No. 855,028. PATENTED MAY 28, 1907.

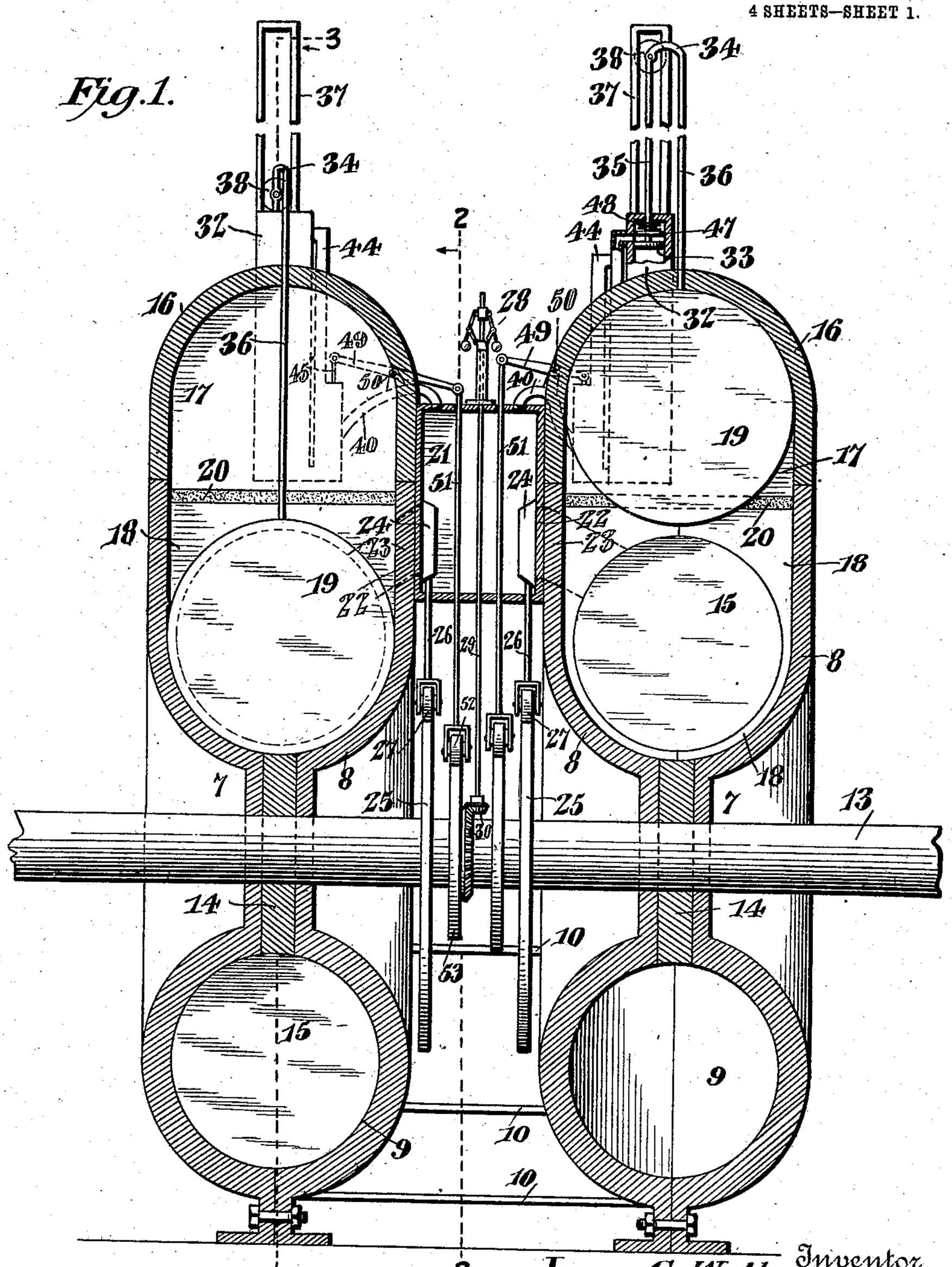
J. C. WALKER.

