No. 885,006. PATENTED APR. 21, 1908.

E. E. BARNES.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED OCT. 9, 1906.

8 SHEETS—SHEET 1.

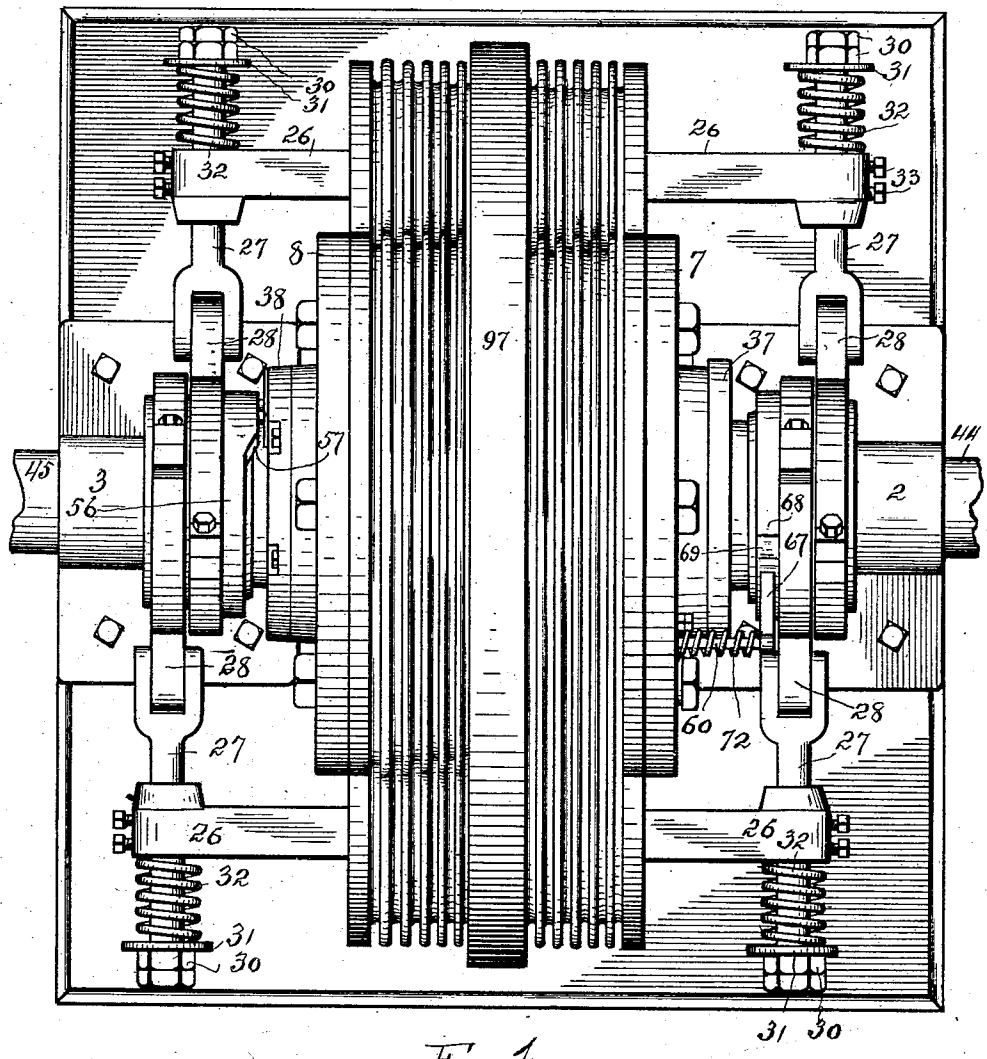


Fig 1

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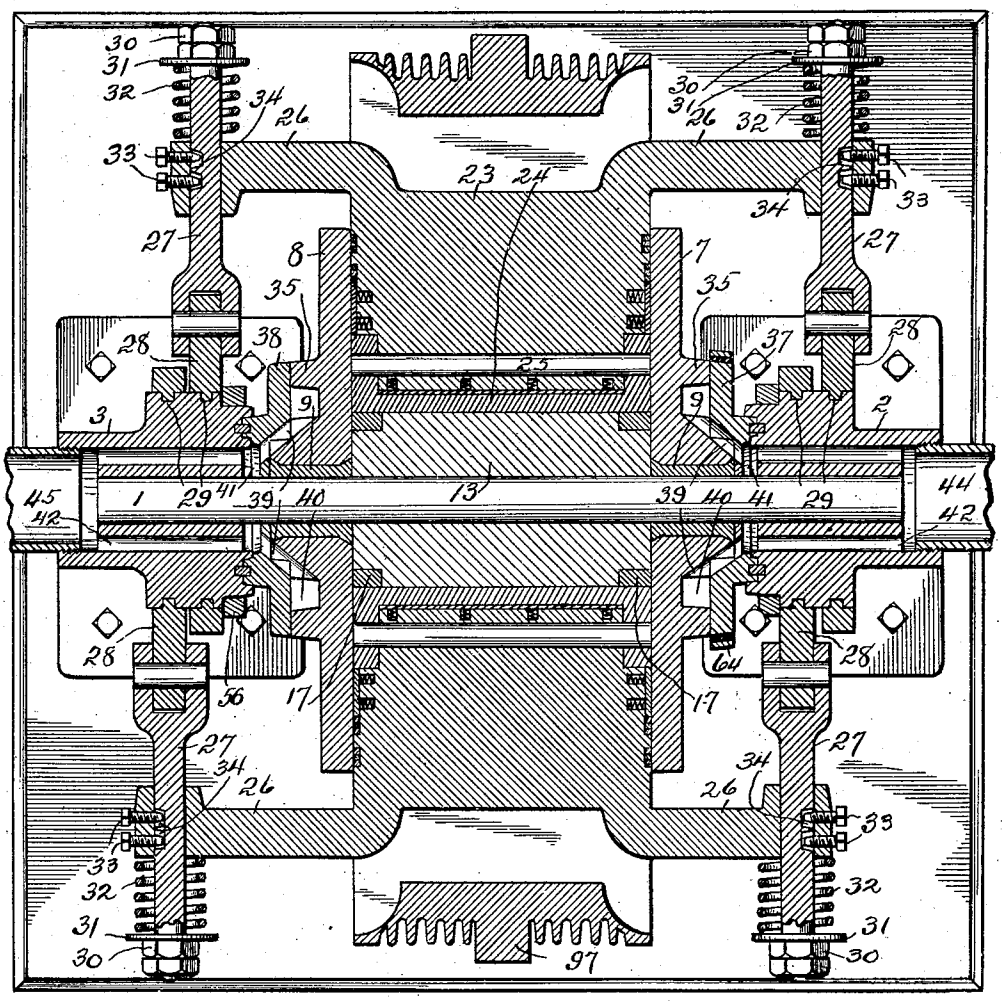


Fig 2

Fig 3

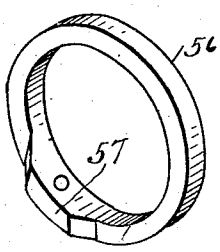
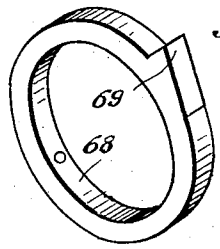


