, the cam for the reciprocating pistons in dotted lines and the position the operative parts would assume at the point of suction, compression, explosion and exhaust. Fig. 4 is a vertical sectional view taken on line Y Y of Fig. 1, showing the rotary piston secured to the driving shaft and one of the reciprocating pistons in the rotary piston operatively connected with the cam on the interior of the casing. Fig. 5 is a detail sectional view taken on line Z Z of Fig. 3 through the casing, sliding abutment, and cam for operating the abutment, and Fig. 6 is a detail face view of that part of the sparking controlling mechanism secured to the driving shaft.

In the drawings, *a* indicates the casing, *b* the driving shaft, *c* the driving pulley, *d* the rotary piston, *e e e* the reciprocating pistons, *f* the cam for the reciprocating pistons, *g g g* the sliding abutments, *h* the cam for the sliding abutments, *i* the suction port, *k* the combined compression and explosion chamber, *l* the exhaust chamber, *m* the exhaust port, *o* the oil inlet plug, *p* the oil outlet plug, *r* the spark plug, *s* the spark controlling mechanism, and *t* a battery connected by the wires t' and t^2 to the spark plug and spark controlling mechanism of my improved rotary explosive engine.

The circular casing *a* is constructed in two parts shaped to conform to and inclose the circular rotary piston *d*. The part a' of the casing is supported on the base a^2 and the part a^3 secured to the part a' on a line coinciding with the adjacent edge of the rotary piston *d* by the bolts a^4 a^4, as shown in Fig. 4. Each of the parts a' and a^3 have the central bearings a^5 a^5 for the driving shaft *b*. The suction port *i*, the explosion chamber *k* and the exhaust port *m* are located at equal distances apart on the circumference of the engine and formed integral with the part a' of the casing. The exhaust chamber *l* which connects with the exhaust port *m* is a continuation of the explosion chamber *k* both being formed by extending the circumference of the casing outward between the explosion chamber *k* and the exhaust port *m* the width of the sliding abutments *g g* and to a depth coinciding to the outward movement of the sliding abutments, as shown in Figs. 3 and 5. The compression and explosion chamber *k* is preferably located at the top of the engine and with the exhaust chamber *l* is air cooled by the radial flanges a^6 a^6 formed integral with the casing, or by a water jacket if desired. A boss a^7 having the screw-threaded hole a^8 extending into the combined compres-

sion and explosion chamber k is formed on the top of the casing, for the spark plug r, as shown in Fig. 3. The cam f for the reciprocating pistons e e is formed on the inside of the part a' of the casing, or secured thereto, and consists of two continuous parallel ribs f' f' forming a continuous groove f^2 adapted to receive the rolls on the stems of the pistons e e and shaped to move the pistons inward at f^3 at the point of suction, then outward at f^4 at the point of compression and explosion, then inward at f^5 and outward at f^6 to the point of exhaust, as shown in dotted lines in Fig. 3. The cam h for the sliding abutments g g is formed on the inside of the part a^3 of the casing or secured thereto and consists of two continuous parallel ribs h' h' forming a continuous groove h^2 adapted to receive the rolls on the sliding abutments g g g and shaped to move the abutments outward at h^3 into the explosion chamber k at the point of explosion and then inward at h^4 at the point of exhaust, as shown in full lines in Fig. 3.

The shaft b is rotatably supported in the bearings a^5 a^5 and has the driving pulley c secured to the outer end of the shaft, as shown in Fig. 4. The rotary piston d is in the form of a balance wheel having the thick rectangular rim d' connected by the central web d^2 to the hub d^3 which is secured to the shaft b by a spline or other means. The sides and peripheral face of the rim d' are shaped to have a sliding fit in the interior of the casing. Piston chambers d^4 d^4 are formed in the rim d'. These piston chambers extend radially through the rim at equal distances apart for the pistons e e, as shown in Fig. 3. Radial slots d^5 d^5 are formed in the web d^2 on a line with the center of the piston chambers, and rectangular shape holes d^6 d^6 d^6 are formed in the rim adjacent the piston chambers for the sliding abutments g g g. The pistons e e each have the packing rings e' e' and the inwardly-extending rigid stem e^2 on the inner end of which is rotatably secured the roll e^3. The stem e^2 extends through the slot d^5 in the web of the rotary piston in a position to bring the roll into the groove f^2 in the cam f. The sides of the slot d^5 form a guide for the stem of the piston and prevent the same from turning in the piston chamber.