ROTARY ENGINE.

APPLICATION FILED DEC. 31, 1906.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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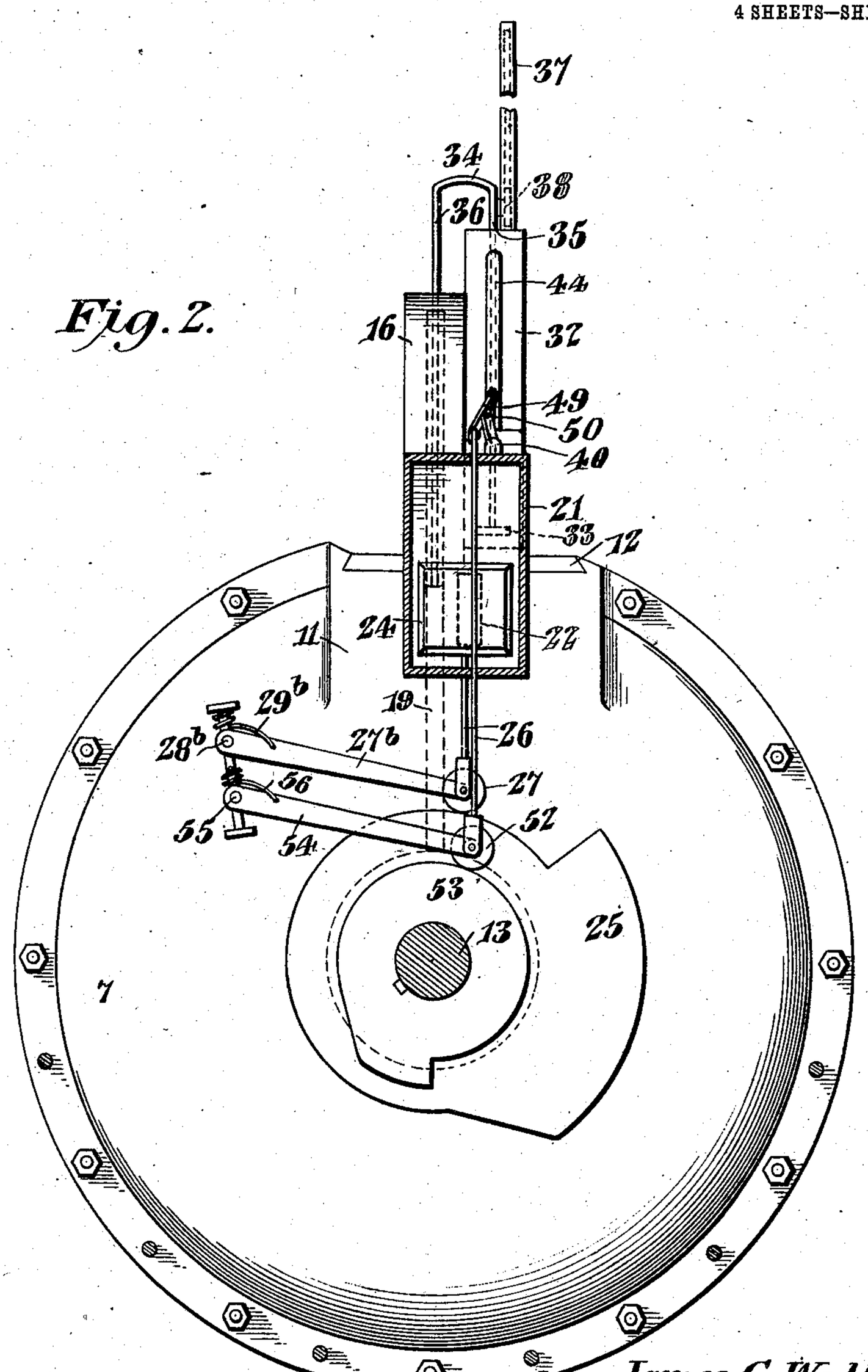
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