Fig 4



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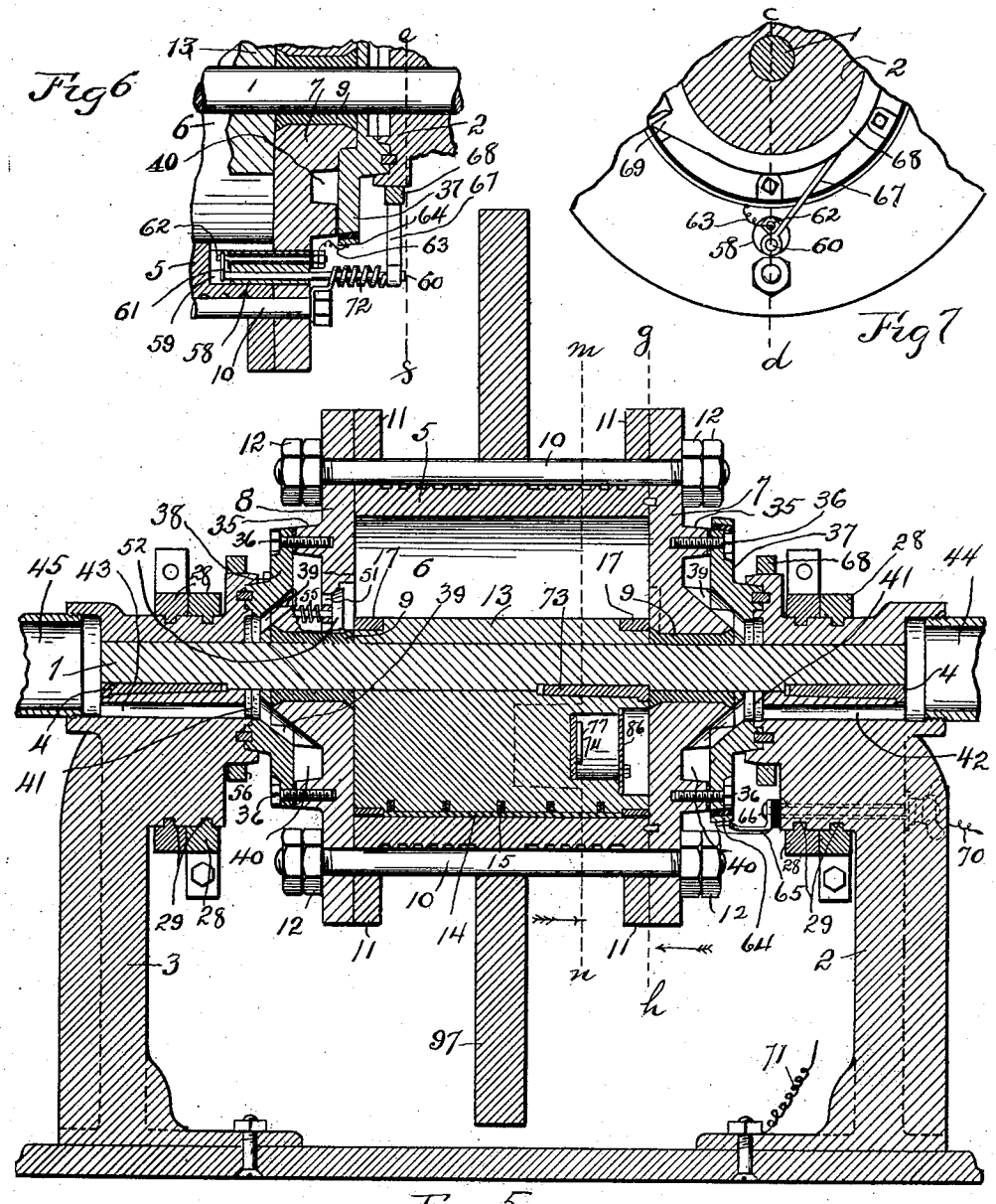


Fig 5

Fig 6

Fig 7

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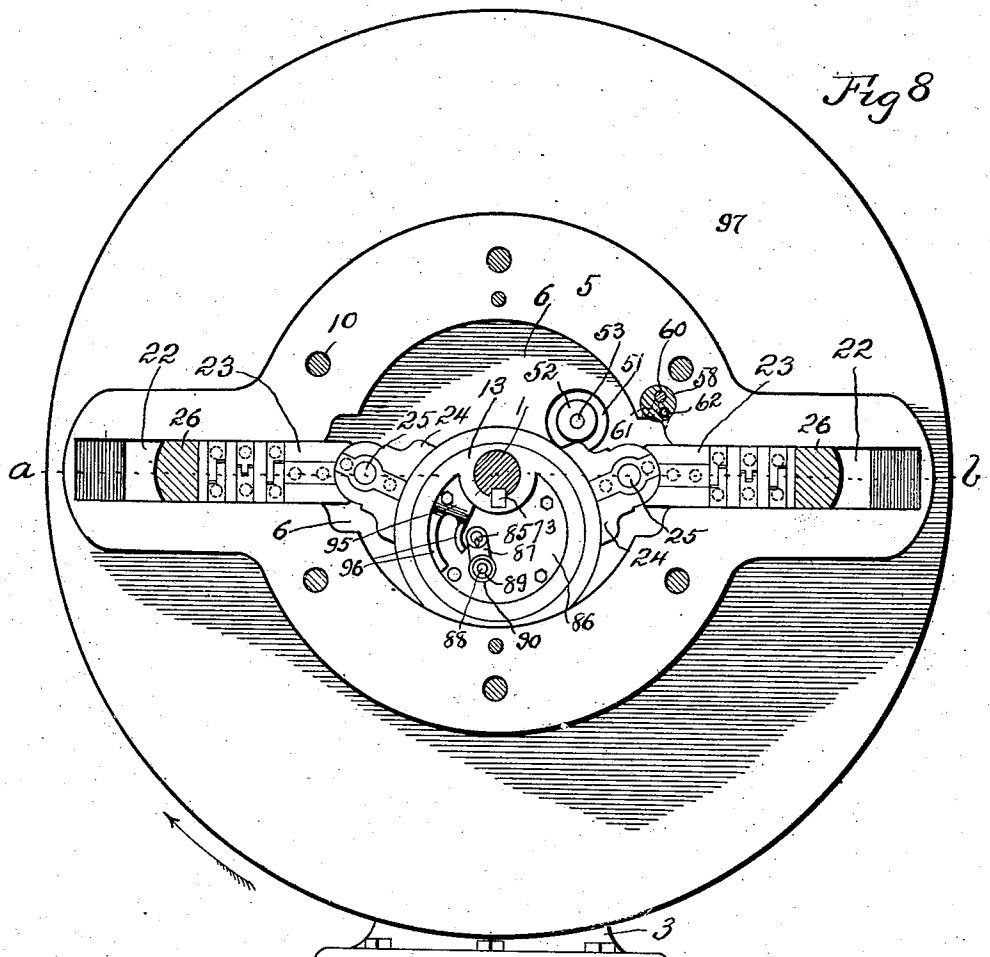
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8 SHEETS—SHEET 4.

