No. 883,363. PATENTED MAR. 31, 1908.

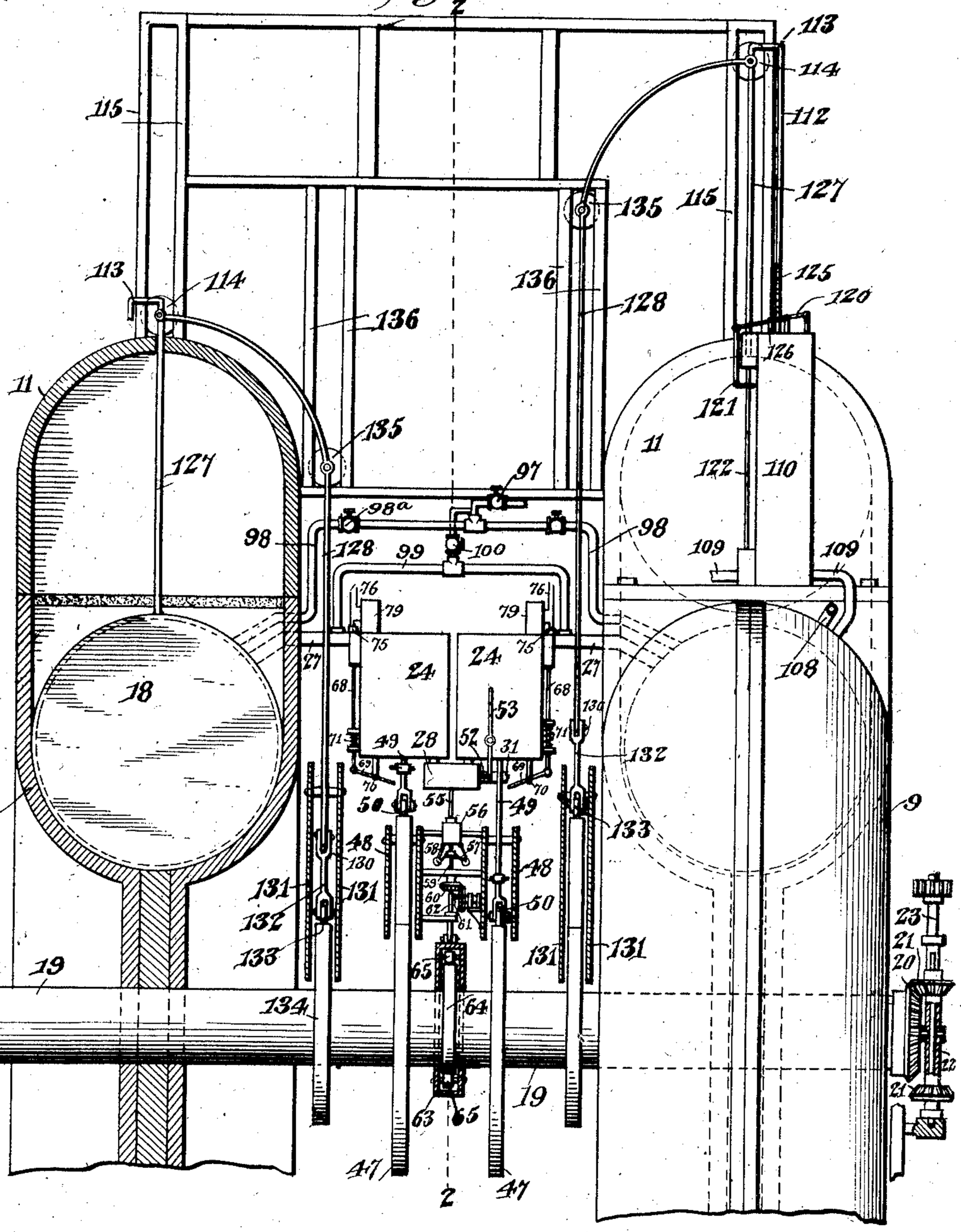
J. C. WALKER.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED JUNE 12, 1907.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

Jas. K. McCathran

B. L. Foster

James C. Walker, Inventor

By E. G. Siggers

Attorney

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4 SHEETS—SHEET 2.

Fig. 2.