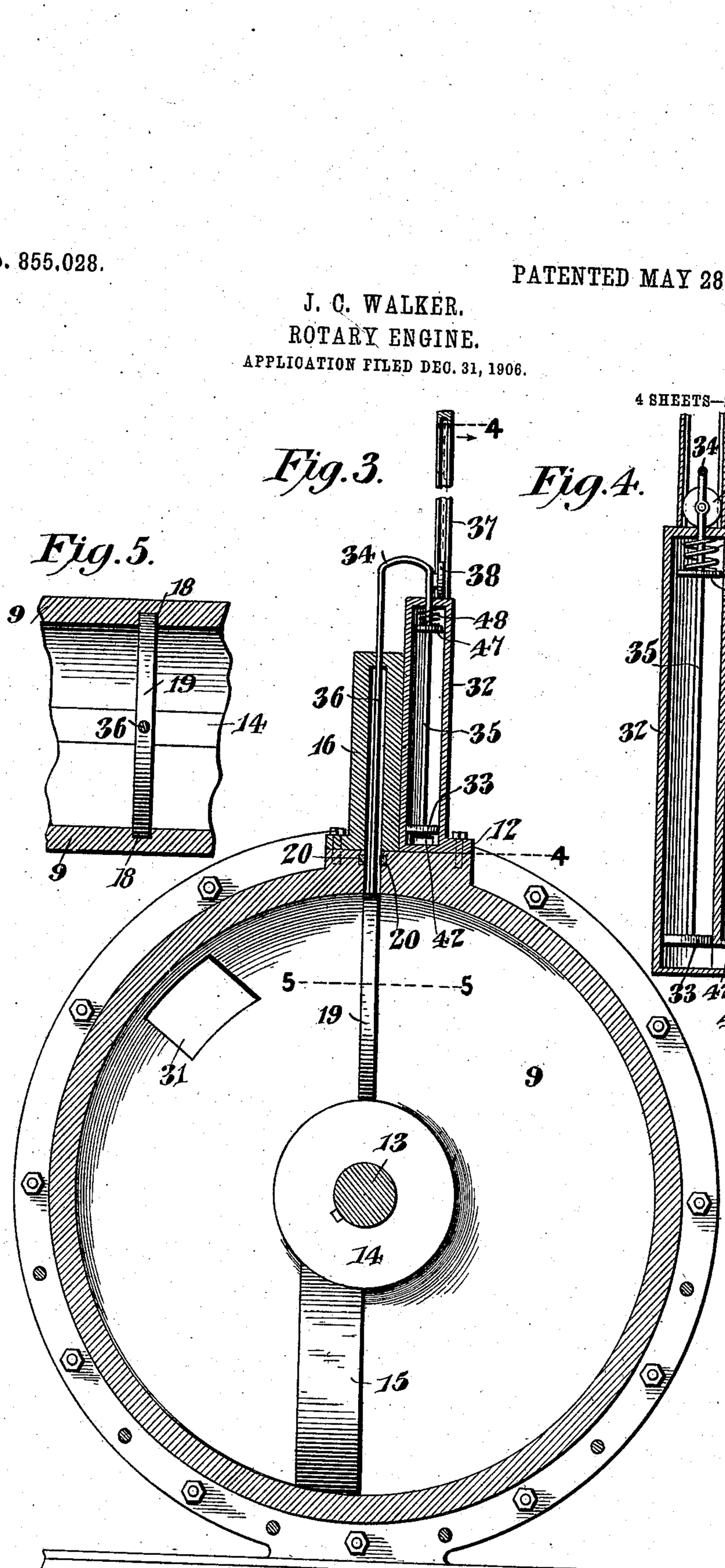

Fig. 4.

Fig. 5.