Fig 8



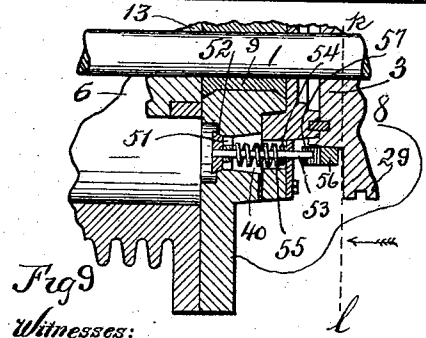


Fig 9

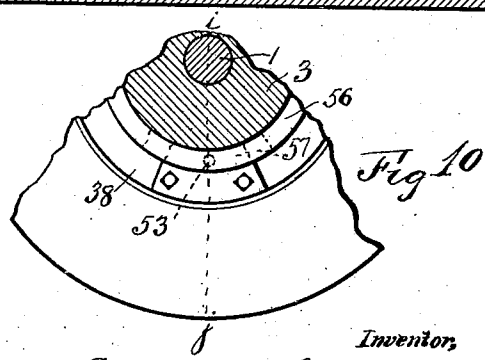


Fig 10

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Fig 11

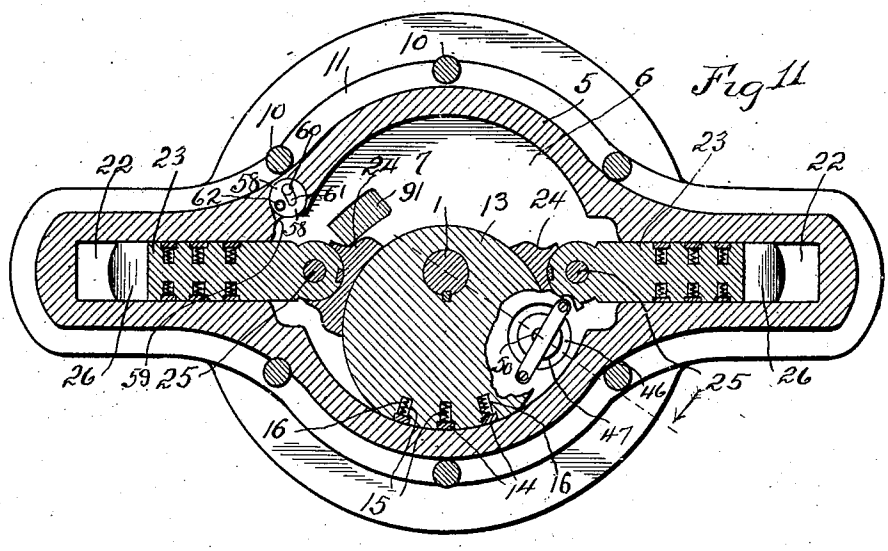


Fig 12

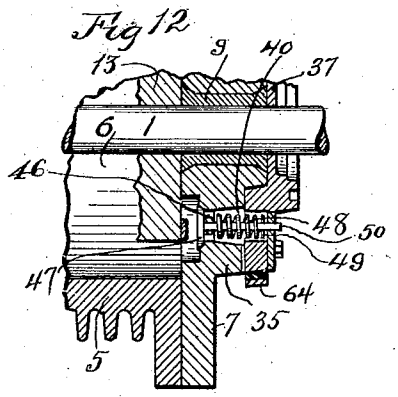


Fig 13

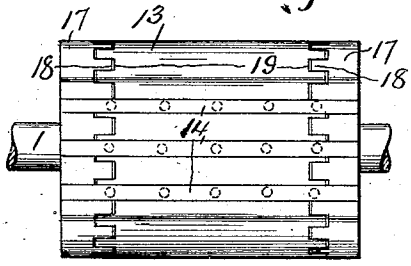
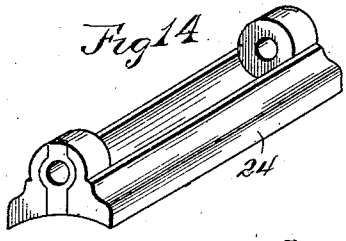


Fig 14



Witnesses:
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8 SHEETS—SHEET 6.