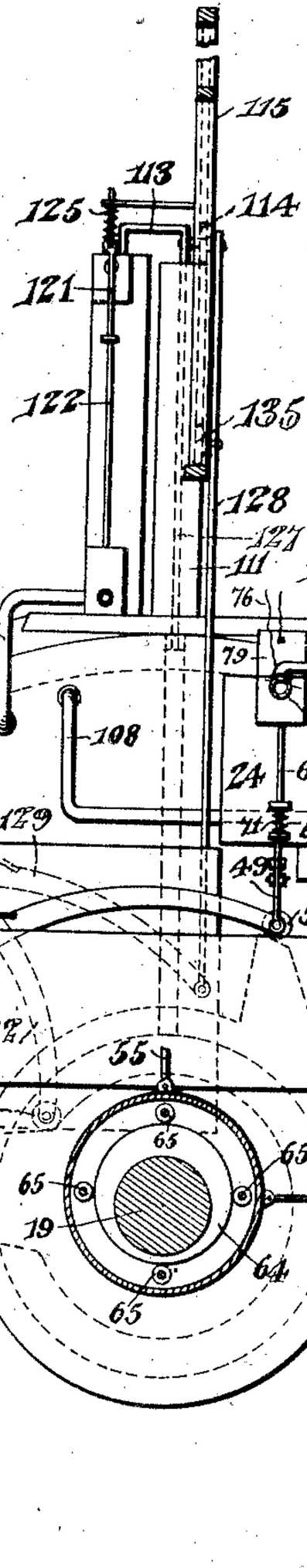


Fig. 8.

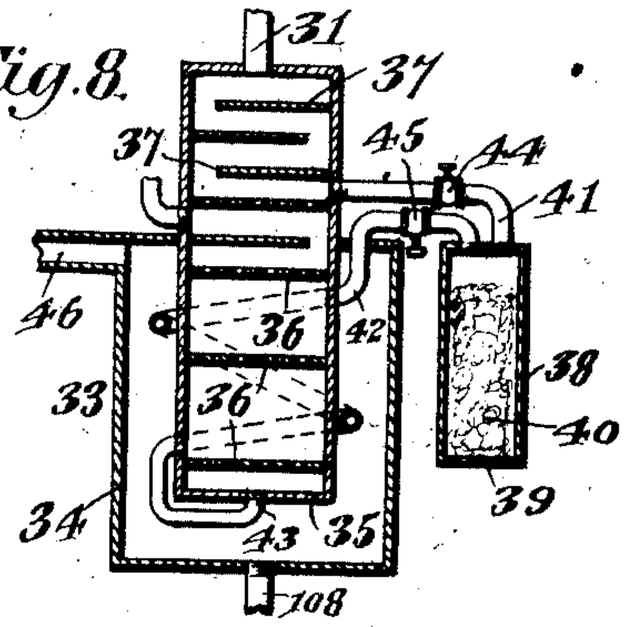
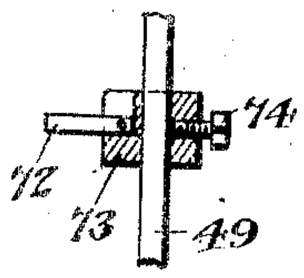


Fig. 9.



Witnesses.

Jas. F. McCathran.

Jas. F. Peter.

James C. Walker,
Inventor

By E. G. Siggers

Attorney

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4 SHEETS—SHEET 3.

Fig. 3.