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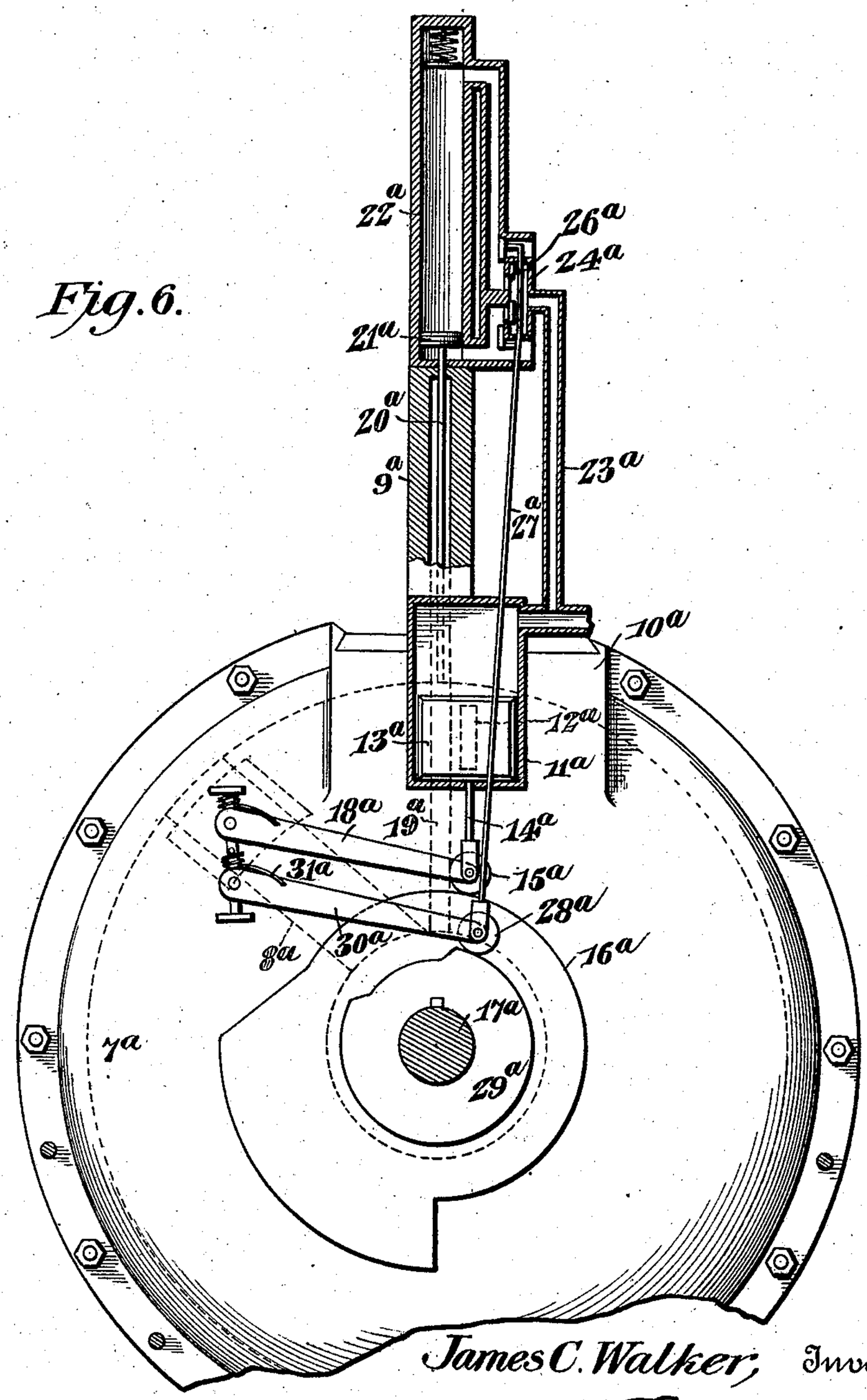
4 SHEETS—SHEET 4.

Fig. 6.



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UNITED STATES PATENT OFFICE.

JAMES C. WALKER, OF WACO, TEXAS.

ROTARY ENGINE.

No. 855,028. Specification of Letters Patent. Patented May 28, 1907.

Application filed December 31, 1906. Serial No. 350,177.

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 Engine, of which the following is a specification.

This invention relates to rotary engines operated by motive fluid of practically any character, such as steam, air, gas and the like.