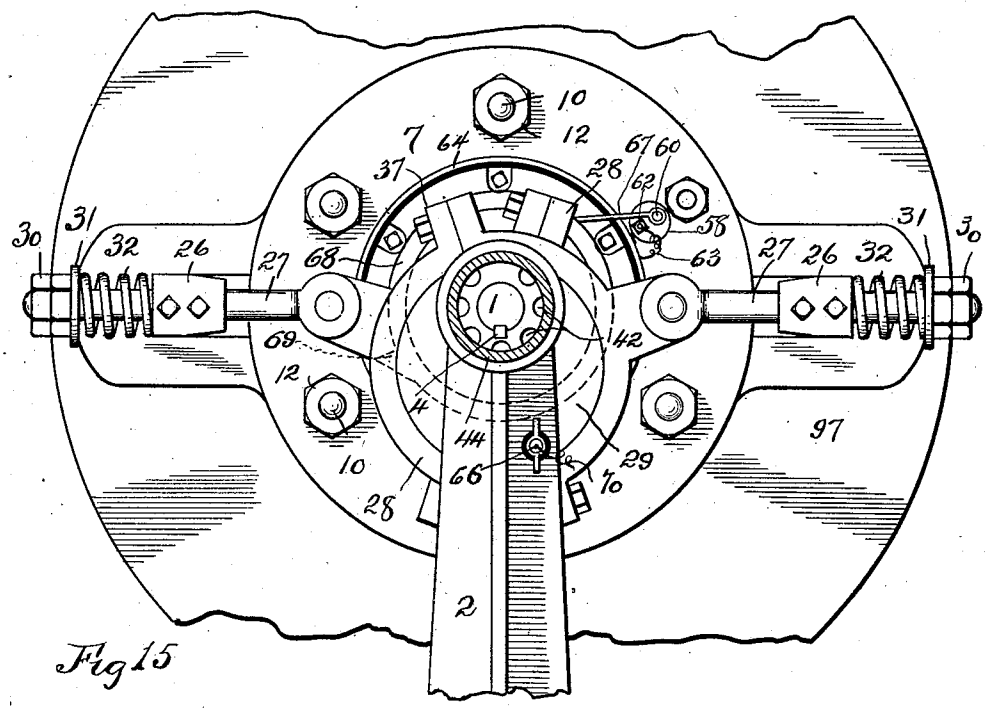


Fig 15

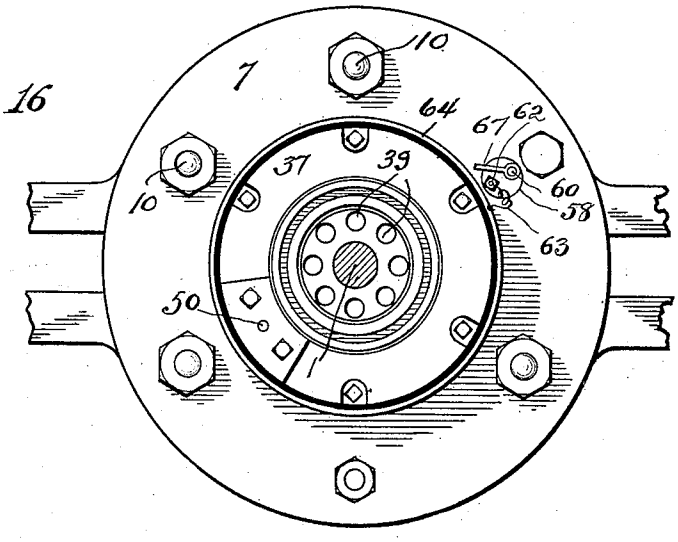


Fig 16

Witnesses:
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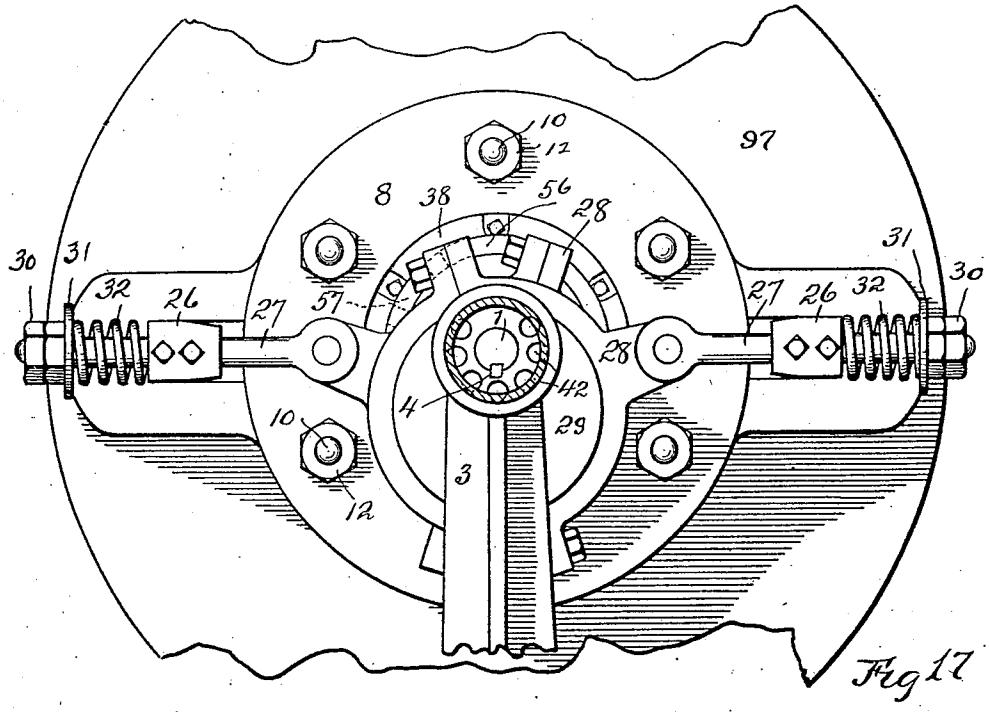


Fig 17

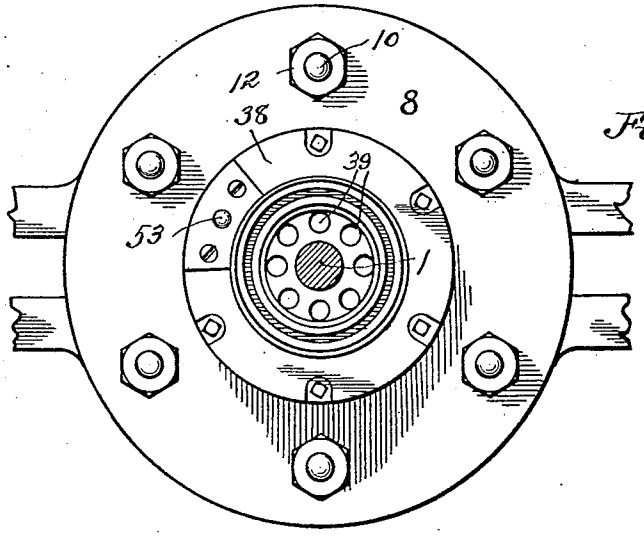


Fig 18

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No. 885,006. PATENTED APR. 21, 1908.

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APPLICATION FILED OCT. 9, 1906.

8 SHEETS—SHEET 8.

Fig 19

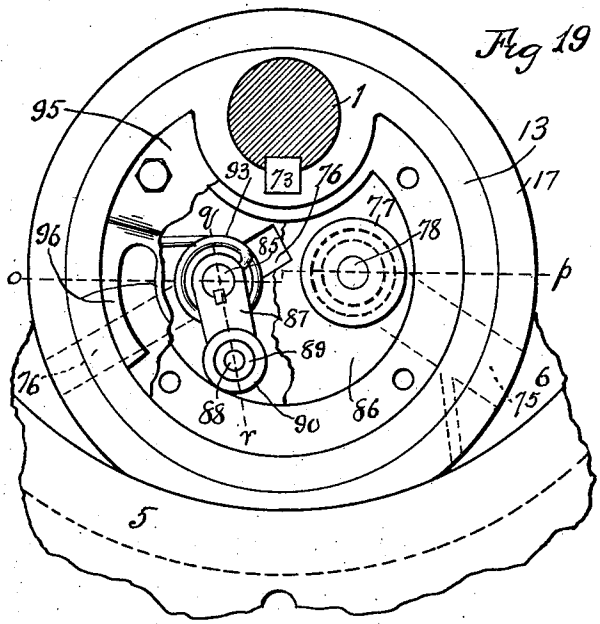


Fig 21

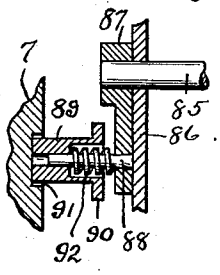


Fig 20

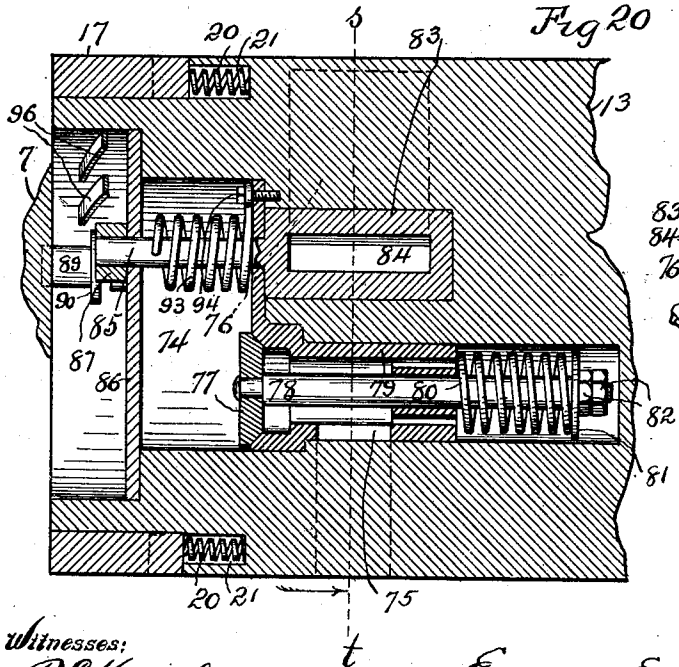
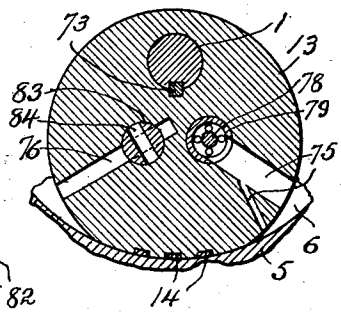


Fig 22



Witnesses:

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UNITED STATES PATENT OFFICE.