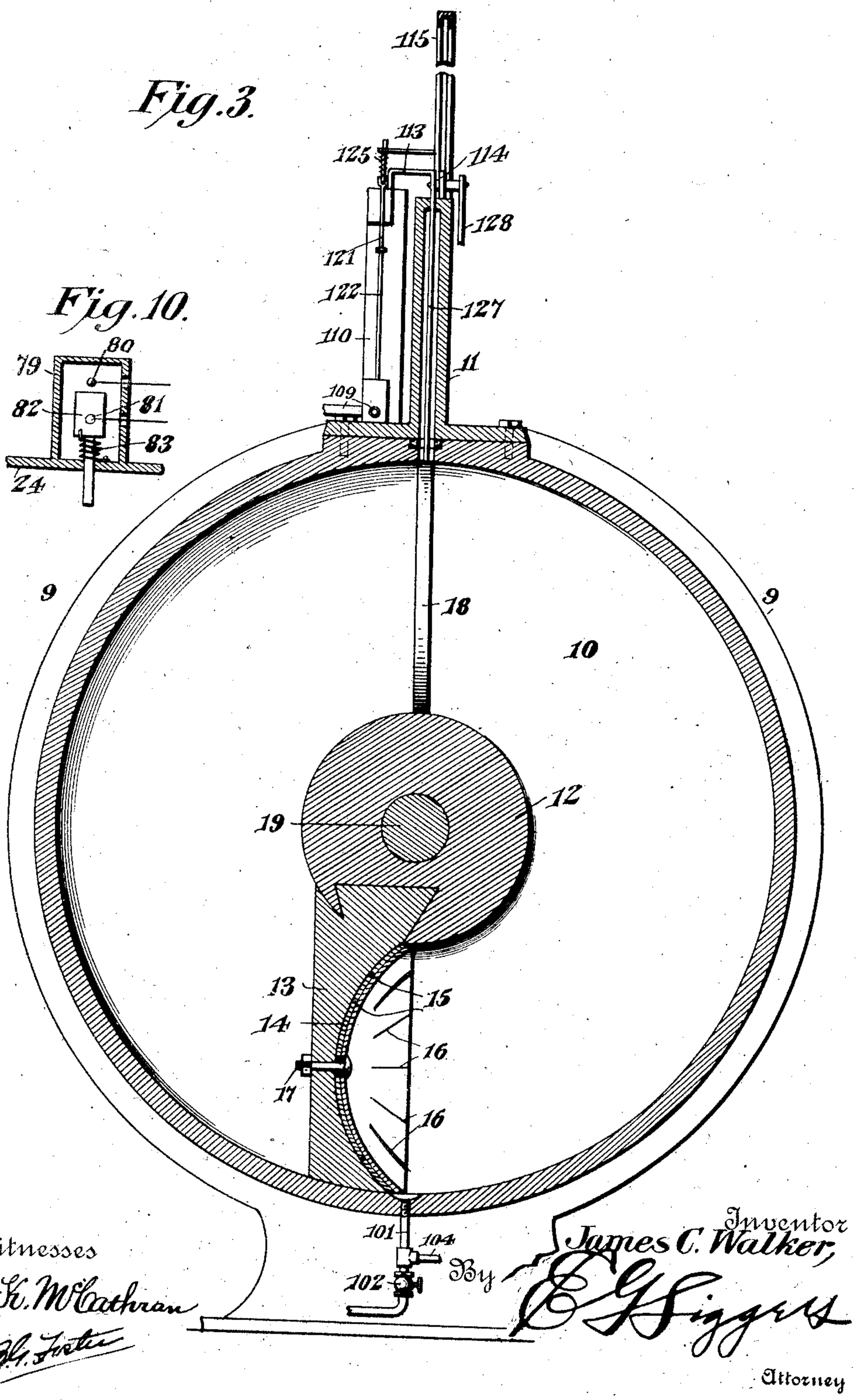

Fig. 10.

Witnesses

Jas. K. McCathran

B. L. Foster

Inventor

James C. Walker,

By E. G. Siggers

Attorney

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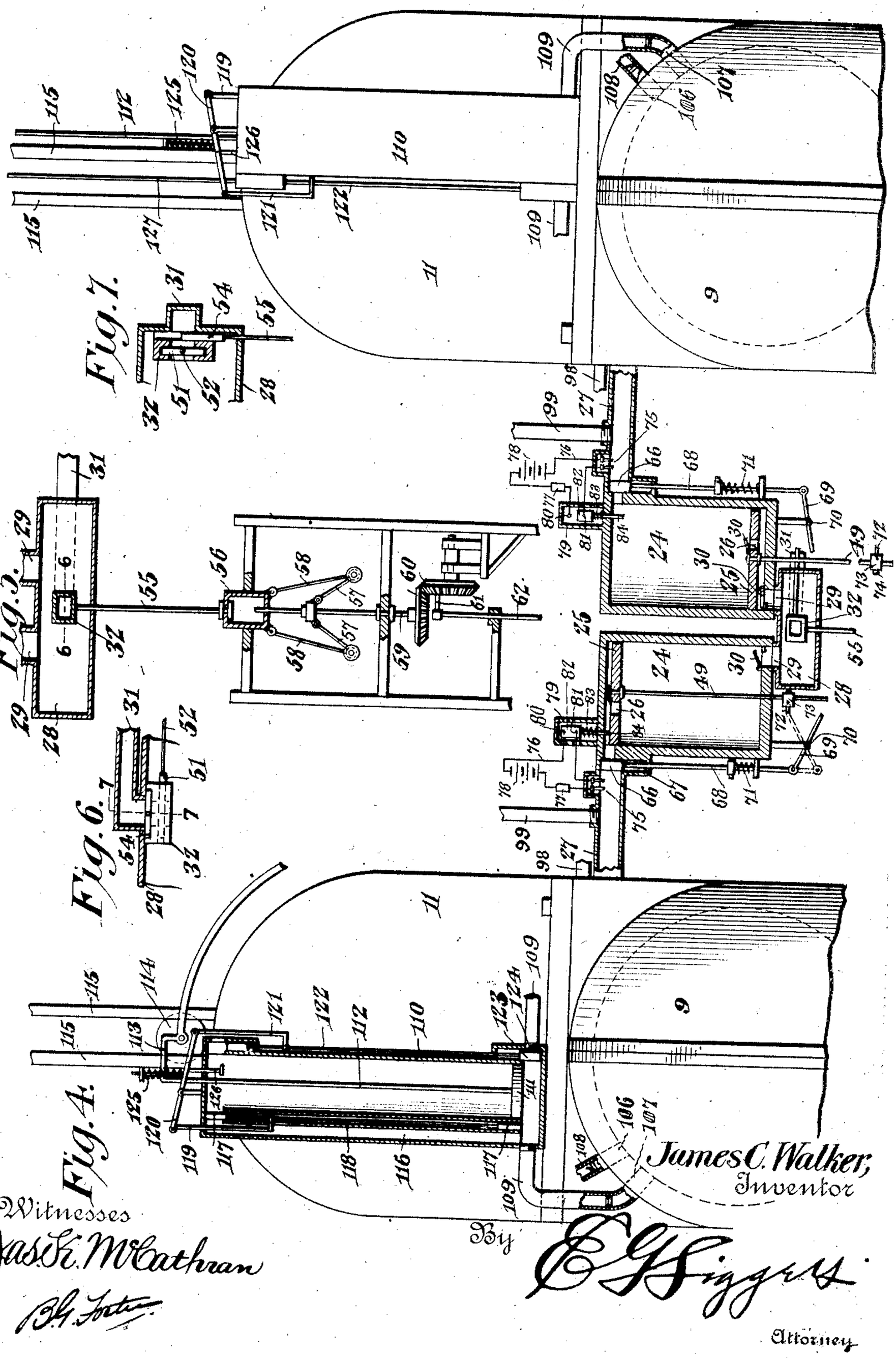
4 SHEETS—SHEET 4.