One of the principal objects is to provide an exceedingly compact structure wherein the steam or other motive fluid is supplied to a plurality of cylinder members directly from a single steam chest, and simple but effective valve mechanism is provided for controlling the supply of such motive fluid.

Another important object is to provide novel means for mounting the abutments, whereby leakage is prevented to a material degree, and to employ novel mechanism for effecting the movements of the abutments at the proper periods, said latter means relieving the engine cylinder of considerable work, and eliminating a great amount of friction.

In the accompanying drawings:—Figure 1 is a sectional view through an engine longitudinally of the engine shaft. Fig. 2 is a sectional view on the line 2—2 of Fig. 1. Fig. 3 is sectional view on the line 3—3 of Fig. 1. Fig. 4 is a sectional view on the line 4—4 of Fig. 3. Fig. 5 is a detail sectional view on the line 5—5 of Fig. 3. Fig. 6 is a vertical sectional view of a modified form of construction.

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

Referring first to the embodiment illustrated in Figs. 1—4 inclusive, a pair of spaced cylinder members 7 are employed, each comprising spaced walls 8, forming between them, a piston chamber 9 that is circular in cross section, as shown in Fig. 1. The cylinders are held in fixed spaced relation by spacing and tie bolts 10. The upper portions of the cylinder members are enlarged, as shown at 11, and are provided with flat tops closed by cap plates 12, preferably dovetailed into the cylinder members, as illustrated.

A shaft 13 extends through the central portions of the cylinder members, and mounted thereon are rotary pistons 14 that have blades 15 fitting and operating respectively in the piston chambers 9, these blades being disposed substantially opposite to each other. Mounted on the cap plates 12, and either formed integrally therewith, as shown, or separately secured thereto, are abutment casings 16 having interior chambers 17, the marginal portions of which are alined with grooves 18, formed in the opposite walls 8 of the cylinder members, and in the enlarged portions thereof. Reciprocatory abutments 19 operate in the interior chambers of the casings 16 and in the grooves 18, thus being movable to positions across the piston chambers 9. Packing strips 20 are preferably located on opposite sides of the abutments 19, these packing strips being suitably mounted in the walls, as shown.

Located between the spaced cylinder members is a single steam chest 21 supplied from any suitable source with any character of motive fluid, whether steam, air or gas. The opposite walls of the chest 21 are provided with ports 22 alined with similar ports 23 in the adjacent walls of the cylinder members, said ports 23 communicating with the piston chambers 9 at opposite sides of the abutments 19. Reciprocatory valves 24, operating in the opposite portions of the steam chest 21, are periodically moved by oppositely disposed cams 25 secured to the engine shaft 13 between the cylinder members. The valves 24 are provided with stems 26 that project through the bottom of the steam chest and have rollers 27 operating on the cams 25. The rollers 27 are held upon the peripheries of the cams 25 by arms 27^b pivoted as shown at 28^b to the cylinder members and to the lower ends of the stems 26. These arms are forced downwardly by springs 29^b that bear upon them. A suitable governor 28 is preferably mounted on the top of the steam chest, and controls in any desired manner the supply of motive fluid to said steam chest. This governor is operated by a stem 29 geared, as shown at 30 to the engine shaft. The exhaust from the cylinder members takes place through suitable outlet ports 31, formed in the inner sides of the cylinder members and on the opposite sides of the abutments to the inlet ports 23.

For the purpose of reciprocating the abutments 19 at the proper times to permit the passage of the blades 15 of the pistons, the following mechanisms are employed. A cylinder 32 is located alongside each abutment casing 16, and may be positioned with respect thereto as desired. Within each cylinder is a reciprocatory piston 33, and a sub-

stantially U-shaped piston rod 34, has one arm 35 connected to the piston 33, while its other arm 36 is connected to the upper end of the abutment 19. It will thus be evident that upon the reciprocation of the piston 33, the abutment will be reciprocated, and thus moved out of and into its particular piston chamber 9. Mounted upon the cylinder is a guide-way 37, and a roller 38, carried by the upper or looped portion of the piston rod, operates in this guide-way, thus insuring the proper movement of the piston rod throughout the movement of the piston.