EVERETT E. BARNES, OF KANSAS CITY, MISSOURI.

ROTARY EXPLOSIVE-ENGINE.

No. 885,006. Specification of Letters Patent. Patented April 21, 1908.

Application filed October 9, 1906. Serial No. 338,142.

To all whom it may concern:

Be it known that I, EVERETT E. BARNES, citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Rotary Explosive-Engines, of which the following is a specification.

My invention relates to improvements in rotary explosive engines.

It relates particularly to the class of explosive engines in which the cylinder is rotatively mounted on a stationary support, a stationary abutment being mounted on the support within a circular chamber provided in the cylinder, the abutment being disposed eccentrically to the axis of the cylinder and radially movable pistons being mounted in the cylinder and bearing upon the periphery of the abutment.

My invention consists in certain novel features hereinafter fully described and claimed.

In the accompanying drawings illustrating my invention Figure 1 is a plan view of the engine. Fig. 2 is a horizontal sectional view of the engine taken on the dotted line *a*—*b* of Fig. 8. Figs. 3 and 4 are perspective views respectively of the cam rings for actuating the exhaust valve and charge igniting device. Fig. 5 is a vertical, central, longitudinal sectional view of the engine. Fig. 6 is a vertical sectional view, taken on the dotted line *c*—*d* of Fig. 7, and showing the charge igniting mechanism and parts connected therewith. Fig. 7 is a vertical sectional view, taken on the dotted line *e*—*f* of Fig. 6. In both Figs. 6 and 7 the cylinder is shown in a position in which the igniting mechanism is disposed below the stationary shaft supporting the cylinder. Fig. 8 is a vertical sectional view taken on the dotted line *g*—*h* of Fig. 5. Fig. 9 is a vertical sectional view of the exhaust valve and parts adjacent thereto, the view being taken on the dotted line *i*—*j* of Fig. 10. Fig. 10 is a vertical sectional view taken on the dotted line *k*—*l* of Fig. 9. In both Figs. 9 and 10 the cylinder is shown rotated to a position in which the exhaust valve is located in the vertical plane intersecting lengthwise the axis of the cylinder. Fig. 11 is a vertical sectional view, taken on the dotted line *m*—*n* of Fig. 5, a portion of the abutment being broken away so as to disclose the cylinder inlet valve. Fig. 12 is a vertical sectional view of the cylinder inlet valve and parts connected therewith, the cylinder being shown rotated to a position in which the inlet valve is in the vertical plane intersecting lengthwise the axis of the cylinder. Fig. 13 is an under view of the stationary abutment and a part of the supporting shaft. Fig. 14 is a perspective view of one of the shoes with which the radially movable pistons are provided. Fig. 15 is an elevation view of a portion of the engine and facing the end of the cylinder in which is provided the inlet valve, and which is the right end as viewed in Figs. 1, 2 and 5. Fig. 16 is an end elevation view of the end of the cylinder shown in Fig. 15, the supporting shaft being shown in vertical section, the standard supporting the shaft and some of the other parts being removed. Fig. 17 is an elevation view facing the end of the cylinder in which is mounted the exhaust valve and which is the left end of the cylinder as viewed in Figs. 1, 2 and 5. Fig. 18 is an elevation view of the end of the cylinder which is shown in Fig. 17, the left supporting standard and other parts being removed. Fig. 19 is an end elevation view of the stationary abutment and a portion of the cylinder, portions of the plates forming the two end walls of the compression chamber being broken away and the supporting shaft being shown in vertical section. Fig. 20 is a horizontal sectional view, taken on the dotted line *o*—*p* of Fig. 19. Fig. 21 is a sectional view, taken on the dotted line *q*—*r* of Fig. 19 and showing the rock valve mechanism engaged with the recessed portion of the adjacent cylinder head. Fig. 22 is a vertical sectional view taken on the dotted line *s*—*t* of Fig. 20 and showing the rock valve in the closed position.

Similar characters of reference denote similar parts.

1 denotes a horizontal, stationary cylindrical shaft, supported at opposite ends respectively by two supports or vertical standards, 2 and 3, to which standards the shaft is held against rotation by longitudinal keys 4, as shown in Fig. 5.

5 is a rotary cylinder, having a circular chamber 6, disposed concentrically with the shaft 1, and through which said shaft extends.

7 and 8 denote respectively the right and left cylinder heads, as viewed in Figs. 2 and 5, said heads being provided with central

openings in which are respectively mounted the bearing sleeves 9, encircling and supported by the shaft 1.

10 denotes one of each of a series of longitudinal, horizontal bolts, which extend through the heads 7 and 8 and through the peripheral flanges 11 provided adjacent opposite ends of the cylinder 5, the outer ends of the bolts 10 having mounted thereon nuts 12, which clamp the heads to the cylinder 5. A cylindrical abutment 13 is longitudinally and eccentrically mounted upon the shaft 1, its ends bearing against the cylinder heads 7 and 8 respectively. A longitudinal portion of the abutment 13 is in contact with the inner periphery of the explosion chamber 6. In the portion of the abutment having contact with the periphery of the chamber 6 are mounted a plurality of longitudinal radially movable packing plates 14, which, as shown in Fig. 11, are held in contact with the chamber wall by spiral springs 15, bearing upon the inner sides of said plates 14 and supported in suitable recesses 16 provided in the periphery of the abutment 13. At opposite ends of the abutment 13 are provided longitudinally movable packing rings 17, the inner edges of which are provided with a series of longitudinal projections 18, which fit, as shown in Fig. 13, in corresponding recesses 19 provided in the periphery of the abutment 13. The rings 17 are forced against the cylinder heads by coil springs 20 mounted in recesses 21, as shown in Fig. 20. Radially movable in two diametrically guide openings 22 (see Figs. 8 and 11) are respectively slidably mounted two plates 23. Two shoes 24 are pivoted by means of bolts 25, to the inner ends respectively of plates 23. The plates 23, together with the shoes 24, comprise two pistons, the inner ends of which, consisting of the shoes 24, bear upon the periphery of the abutment 13 upon opposite sides of the shaft 1. Each plate 23 at its outer end is provided with two longitudinal, lateral arms 26 which are disposed at opposite edges of the plate and are provided with radial openings in which are slidably mounted, one in each arm 26, a plurality of rods 27, the inner ends of which are pivoted respectively to rings 28, of which there are four.

On the inner side and upper end of each standard, 2 and 3, is provided a circular guide 29, disposed eccentrically relative to the shaft 1, said circular guides being so disposed as to move the piston plates 23 radially when the cylinder 5 is rotated and retain the shoes 24 in contact with the periphery of the abutment 13. The outer ends of the rods 27 are screw threaded and have mounted thereon nuts 30 which bear upon the outer sides of washers 31, provided one on each rod 27. Four coils springs 32 are mounted on each rod 27 and bear at their outer ends respectively against the washers 31, their inner ends bearing respectively against the adjacent arm 26. The tension of the springs 32 is such that the said springs will force the piston plates 23 inwardly so that the shoes 24 will bear upon the abutment 13. In each arm 26 are mounted two set screws 33 the inner ends of which are loosely fitted in recesses 34 provided therefor in the rods 27.