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B. H. Foster

James C. Walker,
Inventor

By E. G. Siggers.

Attorney

UNITED STATES PATENT OFFICE.

JAMES C. WALKER, OF WACO, TEXAS.

ROTARY EXPLOSIVE-ENGINE.

No. 883,363. Specification of Letters Patent. Patented March 31, 1908.

Application filed June 12, 1907. Serial No. 378,567.

To all whom it may concern:

Be it known that I, JAMES C. WALKER, a citizen of the United States, residing at Waco, in the county of McLennan and State of Texas, have invented a new and useful Rotary Explosive-Engine, of which the following is a specification.

The present invention relates to explosive engines, and the primary object is to provide a rotary engine with novel and efficient means for producing an explosive mixture, introducing charges of the same into the engine, exploding said charges, and utilizing the exhaust gases in order to avoid waste of power and heat.

The preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is an end view of the upper portion of an engine with parts illustrated in section. Fig. 2 is a sectional view substantially on the line 2—2 of Fig. 1. Fig. 3 is a vertical sectional view through one of the cylinder members. Fig. 4 is a sectional view through the charge introducing mechanism, and showing portions of the cylinders in elevation, also illustrating one of the abutment operating mechanisms in section. Fig. 5 is a detail sectional view through the governing means. Fig. 6 is a detail sectional view on the line 6—6 of Fig. 5. Fig. 7 is a detail sectional view on the line 7—7 of Fig. 6. Fig. 8 is a sectional view through the carbureter employed. Fig. 9 is a detail sectional view of the trip for one of the supply controlling valves. Fig. 10 is a detail sectional view through the circuit closing device.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In the embodiment illustrated, a pair of cylinder members 9 are employed having piston chambers 10 therein, and casings 11 mounted thereon. In the cylinders are rotatably mounted pistons 12 having heads 13 provided in their rear sides with recessed seats 14. In these seats are fitted dished plates 15 formed of steel disks radially slotted, as shown at 16 to provide wings which are overlapped. The plates or blades are fastened to the heads by suitable bolts 17. Reciprocatory abutments 18 are normally located across the piston chambers, and are movable into the casings 11 to permit the passage of the piston heads. So far as thus described, no claim is made to the structure in this application. The pistons 12 are mounted on a shaft 19 that extends through the cylinder members and bridges the space between them. At one end this shaft is provided with a beveled gear wheel 20, with which a pair of other beveled gears 21 are alternately movable into and out of coaction. The gear wheels 21 are carried by a sleeve 22 that is feathered upon a driving shaft 23.

Located between the cylinder members are pumps comprising cylinders 24 in which operate reciprocatory pistons 25 having valve controlled ports 26 therein. Conduits 27, lead from the upper ends of the cylinders 24 to the cylinder members 9 in rear of the abutments. A supply chamber 28, located below the cylinders 24, has ports 29 communicating with the lower ends thereof, said ports being controlled by inwardly opening valves 30. A supply conduit 31 discharges through a port 32 into the chamber 28 and this conduit 31 leads from a carbureter, shown in section in Fig. 8, and designated as a whole by the reference numeral 33.

The carbureter, as disclosed, consists of a casing 34, within which depends a reservoir 35 spaced from the walls of said casing and having a plurality of perforate partitions 36 extending across it. In the upper portion of the casing are a plurality of baffle plates 37. Another casing 38 is located alongside the casing 34, and has a perforate lower end 39. In the casing 38 is located suitable filtering material 40. Two pipes, designated 41 and 42, are connected to the upper end of the casing 38, one communicating with the upper portion of the reservoir 35, the other being coiled about the same within the casing 34 and communicating with the bottom of the reservoir, as shown at 43. Controlling valves 44 and 45 are located in the pipes 41 and 42, and an exhaust pipe 46 communicates with the upper end of the casing 34.