Associated with each cylinder 32, and preferably forming a part of the same, is a valve casing 39 to which is connected a motive fluid conduit 40 that is also connected to the top or other suitable portion of the steam chest 21. The valve casing 39 includes an interior wall 41 having formed therein supply ports 42 and exhaust ports 43. These ports respectively communicate with conduits 44 leading to the opposite ends of the cylinder 32 on opposite sides of the piston. A reciprocatory valve stem 45 is located longitudinally in the valve casing 39, and carries valves 46 located on opposite sides of the wall 41 and respectively controls the inlet and exhaust ports 42—43. These valves are so arranged that when the stem is elevated, the upper exhaust port 43 will be closed, the upper supply port 42 will be opened, the lower supply port 42 will be closed, while the lower exhaust will be opened. It will thus be evident that upon the reciprocation of the valve stem 45, the motive fluid will be admitted alternately to opposite sides of the piston, and the exhaust will be alternately opened so as to effect the reciprocation of said piston, and consequently of the abutment. To prevent the jar due to the sudden stoppage of the abutments upon their elevation, and thereby avoid danger of breakage or injury to the parts, a buffer 47 is preferably located in the upper end of each cylinder in a position to be struck by the piston therein, said buffer having a spring 48 located in rear of the same.

The upper ends of the valve stems 45 are connected to the outer arms of levers 49 that are fulcrumed between their ends, as shown at 50, the inner ends of these levers are connected to stems 51 having rollers 52 at their lower ends, and these rollers ride upon cams 53 secured to the engine shaft 13 between the cams 25, and on opposite sides of the gearing 30. The rollers 52 are held against the cams 53 by arms 54, pivoted as shown at 55 to the cylinder members and to the lower ends of the stems 51. The arms 54 are yieldingly urged downwardly by springs 56 bearing on the same.

The operation of the structure may be briefly described as follows. Steam or other motive fluid being admitted to the chest 21, will be alternately delivered through the ports 22—23 into the piston chambers 9, thus rotating the pistons. The cams 25 that control the supply of motive fluid to the pistons are suitably formed and arranged so that the ports will be opened just after the blades 15 have passed the abutments, and said abutments have been lowered. The steam can be admitted for as long a period as desired, but preferably the cams permit the valves to close the ports a considerable distance before the blades 15 reach the exhaust 31 in order that the expansive force of the steam may be utilized. When the blades 15 approach the abutments 19, the cams 53 operate on the stems 51, to swing the levers 49, and thereby move the valves 46 so as to admit motive fluid beneath the pistons 33 and permit its exhaust from above the same. The result is that such pistons will be elevated and the abutments 19 carried with them into the casings 16. The blades 15 of the pistons can therefore freely pass the abutments and as soon as they have passed, the cams 53 operate to again reverse the valves 46 so that the abutments are again lowered, whereupon the motive fluid is admitted to the cylinders in the manner already set forth, and the operation is repeated. It will be evident that because of the opposite arrangement of the valves and pistons, these operations alternately take place with each set of mechanisms, and it will also be evident that while two are shown, as many may be employed as desired. Furthermore under certain conditions, the structure may be employed with a single cylinder and piston.

A slightly modified form of construction is illustrated in Fig. 6. In this embodiment of the invention, the cylinder member is designated 7^a, and in the same operates the usual piston including a blade 8^a. An abutment casing 9^a is mounted on the enlarged portion 10^a of the cylinder member, and a steam box 11^a has a supply port 12^a controlled by reciprocatory valve 13^a. This valve has a stem 14^a provided with a roller 15^a that operates on a cam 16^a connected to the engine shaft 17^a, a spring pressed arm 18^a, holding the roller 15^a against the cam. The abutment 19^a is movable into and out of the casing 9^a, and is connected by a piston rod 20^a to a piston 21^a. This piston operates in a cylinder 22^a that is located directly on the top of the casing 9^a. Motive fluid is supplied through a conduit 23^a, and through a valve casing 24^a to opposite sides of the piston, and valve mechanism 26^a corresponding to that already described, controls the supply and exhaust of this motive fluid. The valve mechanism 26^a is connected by a rod 27^a to a roller 28^a that operates on a cam 29^a carried by the engine shaft. An arm 30^a is pivoted to the cylinder member, and the lower end of the stem 27^a is pressed downward by a spring 31^a, that serves to hold the roller 28^a