Each head 7 and 8, on its outer side is provided with an annular flange 35, concentric with the shaft 1. Secured respectively to the flanges 35 by means of bolts 36, are two rings 37 and 38, which are mounted upon the shaft 1 and are provided each with a series of holes 39 which communicate at their inner ends with an annular space 40. The outer ends of said holes communicate with an annular space 41 disposed between the inner sides of the supporting standards 2 and 3 and the outer sides of the rings 37 and 38 respectively. The standards 2 and 3 are provided respectively with horizontal passages 42 and 43 communicating respectively at their inner ends with the annular spaces 41, their outer ends communicating respectively with two horizontal tubes 44 and 45 which respectively receive and discharge the propelling fluid. An inlet passage 46 connects the explosion chamber 6 with the annular space 40 in the cylinder head 7. An inlet valve 47 is mounted in said inlet opening 46 and is normally held seated by means of a coil spring 48, which bears at one end upon a pin 49, mounted in the valve stem 50, the other end of the spring bearing against the head 7. The parts just described are best shown in Fig. 12. In the cylinder head 8 is provided an exhaust opening or passage 51 which connects the annular space 40 with the circular explosion chamber 6. An outlet or exhaust valve 52, normally closes the passage 51, said valve being provided with a valve stem 53, carrying a pin 54 against which bears one end of a coil spring 55, the other end bearing against the head 8. The function of the spring 55 is to normally retain the valve 53 seated. On the supporting standard 3 is secured a cam ring 56, provided on the side next the cylinder head 8 with a projection 57 adapted, during each revolution of the cylinder, to strike the outer end of the horizontal valve stem 53, thereby forcing the valve 52 open and permit the exploded charge to escape from the chamber 6. The mechanism just described is best shown in Figs. 5, 9, 17 and 18.

I will now describe the mechanism by which the charge is ignited:—Referring to Figs. 4, 5, 6, 7, 8, 11, 15 and 16,—58 denotes a cylindrical plug mounted in a horizontal opening extending through the cylinder head 7 which registers with an opening 59 provided in the cylinder body 5 and communicating with the chamber 6. A horizontal rock shaft 60 extends through the plug 58,

the inner end of said rock shaft having secured to it a lateral arm 61 normally separated from but adapted to strike a contact pin 62 extending lengthwise through the plug 58 but insulated therefrom, said pin 62 having its outer end connected by a wire 63 with a ring 64 of conductive material, mounted on but electrically insulated from, the periphery of the ring 37. 65 denotes a spring arm bearing at one end upon the outer periphery of the ring 64, the other end of said arm being secured to the inner end of a horizontal rod 66, which extends through but is insulated from the supporting standard 2. Rigidly secured to the outer end of the rock shaft 60 is a radial arm 67, which normally rests at its free end upon a ring 68 mounted upon the standard 2 concentrically with the shaft 1. From the periphery of the ring 68 radially extends a projection 69 adapted, when the cylinder 5 is rotated, to come in contact with the arm 67, thus swinging the rock shaft 60 so that the arm 61 strikes the contact pin 62, thus completing the electric circuit which, however, is immediately broken by the arm 67 passing off from the projection 69 on the ring 68. At the time that the arm 61 is separated from the pin 62 the electric spark is created in the explosion chamber 6 and the charge is ignited. The projection 69 is so disposed that the charge is exploded when the cylinder 5 is in approximately a position diametrically opposite that shown in Fig. 8. The valves 47 and 52 are located on opposite sides of the plane in which the piston plates 23 are located, which plane intersects lengthwise the axis of rotation of the cylinder 5. The recess 59, in which the plug 58 is located, communicates with the side of the chamber 6 in which is situated the exhaust valve 52. 70 and 71 denote two wires connecting with the opposite poles of a battery, not shown, or other electric generator. The wire 70 is connected to the insulated bolt 66, the wire 71 being connected to any metallic portion of the engine, such as the supporting standard 2. An electric current entering the machine by wire 70 will pass through the bolt 66, spring arm 65, insulated ring 64, wire 63, pin 62, arm 61, rock shaft 60, and thence through the plug 58 into the head 7, thence by bearing sleeves 9 into the shaft 1, and thence into the supporting standard 2, from which the current passes back to the battery by the wire 71. The rock shaft 60 is normally held in position such that the arm 61 will be separated from the contact pin 62 by means of a coil spring 72 which encircles the rock shaft, one end of the spring being secured to the adjacent bolt 10, the other end being secured to the arm 67.

The abutment 13 is rigidly held to the shaft 1 by means of a longitudinal key 73, mounted in suitable keyways in the said abutment and shaft.

I will now describe the mechanism by which the propelling charge is admitted into the chamber 6 through the inlet passage 46 forced from the said chamber 6 into a compressing chamber in abutment 13, and then permitted to again pass into the chamber 6 and then exploded against the pistons and said abutment.

Referring particularly to Figs. 5, 8, 11, and 19 to 22 inclusive, 74 denotes the compression chamber provided in the abutment 13 in the end adjacent the cylinder head 7. 75 indicates an inlet passage communicating at one end with the chamber 6 and communicating at the other end with the compression chamber 74. 76 indicates an outlet passage communicating at one end with the compression chamber 74 and at the other end communicating with the explosion chamber 6. The passages 75 and 76 communicate respectively with the chamber 6 at opposite sides of the place of peripheral contact between the abutment 13 and the wall of chamber 6. In the inlet passage 75 is mounted a valve 77, having a valve stem 78, horizontally and slidably mounted in a tubular plug 79 forming a portion of the inlet passage 75. The valve 77 is normally held seated by means of a coil spring 80 which encircles the stem 78 and has one end bearing against the plug 79, the other end bearing against a washer 81, encircling the stem 78 and bearing upon two nuts 82 mounted upon the threaded inner end of the stem 78. Rotatively mounted in the outlet passage 76 is a rock valve 83 having a transverse passage therethrough, 84, adapted, when the rock valve is rocked to the proper position, to register with the outlet passage 76, so as to permit the escape from the compression chamber 74 of the compressed propelling charge. The rock valve 83 is provided with a central, longitudinal, horizontal stem 85, disposed parallel with the shaft 1 and which extends through an opening provided in a circular plate 86 which forms the outer wall of the compression chamber 74. Secured rigidly to the valve stem 85 outside the compression chamber 74, is a radial arm 87, having secured to it a horizontal pin 88, on which is rotatively and slidably mounted a roller 89, having at its inner end a peripheral flange 90 the outer end being adapted to enter a recess 91, provided, as shown in Figs. 11 and 21, on the inner side of the cylinder head 7. A coil spring 92 encircles the pin 88, the inner end of the spring bearing against the radial arm 87, the outer end bearing against the roller 89 so as to force said roller into the recess 91 when the cylinder 5 has been rotated to the proper position. When the cylinder 5 has been rotated to a position in which the spring 92 will force the adjacent end of the roller 89 into the recess 91, the continued rotation of the cylinder will rock the valve 83, by means

of the said roller, pin 88, arm 87 and stem 85, to a position in which the opening 84 of the valve 83 will register with the outlet passage 76, thus permitting the compressed charge to pass into chamber 6, through the passage 76. Encircling the stem 85 is a coil spring 93, one end of which is secured to the stem 85, the other end being secured to a screw 94 fastened to the abutment 13. The function of the spring 93 is to retract the rock valve 83 after the charge has been permitted to escape through the passage 76. In order that the roller 89 may be released or withdrawn from the recess 91 so as to permit the spring 93, retracting the valve 83, the following described mechanism is provided:—