The means for operating the pistons 25 of the supply pumps consist of cams 47 fixed to the shaft 19 between the cylinder members 9. These cams operate between guide plates 48, and piston rods 49, connected to the pistons 25, have their lower ends also extending between the plates 48, said lower ends being provided with rollers 50 that operate on the peripheries of the cams 47. The supply of motive fluid from the carbureter through the conduit 31 to the supply chamber 28 is manually controlled by a suitable throttle valve

51 located in the chamber 28 and having a stem 52 that extends exteriorly thereof, and is connected to the suitable hand lever 53. The supply is also governed by a valve 54 that coöperates with the port 32, and has a stem 55 connected to the rotating head 56 of a centrifugal governor, the weighted arms 57 of which have link connections 58 with said head. The said arms are mounted on a revolving shaft 59 having a gear connection 60 with a crank 61. This crank has one end of a pitman 62 connected thereto, and the other end of said pitman is connected to a ring casing 63 that surrounds a cam 64 secured centrally to the engine shaft 19. Rollers 65, located within the ring casing, operate against the cam.

The supply of motive fluid from the pumps 24—24 through the conduits 27 to the cylinder members 9 is controlled by reciprocating valves 66 operating in casings 67 and movable across said conduits. The valves are provided with depending stems 68 connected at their lower ends to the outer ends of levers 69 that are fulcrumed between their ends, as shown at 70. The valves are normally held in closed positions, or in other words, across the conduits 27 by springs 71. The inner ends of the levers are disposed in the paths of movement of trips 72 pivoted to collars 73 that are adjustably mounted on the piston rods 49, and are held in their adjusted positions by suitable set screws 74. The structure of the trips and collars is shown in detail in Fig. 9.

The igniters, designated as a whole by the reference numeral 75, are preferably, though not necessarily of the jump spark type, and are located in the conduits 27. They are included in circuits 76, which also include spark coils 77 and sources of electrical energy, shown diagrammatically at 78. One of the leads of each circuit 76 enters a casing 79, and is connected to a stationary contact 80. Another lead in said circuit, in like manner enters the casing 79, and is in like manner connected to another contact 81. A circuit closing plate 82, slidably mounted in the casing, is normally held in its lowermost position by a spring 83 connected thereto, and when in said lowermost position, as shown in Figs. 4 and 10, the plate is out of engagement with the contact 80. A stem 84, connected to the closure plate 82, projects downwardly through the cylinder head on which the casing 79 is located, and has its lower end disposed in the path of movement of the piston 25.

Arranged at the rear portion of the engine and between the cylinder members 9 is an air pump comprising a cylinder 86 in which operates a reciprocatory piston 87 having a valve port 88 therein. A piston rod 89 extends from the piston 87, and is connected to the casing ring 63 that is operated by the cam 64. A valve controlled discharge pipe 90 leads from the cylinder 86 to an air reservoir 91 that is preferably provided with a gage 92 and a safety valve 93. A pipe 95 leads from the reservoir 91, and is controlled by an inwardly opening valve 96. This pipe contains a manually operated globe valve 97, and has branches 98 leading to the cylinder members 9 in rear of the abutments 18. The branches 98 have controlling valves 98ª in them. Branches 99, containing valves 100 communicate with the conduits 27 directly above the sparking devices 73. A drain pipe 101 leads from the bottom of each cylinder, as shown in Fig. 2, and is controlled by a valve 102. These pipes also constitute means for introducing lubricant into the cylinder members, and therefore holders 103 for lubricant are carried by the upper ends of pipes 104 that are connected to the pipes 101, the holders 103 being located above the bottoms of the piston chambers and the pipes 104 being provided with controlling valves 105.

Each of the cylinder members is provided as shown in Fig. 4 with two exhausts 106 and 107. A pipe 108 leads from one of the exhausts as 106, and is connected as shown in Fig. 8 to the lower end of the casing 46 that surrounds the hydrocarbon receiver 35. A conduit 109 leads from each of the other exhausts 107 to the lower end of a cylinder 110 mounted on each cylinder member 9 in front of the abutment casing 11. The construction and arrangement of the parts about to be described will be seen particularly on the left hand cylinder 9 of Fig. 4. It will be observed that the cylinder 110 contains a reciprocatory piston 111 provided with a rod 112 that projects through the upper end of the cylinder 110, and has an offset portion 113 connected to a guide wheel 114 operating in the guideway 115. The pipe 109 communicates directly with the lower end of the cylinder 110, and also has a branch 116 that communicates with the upper end of the cylinder. This communication is controlled, however, by a pair of reciprocating valves 117 connected by a valve stem 118. The valves are so arranged that when one is opened, the other is closed. The stem 118 has a link connection 119 with a lever 120 fulcrumed between its ends upon the upper end of the cylinder, and the other end of the lever has a link connection 121 with another valve stem 122 that coöperates with oppositely operating valves 123 controlling exhausts 124 at the upper and lower ends of the cylinder. The valves are moved in one direction by a spring 125 that bears against one arm of the lever 120, but said lever is adapted to be moved against the action of the spring by the piston 111, which engages a stem 126 depending from the lever into the cylinder. The roller 114, as shown par-