against the periphery of the cam. It will be evident that this structure operates in all respects like the embodiment just described, and it is therefore believed to be unnecessary to set forth the operation in detail.

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, without 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 claim as new, and desire to secure by Letters Patent, is:—

1. In a rotary engine, the combination with spaced cylinder members, of a shaft extending through the members and across the space between them, rotary pistons mounted on the shaft and operating in the cylinder members, a steam chest located between the cylinder members at one side of the shaft and having communication with said cylinder members, cam mechanism mounted on the shaft between the cylinder members and exteriorly of the steam chest, and valves located in the steam chest and controlling the communication with the cylinder members, said valves having stems projecting through the inner wall of the steam chest and actuated by the cam mechanism.

2. In a rotary engine, the combination with spaced cylinder members having inner spaced walls provided with ports, of a single steam chest located between the cylinder members and having side walls disposed adjacent to the inner walls of the cylinder member, said side walls also having ports that aline with the ports of the cylinder member walls, rotary pistons operating in the cylinder members, reciprocating valves located in the opposite portions of the steam chest and controlling the ports, and cams located exteriorly of the steam chest and connected to the valves for periodically operating the same.

3. In a rotary engine, the combination with spaced cylinder members, of a single steam chest located between them and having ports in its opposite sides that communicate with said cylinder members, rotary pistons operating in the cylinder members, reciprocatory valves located in the opposite sides of the steam chest and controlling the ports, and cams located between the cylinder members and associated with the valves for periodically operating the same.

4. In a rotary engine, the combination with spaced cylinder members, of a steam chest located between the cylinder members and communicating therewith, rotary pistons operating in the cylinder members, a shaft connecting the pistons and bridging the space between the cylinder members, valves located in the steam chest for controlling the communication thereof with the cylinder members, cams mounted on the shaft between the cylinder members and periodically operating the valves, cylinders associated with the cylinder members and having reciprocating pistons therein, reciprocatory abutments operating in the cylinder members and connected to the pistons, means for supplying motive fluid to and exhausting it from the cylinders to effect the operation of the abutments, valves controlling the supply and exhaust, and cams located on the shaft between the cylinder members and connected to said latter valves.

5. In a rotary engine, the combination with a cylinder member, of a rotary piston operating therein, an abutment movable within the cylinder member, another cylinder located exteriorly of the cylinder member, a reciprocatory piston operating in the latter cylinder, means for periodically supplying motive fluid to the cylinder on opposite sides of the reciprocatory piston to move the same, a piston rod connecting the piston and the abutment, and a reciprocatory guide for the piston rod.

6. In a rotary engine, the combination with a cylinder member, of a rotary piston operating therein, an abutment casing mounted on the cylinder member, a reciprocatory abutment movable in the casing and within the cylinder member, a guide-way associated with the abutment casing, a cylinder disposed adjacent to the abutment casing, a reciprocatory piston operating therein, a piston rod connected to the piston and to the abutment, a roller carried by said piston rod and operating in the guide-way, and means for supplying motive fluid to the cylinder to reciprocate the piston.

7. In a rotary engine, the combination with a cylinder member, of a shaft extending therethrough, a rotary piston located within the cylinder member and carried by the shaft, a movable abutment operating in the cylinder member and coacting with the piston, another cylinder, a reciprocatory piston mounted therein and connected to the abutment, a valve casing having motive fluid communication with the ends of the cylinder and having separate exhaust channels, valve mechanism located in the valve casing and controlling the communication and the exhaust channels, and means operated by the shaft for periodically moving the valve mechanism.