The sliding abutments g g are each constructed to have a sliding fit in a hole d^6 in the rim d'. These abutments extend through the rim and have on their inner ends a roll g' in a position to enter the groove h^2 in the cam h, as shown in Figs. 3, 4 and 5. The pins for rotatably securing the rolls to the inner ends of the abutments and piston stems may each be in the form of an eccentric secured by a set bolt in the adjusted position, as shown in Figs. 3 and 5, thereby providing means for adjusting the pistons and abutments for wear.

The spark plug r has the usual construction consisting of an insulated central core in an outer shell adapted to screw into the screw threaded hole a^8 in the boss a^7 and coinciding sparking points on the inner ends of the core and shell, as shown in Fig. 3. The spark controlling mechanism s consists of a spider s' having the central hub s^2 secured to the shaft b and the three arms s^3 s^3 s^3 to the ends of which are secured the L-shaped contact springs s^4 s^4 s^4. A ring s^5 having the handle s^6 and the arm s^7 on the end of which is an L-shaped contact spring s^8 in a position to engage in succession with the L-shaped contact springs on the spider, is rotatably secured on the bearing a^5 adjacent the spider s', as shown in Fig. 4. By moving the handle s^6 the sparking is advanced or retarded, as desired, thus varying the speed of the engine.

In the operation of my improved rotary engine, the inlet port is connected to a carbureter or a source of gas supply and the outlet port m may be connected to a muffler if desired. The rotary piston d revolves in the direction of the arrow, as shown in Fig. 3. The function of suction is performed by a piston e being drawn inward by the cam f as it arrives opposite the inlet port i. The charge of gas thus drawn in is carried around in the piston chamber d^4 toward the compression chamber k. Just before the point of compression a sliding abutment g is moved outward by the cam h into the compression and explosion chamber k. An outward movement of the piston e by the cam f now compresses the charge of gas in the compression chamber, and the charge of gas is exploded by a spark from the battery t, controlled by the mechanism s jumping across the points on the spark plug r. The force of the explosion acting on the abutment g and on the end of the piston e forces the rotary piston d around in the direction of the arrow to the point of exhaust, when the piston and abutment is drawn inward by their respective cams. The inward movement of the piston e toward the point of exhaust (controlled by the cam f at f^5) tends to revolve the rotary piston d and the outward movement of the piston e at the point of exhaust assists in forcing the burned gases out through the exhaust port m. These operations are repeated simultaneously three times in one revolution of the engine. Any products of combustion left in the exhaust chamber l are forced out of the exhaust port m by the next following abutment, thus keeping the compression and explosion chamber k free of the products of combustion.

I do not wish to confine myself to the jump spark system shown for exploding the gas or to the mechanism for controlling the same, as any of the usual means may be used for this purpose, without materially affecting the spirit of my invention.

Having thus described my invention, I

claim as new and desire to secure by Letters Patent:—

1. In a rotary explosive engine, a rotary piston, a reciprocating piston in the rotary piston and a fixed cam operatively connected with the reciprocating piston.

2. In a rotary explosive engine, a rotary piston, a reciprocating piston in the rotary piston and a fixed cam in the engine casing operatively connected with the reciprocating piston.

3. In a rotary explosive engine, a rotary piston, a plurality of reciprocating pistons in the rotary piston, stems on the reciprocating pistons, and a fixed cam in the engine casing, operatively connected with the stems of the reciprocating pistons.

4. In a rotary explosive engine, a rotary piston, a reciprocating piston in the rotary piston, a sliding abutment in the rotary piston, means for operating the reciprocating piston and means for operating the sliding abutment.

5. In a rotary explosive engine, a rotary piston, a plurality of reciprocating pistons in the rotary piston, a plurality of sliding abutments in the rotary piston, means for operating the reciprocating pistons and means for operating the sliding abutments.

6. In a rotary explosive engine, a rotary piston, a plurality of reciprocating pistons in the rotary piston, a plurality of sliding abutments in the rotary piston adjacent the reciprocating pistons, means for operating the reciprocating pistons and the sliding abutments consisting of cams operatively connected to the same.

7. In a rotary explosive engine, a casing, a shaft rotatably supported in bearings in the casing, a rotary piston in the casing secured to the shaft, a plurality of reciprocating pistons in the rotary piston, a plurality of sliding abutments in the rotary piston, cams in the casing, and means for operatively connecting the reciprocating pistons and the sliding abutments with the cams.

8. In a rotary explosive engine, a rotary piston having an annular rim, a plurality of piston chambers in the rim, a plurality of reciprocating pistons in the piston chambers, a plurality of sliding abutments in the rim adjacent the pistons, and means for operating the reciprocating pistons and the sliding abutments.