ticularly in Fig. 3, is journaled on the upper end of a rod 127 projecting from the abutment casing 11 and connected to the upper end of the abutment. A link 128, shown in Fig. 2 is connected to one arm 129 of a substantially Y-shaped lever 130, mounted between the guide plates 131 and having its other arm 132 provided with a roller 133 that operates against the periphery of a cam 134 fixed to the shaft 19. The stem 128 preferably has journaled to an intermediate portion thereof, a guide roller 135 operating in a guideway 136. It will be understood that both cylinder members are provided with corresponding mechanism of the above character.

The operation of the engine may be briefly outlined as follows. Assuming the piston members and shaft 19 being revolved, it will be evident that the pistons 25 will be in alternate reciprocation within the cylinders 24. As one of the pistons is elevated, it will draw a charge into its cylinder 24 from the supply chamber 28. This will cause an indraft through the supply pipe 31, and referring to Fig. 8, it will be evident that when the draft takes place, air will be drawn inwardly through the perforate bottom 39 of the filter casing 38, a portion of such air passing through the conduit 42, and another portion passing through the conduit 41, these proportions being readily varied by means of the valves 44 and 45. The air, which passes through the pipe 42, will enter the bottom of the reservoir, and passing through the hydrocarbon therein, will carry off some of the vapor, thence mixing with the inrushing air that enters through the pipe 41, will pass through the pipe 31 into the chamber 28. Upon the descent of the piston 25, the charge below it will pass through the port 26^a, and thus be in the cylinder above the piston. As said piston is again elevated, the charge will be compressed until the trip 72 engaging the lever 69 will swing said lever, and open the valve 66. With the valve thus opened, the charge will rush into the conduit 27, and as the trip 72 passes the lever, the spring 71 will act to reclose the valve. At the instant the valve 66 closes, the piston 25 which has engaged the stem 84 of the closure plate 82 will have raised said plate sufficiently to close the circuit 76, thus causing a spark at the igniter 75, which will explode the mixture. Upon the descent of the piston 25, the circuit is again opened, and the trip 72 will freely pass the inner end of the lever 69, its upward movement being readily permitted, as will be evident by reference to Fig. 9. The supply of motive fluid to the chamber 28 is controlled manually by the throttle valve 51, as will be apparent but the speed governor effects an automatic control. In explanation of this, it will be seen that as the cam 64 is revolved by the shaft 19, the ring casing 65 will be raised and lowered. This effects a corresponding movement of the stem 62, which operates on the crank 61 and will revolve the gear 60. As a result, the shaft 59 carrying the governor 57 will be revolved, and the weighted arms being moved out more or less by centrifugal force, will cause the movement of the stem 55, and consequently of the valve 54.

When the exhaust takes place, a portion thereof will flow through the pipe 108 of the casing 34 that surrounds the hydrocarbon reservoir, thereby keeping the same and the coiled portion of the pipe 42 heated. The remainder of said exhaust enters the pipe 109. Now it will be understood that this exhaust takes place just prior to the time the piston head reaches the abutment 18. The exhaust of course will relieve the pressure within the piston chamber, and consequently against the abutment 18 and the exploded gases under pressure will pass into the cylinder 110 beneath the piston 111. The result is that inasmuch as the port 124 is closed, the piston 111 will be elevated, thereby raising the abutment. However, the exhaust is not depended upon entirely for the movement of the abutment, as the cam 134 will simultaneously operate to raise the lever 130, and thereby the link 128, which is connected to said abutment. As the piston 111 reaches the limit of its up-stroke, it will engage the lower end of the stem 126, thereby swinging the lever 120 against the action of the spring 125 and reversing the valve mechanism so that the cylinder 110 will now exhaust below the piston through the port 124, and the remnant of the gases delivered through the pipe 109 at port 117 will return the piston to its lowermost position. By this time, the piston head of course has passed the abutment 18, and the parts are in position for a repetition of the cycle or operations above described.