Secured at one end to the outer side of the plate 86 is a plate 95, the other end of which is bifurcated, the two arms 96 inclining toward the cylinder head 7. When the cylinder has revolved to a position in which the rock valve 83 shall have been moved to the open position and the compressed charge has escaped through said valve, the outer end of the roller 89 will be forced between the arms 96, the flange 90 passing under said arms. The inclination of the arms 96 will force the roller 89 out of the recess 91 against the pressure of the spring 92, after which the spring 93 will rock the valve 83 to the closed position, shown in Figs. 19 and 22. As shown in Figs. 19 and 22, the end of the inlet passage 75 communicating with the chamber 6, is bifurcated, thus giving support on the periphery of the abutment 13, to the shoes 24 and at the same time permitting the shoe which does the compressing to force the entire charge into the passage 75 from the chamber 6.

The body of the cylinder 5 is centrally provided with a circular peripheral flange 97, which serves as a balance wheel and also as a pulley from which power derived by the rotation of the cylinder may be transmitted by a belt, not shown, to other machinery.

I will now describe the operation of the engine as a whole:—Referring particularly to Figs. 2, 5 and 8, if the cylinder, which is positioned as shown in Fig. 8, is rotated manually in the direction indicated by the arrow, the shoes 24 will travel around the periphery of the abutment 13. A vacuum will be formed in the chamber 6 to the left of the abutment 13 and below the horizontal plane in which is located the shaft 1. At this particular time the inlet passage 46 will be in communication with this portion of the explosion chamber 6, in which the vacuum is being formed, the said inlet passage being at this time located approximately diametrically opposite the position in which the exhaust valve 52 is located. The explosive mixture comprising the propelling fluid, will be forced by atmospheric pressure, from the tube 44, which is connected with the carbureter, not shown, through passages 42, 41, 39, into the annular space 40, of the cylinder head 7, and from thence through the passage 46, past the inlet valve 47 and into the chamber 6. When the cylinder has made one-half a revolution from the position shown in Fig. 8, that portion of the chamber 6 communicating with the inlet passage 46, will have expanded to its greatest capacity, and continued rotation of the cylinder 5 will contract that portion of the chamber, the valve 47 will close and compression of the charge which has been taken into the chamber will begin. The charge will be forced through the inlet passage 75, past the valve 77, into the compression chamber 74. Continued rotation of the cylinder will again bring the parts to the position shown in Fig. 8 and a complete revolution will have been made and the parts will be in position for a new charge to be again taken in and compressed, as just described. When the cylinder has been rotated from the position shown in Fig. 8, to a position diametrically opposite, the rock valve 83 will have been opened, as hereinbefore described, and the compressed charge will pass from the chamber 74, through the passage 76, into that portion of the explosion chamber 6 with which communicates the exhaust passage 51. At this particular time the two electrodes comprising the arm 61 and pin 62, will be connected and then separated, in the manner hereinbefore described, so as to produce the igniting spark which explodes the compressed charge contained in that portion of the chamber 6 communicating with the exhaust passage 51. The charge being exploded will exert its force against the right hand piston, as viewed in Fig. 8, and will rotate the cylinder 5 to the position shown in Fig. 8, in which position the pressure of the exploding charge will be the same upon both pistons. The disposition of the projection 57, on the cam ring 56, is such that as soon as the cylinder 5 reaches the position shown in Fig. 8 the exhaust valve 52 will be opened in the manner hereinbefore described and the greater portion of the exploded charge will escape from chamber 6, through the exhaust passage 51, passages 40, 39, recesses 41, passages 43, and through the discharge tube 45.

It will be noted that during each revolution of the cylinder a fresh charge is taken into the chamber 6 and compressed in chamber 74 and the charge compressed during the previous revolution is, during this revolution, discharged into chamber 6, ignited, exploded and discharged from the explosion chamber past the exhaust valve 52. It will be further noted that the propelling charge is always taken into the chamber 6 and compressed in said chamber at one side of the radially movable pistons and exploded in said chamber against the opposite side of said pistons.

Having thus described my invention, what

I claim and desire to secure by Letters Patent, is:—

1. In a rotary explosive engine, the combination with a stationary support, of a cylinder rotatively mounted on the support and provided with an explosion chamber of circular form disposed concentrically with the axis of the cylinder, the explosion chamber having inlet and exhaust passages located respectively upon opposite sides of a longitudinal plane in which is located the axis of the cylinder, valves controlling the said passages, means actuated by the rotation of the cylinder for opening the exhaust valve, a stationary cylindrical abutment longitudinally and eccentrically mounted in the said explosion chamber on said support, and having a portion of its periphery in contact with the periphery of said chamber, and having a compression chamber and two passages communicating with the compression chamber and communicating with the explosion chamber respectively at opposite sides of the place of peripheral contact between the cylinder and the abutment, two valves controlling respectively the passages communicating with the compression chamber, and two radially movable pistons disposed diametrically opposite in the explosion chamber and located in said plane and with their inner ends bearing upon the periphery of said abutment.

2. In a rotary explosive engine, the combination with a support, of a cylinder rotatively mounted on said support and having an explosion chamber with a circular periphery disposed concentrically with the axis of the cylinder, a cylindrical abutment fixed eccentrically on said support in said chamber and having its periphery touching the periphery of the chamber, two pistons radially slidable in the cylinder in a plane in which is located the axis of the cylinder, the pistons being disposed on opposite sides of said axis and provided each with a longitudinal shoe pivoted on the piston and adapted to bear against the periphery of the abutment, means connected with the support by which the pistons are retained against said abutment when the cylinder is rotating, the cylinder having inlet and outlet passages disposed respectively on opposite sides of the plane in which are located the pistons, the abutment having a compression chamber and inlet and outlet passages communicating with the compression chamber and communicating respectively with the explosion chamber at opposite sides of the place of peripheral contact between the abutment and cylinder, valves controlling the inlet passages and the outlet passages, and means actuated by the rotation of the cylinder for controlling the opening of the valves in said outlet passages.

3. In a rotary explosive engine, the combination with the rotary cylinder having a circular explosion chamber, of a shaft disposed concentrically in said chamber and supporting said cylinder, a longitudinal cylindrical abutment eccentrically on said shaft in said chamber and touching at its periphery the periphery of the chamber, the abutment having a compression chamber and two passages communicating with said compression chamber and with the explosion chamber at opposite sides of the place of peripheral contact between the abutment and cylinder, a valve in one of said passages, means for normally holding said valve closed, a rock valve in the other passage, means for normally rocking said rock valve to the closed position, means actuated by the rotation of the cylinder for rocking the rock valve to the open position, two pistons disposed at opposite sides of said shaft and radially movable in the explosion chamber in guides provided in the cylinder, the pistons being adapted to bear against the periphery of the abutment, and means for retaining the pistons against the abutment when the cylinder is rotating.