9. In a rotary explosive engine, a casing, a suction port, a combined compression and explosion chamber and an exhaust port in the casing, a shaft rotatably supported in bearings in the casing, a rotary piston in the casing secured to the shaft, a plurality of reciprocating pistons in the rotary piston, a plurality of sliding abutments in the rotary piston adjacent the reciprocating pistons, cams on the interior of the casing, and means for operatively connecting the reciprocating piston and the sliding abutments with the cams.

10. In a rotary explosive engine, a casing, a suction port, a combined compression and explosion chamber merging into an exhaust port in the casing, a shaft rotatably supported in bearings in the casing, a rotary piston in the casing secured to the shaft, a plurality of reciprocating pistons in the rotary piston, a plurality of sliding abutments in the rotary piston, cams on the interior of the casing, means for operatively connecting the reciprocating piston and the sliding abutments with their respective cams, a spark plug operatively connected with the combined compression and explosion chamber, and means for operatively connecting the spark plug with a battery.

11. In a rotary explosive engine, a casing, a suction port, explosion chamber and exhaust port in the casing, a shaft rotatably supported in bearings in the casing, a rotary piston secured to the shaft and having an annular rim, a plurality of piston chambers in the annular rim, a plurality of reciprocating pistons in the piston chambers, a plurality of sliding abutments in the rim adjacent the pistons, cams on the interior of the casing, means for operatively connecting the reciprocating pistons and the sliding abutments with their respective cams, means for igniting the gas in the explosion chamber and means for cooling the engine.

12. In a rotary explosive engine, a casing, a suction port, explosion chamber and exhaust port in the casing, a shaft rotatably supported in bearings in the casing, a rotary piston having an annular rim and a central hub secured to the shaft, a plurality of piston chambers in the annular rim, a plurality of reciprocating pistons in the piston chambers, stems on the reciprocating pistons, rolls on the ends of the stem, a cam on the interior of the casing operatively connected with the rolls on the piston stems, a plurality of sliding abutments in the rim of the rotary piston adjacent the reciprocating pistons, rolls on the abutments, a cam on the interior of the casing operatively connected with the rolls on the abutments, means for igniting the gas in the explosion chamber, and means for cooling the engine.

13. In a rotary explosive engine, a casing, a suction port, exhaust port and a combined compression and explosion chamber merging into the exhaust port, in the casing, a shaft rotatably supported in bearings in the casing, a rotary piston having an annular rim and a central hub secured to the shaft, a plurality of piston chambers in the annular rim; a plurality of reciprocating pistons in the piston chambers, stems on the reciprocating pistons, rolls on the end of the stems, a cam on the interior of the casing operatively connected with the rolls on the piston stems, a

plurality of sliding abutments in the rim of the rotary piston adjacent the reciprocating pistons, rolls on the abutments, a cam on the interior of the casing operatively connected with the rolls on the abutments, a spark plug in the explosion chamber, spark controlling mechanism adapted to advance or retard the spark, means for operatively connecting the spark plug and the spark controlling mechanism to a source of electric energy, and means for cooling the engine, as described.

14. In a rotary explosive engine, a casing, a suction port, exhaust port, combined compression and explosion chamber merging into the exhaust chamber leading to the exhaust port in the casing, cams on the interior of the casing, a shaft rotatably supported in bearings in the casing, a rotary piston having an annular rim, a connecting web in which are radial slots and a central hub secured to the shaft, a plurality of piston chambers in the annular rim on a line with the radial slots, a plurality of reciprocating pistons in the piston chambers, rigid stems on the reciprocating pistons adapted to extend through the radial slots in the web of the rotary piston, rolls on the ends of the stems in a position to engage with a cam on the interior of the casing, a plurality of sliding abutments in the rim of the rotary piston adjacent the reciprocating pistons, rolls on the abutments in a position to engage with a cam on the interior of the casing, means for igniting the gas in the explosion chamber, and means for cooling the engine, as described.

15. In a rotary explosive engine, the combination of a casing *a*, a driving shaft *b* rotatably supported in bearings in the casing, a pulley *c* on the shaft, a rotary piston *d* secured to the driving shaft, reciprocating pistons *e e e* in the rotary piston *d*, a cam *f* operatively connected with the reciprocating pistons *e e*, sliding abutments *g g g* in the rotary piston, a cam *h* operatively connected to the sliding abutments, a suction port *i*, a combined compression and explosion chamber *k* merging into an exhaust chamber *l*, an exhaust port *m*, an oil inlet plug *o*, an oil outlet plug *p*, a spark plug *r*, and a spark controlling mechanism *s*, all constructed as shown and for the purpose as described.

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

CHARLES H. LUTHER, JR.

Witnesses:
J. A. MILLER,
ADA E. HAGERTY.