During the operation of the engine, the piston 87 of air pump will be in action, and will be forcing air into the reservoir 91. A part of this air is delivered through the branches 99 into the conduits 27, and this air performs a three fold function, part mixes with the charge at the time of the explosion, part scavenges the conduits after the explosion, and part assists in cooling the sparking devices and cylinders. The branches 98 are employed in starting the engine, for air is maintained under pressure at all times in the reservoir 91, and when the engine is at a standstill, all that is necessary to start the engine is to open valves 98^a and thus introduce air through the branches 98 into the cylinder members behind the pistons.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art, with-

out further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus fully described my invention what I clain as new, and desire to secure by Letters Patent, is:—

1. In an engine of the character set forth, the combination with a cylinder member, of a cylinder located alongside the same, a rotary piston member operating in the cylinder member, and a piston operating in the cylinder, a conduit leading from the cylinder into thecylinder member and disposed transversely of both, a valve operating across the conduit transversely thereof and longitudinally of the cylinder, means for periodically operating the valve, means for supplying an explosive mixture to the cylinder, and ignition mechanism located in the conduit between the valve and cylinder member.

2. In an engine of the character set forth, the combination with a cylinder member, of a cylinder located alongside the same, a rotary piston member operating in the cylinder member and a reciprocatory piston operating in the cylinder and having a piston rod projecting therefrom, a conduit leading from the cylinder to the cylinder member and disposed transversely of both, a reciprocatory valve operating across the conduit transversely thereof and longitudinally of the cylinder, means movable longitudinally of the piston rod and operated thereby for periodically operating said valve, and means for supplying an explosive mixture to the cylinder.

3. In an engine of the character set forth, the combination with a cylinder member and a rotary piston member operating therein, of a compression pump including a piston, a conduit connecting the pump and cylinder member, a valve operating in the conduit, and actuating means for the valve including a movable device connected thereto and a trip pivotally connected to the piston and movable past the device, said trip engaging said device and having its movement limited in one direction with respect to the piston.

4. In an engine of the character set forth, the combination with a cylinder member and a rotary piston member operating therein, of a compression pump including a reciprocatory piston and piston rod, a conduit leading from the pump to the cylinder member, a reciprocatory valve operating in the conduit and having a stem, a lever fulcrumed between its ends and connected to the stem, and a trip pivotally mounted on the piston rod and movable past the lever, said lever being disposed in the path of movement of the trip, and said trip having its pivotal movement in one direction on the piston rod limited.

5. In an engine of the character set forth, the combination with a cylinder member and a rotary piston member operating therein, of a compression pump delivering to the cylinder member and comprising a cylinder and a piston operating in the cylinder, an igniter for exploding the charges delivered by the pump, and controlling means for the igniter having a portion projecting into the cylinder and into the path of movement of and operated by the piston.

6. In an engine of the character set forth, the combination with a cylinder member, and a piston operating therein, of a compression pump delivering to the cylinder member and comprising a cylinder, and a piston operating in the cylinder, an igniter for exploding the charges delivered by the pump, and controlling means for the igniter including a switch and a reciprocatory stem secured to the movable member of the switch and slidably extending into the cylinder with its inner end disposed in the path of movement of the piston.

7. In an engine of the character set forth, the combination with a cylinder member and a piston member operating therein, of means for delivering charges to the cylinder member including a conduit, separate independently operating valves having different paths of movement and each being movable to a position to completely close the conduit, manual means connected to one valve for operating the same, and a speed governor operated by the engine and connected to the other valve for operating it.

8. In an engine of the character set forth, the combination with a cylinder member and a piston member operating therein, of means for delivering charges to the cylinder member including a conduit, separate independently operating reciprocatory valves controlling the conduit and having angularly disposed paths of movement and angularly disposed stems, manual operating means connected to one of the stems, and a speed governor operated by the engine and connected to the other stem.

9. In an engine of the character set forth, the combination with a cylinder member and a rotary piston operating therein, of a carbureter, a supply chamber having a connection with the carbureter, means for conveying charges from the chamber to the cylinder member, separate reciprocatory valves controlling the communication between the carbureter and supply chamber and having angularly disposed paths of movement, manual means for operating one of the valves, and a speed governor operated by the engine and connected to the other valve.

10. In an engine of the character set forth,

the combination with a cylinder member, of a rotary piston operating therein, a compression pump having communication with the member, a valve controlling said communication, means for operating the valve upon the completion of the compression stroke of the pump, a carbureter, a conduit connecting the carbureter and inlet of the pump, valves controlling the passage of motive fluid through the conduit and having separate overlapping paths of movement, manual operating means for moving one of the valves, and a speed governor connected to the other valve for moving the same.