4. In a rotary explosive engine, the combination with the supporting shaft, of the cylinder rotatively mounted on said shaft and having a circular chamber disposed concentrically with the shaft, an abutment of cylindrical shape disposed longitudinally and eccentrically on said shaft and touching at one place lengthwise along its periphery against the periphery of the chamber, the abutment having a compression chamber having communicating with it two passages which communicate respectively with the explosion chamber at opposite sides of the place of peripheral contact between the cylinder and abutment, two valves located in said passages, means for normally holding both of said valves closed, and means actuated by the rotation of the cylinder for opening the other valve.

5. In a rotary explosive engine, the combination with the supporting shaft, of a cylinder rotatively mounted on said shaft and having a circular cylinder concentrically disposed relative to the shaft, an abutment of cylindrical form mounted eccentrically longitudinally on said shaft in said chamber and having its periphery touching the periphery of the cylinder, the abutment having a compression chamber and two passages communicating with said compression chamber and with the explosion chamber at opposite sides of the place of peripheral contact between the cylinder and the abutment, two valves located respectively in said passages, means for normally holding said valves closed, means actuated by the rotation of the cylinder for opening once during each revolution one of said valves, two diametrically opposite pistons radially movable in the same plane in said cylinder and in the explosion

chamber, and having pivoted shoes adapted to bear lengthwise on opposite sides of said abutment, the cylinder having inlet and outlet passages disposed respectively at opposite sides of the plane in which are located the pistons, valves in said inlet and outlet passages, means for normally holding the latter named valves closed, means actuated by the rotation of the cylinder for opening the valve in the outlet passage, a supporting means for said shaft having cylindrical guides disposed eccentrically with said shaft, and means coöperating with said guides for retaining the shoes of said pistons in contact with the said abutment.

6. In a rotary explosive engine, the combination with the supporting shaft, of the cylinder rotatively mounted on the shaft and having a circular chamber disposed concentrically with the shaft, a cylindrical abutment mounted longitudinally and eccentrically on said shaft in said chamber and having its periphery touching the periphery of the chamber, supports for said shaft having circular guides disposed eccentrically with the shaft, rings rotatively mounted on said circular guides respectively, two pistons radially movable in the cylinder chamber and bearing at opposite sides of said shaft on the periphery of said abutment, rods pivoted respectively to said rings and supported by said pistons, and springs supported by said rods and normally forcing the pistons toward the periphery of the abutment.

7. In a rotary explosive engine, the combination with a supporting shaft, of a cylinder rotatively mounted on the shaft and having a circular chamber disposed concentrically with said shaft, said chamber having at opposite sides of a longitudinal plane in which lies the axis of the cylinder an inlet and an outlet passage, two valves respectively controlling said passages, igniting means located in the chamber on the side of the plane at which is disposed the outlet passage, an abutment of cylindrical form mounted in said chamber eccentrically upon said shaft and touching at its periphery the periphery of the cylinder chamber, the abutment having a compression chamber and two passages communicating with the compression chamber and with the cylinder chamber at opposite sides respectively of the place of peripheral contact between the cylinder and abutment, valves controlling the latter named passages, means controlled by the rotation of the cylinder for actuating the igniting means, means controlled by the rotation of the cylinder for opening said outlet valve and one of the valves located in abutment passages, means for normally forcing all of said valves to the closed positions, two radially movable pistons mounted in said cylinder chamber in said plane and bearing at opposite sides of said shaft upon the periphery of said abutment, and means for retaining said pistons in contact with said abutment.

8. In a rotary explosive engine, the combination with the supporting shaft, of a cylinder rotatively mounted on the shaft and having a circular explosion chamber disposed concentrically with the shaft, a stationary cylindrical abutment mounted eccentrically on said shaft in said chamber and touching lengthwise along its periphery the periphery of said chamber and having a compression chamber and an inlet and outlet passage communicating with said compression chamber and with the explosion chamber at opposite sides of the place of peripheral contact between the cylinder and abutment, a rock valve in said outlet passage, means for normally rocking said valve to the closed position, means actuated by the rotation of the cylinder for rocking said valve to the open position, two radially movable pistons in the explosion chamber and bearing at opposite sides of said shaft upon the periphery of said abutment, and means for retaining the pistons against the abutment.

9. In a rotary explosive engine, the combination with the stationary shaft, of means for supporting said shaft, a cylinder rotatively mounted on said shaft and having a circular explosion chamber disposed concentrically with the shaft, a cylindrical stationary abutment mounted eccentrically in said explosion chamber on said shaft and touching along its periphery the periphery of the explosion chamber, the abutment having a compression chamber and an inlet and an outlet passage communicating with the compression chamber and with the explosion chamber at opposite sides of the place of peripheral contact between the cylinder and abutment, a valve controlling the inlet passage, a valve controlling the outlet passage, and means actuated by the rotation of the cylinder for opening the valve in the outlet passage.

10. In a rotary explosive engine, the combination with the stationary shaft, of a cylinder rotatively mounted on the shaft and having a circular chamber disposed concentrically with said shaft, a stationary cylindrical abutment eccentrically mounted on said shaft in said circular chamber and touching at its periphery the periphery of said chamber, and having a compression chamber and an inlet and an outlet passage communicating with the compression chamber and with the circular chamber at opposite sides of the place of peripheral contact of the abutment with the cylinder, two valves mounted in said inlet and outlet passages respectively, means connected with the cylinder for opening the valve in the outlet passage, means for normally closing said valves, means for igniting the propelling charge in the circular chamber, and a radially movable piston carried by said cylinder and bearing in the circular

chamber upon the periphery of said abutment.

11. In a rotary explosive engine, the combination with a stationary shaft, of a cylinder rotatively mounted on the shaft and having a circular explosion chamber disposed concentrically with the shaft, and provided with inlet and outlet passages, valves controlling said passages, means for igniting the propelling charge in said explosion chamber, a cylindrical abutment mounted eccentrically on said shaft in said explosion chamber and touching at its periphery the periphery of the explosion chamber, the abutment having a compression chamber and two passages communicating with the compression chamber and with the explosion chamber at opposite sides of the place of peripheral contact between the abutment and cylinder, valves controlling the passages communicating with the compression chamber, and a radially movable piston carried by said cylinder and bearing in the explosion chamber upon the periphery of the abutment.

12. In rotary explosive engines, the combination with an abutment having a transfer opening extending between two points on its periphery, of a cylinder encircling said abutment one of said parts being rotatable, the cylinder engaging the abutment at a point intermediate the ends of said transfer opening, a piston movably mounted on the cylinder and engaging said abutment, means for admitting and exhausting the motive agent, means for igniting the charge, and two valves located in said transfer opening for isolating therein a portion of the charge.

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

EVERETT E. BARNES.

Witnesses:
E. B. HOUSE,
R. E. HAMILTON.