11. In an engine of the character set forth, the combination with a cylinder member, of a rotary piston operating therein, a pump including a cylinder and a reciprocatory piston in the cylinder, a conduit connecting the pump cylinder and the cylinder member, a valve controlling the conduit, a spring for normally holding the valve in closed position, means operated by the pump to open the valve upon the compression stroke of said piston, an igniter, means actuated by the piston on its movement for effecting the operation of the igniter, a carbureter, a supply chamber connected to the inlet side of the pump, a conduit connecting the carbureter and supply chamber, valves operating over the delivery end of the latter conduit and having angularly disposed paths of movement, manual actuating means for moving one of the valves, and a speed governor operated by the engine and operating the other valve.

12. In an engine of the character set forth, the combination with a cylinder member, and a piston member operating therein, of an abutment movably mounted in the cylinder member and coöperating with the piston member, and means operated by the exhaust from the cylinder member for moving the abutment out of the path of movement of the piston member.

13. In an engine of the character set forth, the combination with a cylinder member and a piston member operating therein, of a movable abutment located in the cylinder member and coöperating with the piston member, another cylinder, a piston operating in the cylinder and connected to the abutment for moving it and means for leading the exhaust from the cylinder member to said cylinder.

14. In an engine of the character set forth, the combination with a cylinder member, of a rotary piston operating therein, a reciprocatory abutment coöperating with the piston, a cylinder mounted on the cylinder member, a reciprocatory piston located therein and connected to the abutment, an exhaust conduit leading from the cylinder member to the cylinder, valve mechanism controlling the passage of the exhaust to said cylinder, and means for moving the valve mechanism.

15. In an engine of the character set forth, the combination with a cylinder member, of a rotary piston member operating therein, a reciprocatory abutment coöperating with the piston member, a cylinder located on the cylinder member, a reciprocatory piston operating in the cylinder and connected to the abutment, a conduit for leading the exhaust from the cylinder member to the cylinder, supply and exhaust valves controlling the passage of the exhaust to the cylinder member, and means for actuating the valves, said means comprising a lever connected to the valve, a spring for swinging the lever in one direction, and a stem connected to the lever and located in the path of movement of the reciprocatory piston.

16. In an engine of the character set forth, the combination with a rotary engine, of means for supplying explosive charges thereto and igniting said charges therein, an eccentric operated by the engine, a compressing pump operated by the eccentric, and a centrifugal governor also operated by the eccentric.

17. In an engine of the character set forth, the combination with a rotary engine, of means for supplying explosive charges thereto and igniting said charges therein, said igniting means including a sparking device, an air compression pump operated by the engine, an air reservoir connected to the pump, and a delivery pipe having branches one of which is connected to the engine for starting the same, and the other delivering to the engine adjacent to the sparking mechanism.

18. In an engine of the character set forth, the combination with a rotary engine including a cylinder member and a rotary piston operating therein, of a charge compression pump, a cam operated by the engine for actuating the pump, a conduit leading from the pump to the cylinder member, a sparking device located in the conduit, an eccentric operated by the engine, speed governing mechanism actuated by the eccentric, an air compression pump also actuated by the eccentric, an air reservoir connected to the pump, and a pipe leading from the reservoir and having branches, one of said branches being connected to the cylinder member, the other being connected to the conduit directly adjacent to the sparking device.

19. In an engine of the character set forth, the combination with a cylinder member, of a rotary piston operating therein, an abutment movably mounted in the cylinder member, a cam, a device operated by the cam and connected to the abutment, and means actuated by the exhaust for assisting in moving the abutment.

20. In an engine of the character set forth,

the combination with a cylinder member, of a rotary piston operating therein, a shaft, a cam mounted on the shaft, an abutment movably mounted in the cylinder member, a swinging arm operated by the cam and connected to the abutment, a cylinder, a reciprocatory piston in the cylinder, a connection between said piston and the abutment, and valve controlled means for conducting the exhaust to and from the cylinder.

21. In an engine of the character set forth, the combination with a cylinder member and a piston member operating therein, of a compression pump, a conduit connecting the compression pump and cylinder member, a valve controlling the conduit, said conduit being at all times open between the valve and cylinder member and means for delivering air into said conduit between the valve and cylinder member.

22. In an engine of the character set forth, the combination with a cylinder member and a piston member operating therein, of a compression pump, a conduit connecting the compression pump and cylinder member, an igniter located in the conduit between the pump and cylinder member, said conduit from the igniter to the cylinder member being open and means for delivering air into said conduit contiguous to the igniter to scavenge the conduit after the operation of the igniter.

23. In an engine of the character set forth, the combination with a cylinder member and a piston member operating therein, of a compression pump, a conduit connecting the compression pump and cylinder member, a valve controlling the conduit, said conduit being open between the valve and the cylinder member to permit the free passage therethrough at all times of fluid in the conduit means for periodically operating the valve, an igniter located in the conduit between the valve and the cylinder member, and means for delivering air into said conduit contiguous to the igniter to scavenge the conduit after the operation of the igniter.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JAMES C. WALKER.

Witnesses:

BART MOORE,

CHAS. E. MOORE.