8. In a rotary engine, the combination with a cylinder member, of a shaft extending therethrough, a rotary piston located within the cylinder member and carried by the shaft, a movable abutment operating in the cylin-

der member and coacting with the piston, another cylinder, a reciprocatory piston mounted therein and connected to the abutment, a valve casing having motive fluid communication with the ends of the cylinder and having separate exhaust channels, valve mechanism located in the valve casing and controlling the communication and the exhaust channels, a cam secured to the shaft, and a rod operated by the cam and connected to the valve mechanism.

9. In a rotary engine, the combination with a cylinder member, of a rotatable piston operating therein, a movable abutment coöperating with the piston, another cylinder, a reciprocatory piston mounted therein and connected to the abutment, a valve casing including a wall having a plurality of supply and exhaust ports therethrough, reciprocatory valves located in opposite sides of the wall and respectively controlling the supply and exhaust ports, and means for reciprocating the valves.

10. In a rotary engine, the combination with a cylinder member, of a rotary piston operating therein, a movable abutment operating in the cylinder member and coacting with the piston, another cylinder, a reciprocatory piston mounted therein and having a connection with the abutment, a valve casing including a wall having supply and exhaust ports therethrough, a reciprocatory valve stem extending through the casing, valves connected to the stem and located on opposite sides of the wall, said valves respectively controlling the supply and exhaust ports, a shaft operated by the piston, a cam mounted on the shaft, an actuating rod coöperating with the cam, and a lever fulcrumed between its ends and connected to the rod and to the valve stem.

11. In a rotary engine, the combination with a cylinder member, of a rotatable piston operating therein, an abutment casing mounted on the cylinder member, an abutment slidable in the casing and movable into and out of the cylinder member, another cylinder located alongside the abutment casing, a piston operating in the latter cylinder and connected to the abutment, and means for supplying motive fluid to the latter cylinder to move the piston and thereby the abutment.

12. In a rotary engine, the combination with a cylinder member, of a rotary piston operating therein, an abutment casing mounted on the cylinder, a reciprocatory abutment slidably mounted in the casing and movable into the cylinder member, a cylinder located alongside the casing a reciprocatory piston operating in the cylinder, a substantially U-shaped piston rod connected to the piston and to the abutment, a guide-way extending above the cylinder, a roller carried by the piston rod and operating in the guide-way, a valve casing including a wall having supply and exhaust ports therethrough, a reciprocatory valve stem operating in the casing, valves carried by the stem and controlling the supply and exhaust ports, and means operated by the rotary piston for effecting the movement of the valve stems.

13. In a rotary engine, the combination with a cylinder member, of a rotatable piston operating therein, a movable abutment cooperating with the piston, another cylinder, a reciprocatory piston mounted on the latter cylinder and connected to the abutment, a valve casing including a wall having a plurality of supply and exhaust ports therethrough, a plurality of reciprocatory valves associated with the wall and respectively controlling the different supply and exhaust ports, and means operated by the piston for reciprocating the valves.

14. In a rotary engine, the combination with spaced cylinder members, of a single steam chest located between them and communicating with both, separate valves controlling said communication, means located between the cylinder members for alternately operating the valves, rotary pistons located in the cylinder members, movable abutments coöperating therewith, motive fluid operated means for moving the abutments, said means being connected to the steam chest, a governor mounted on the steam chest, and means for rotating said governor.

15. In a rotary engine, the combination with spaced cylinder members having enlarged portions and grooves formed in said enlarged portions, of abutment casings mounted on said enlarged portions and having interior chambers alined with the grooves, rotary pistons operating in the cylinder members, a shaft carrying said pistons, abutments operating in the grooves and casings, cylinders associated with said casings, reciprocatory pistons operating in the cylinders and connected to the abutments directly or otherwise for moving the same, a steam chest located between the cylinder members and having ports communicating therewith, valve mechanism operated from the shaft for controlling the ports, conduits connecting the steam chest and cylinders, valve mechanism controlling the supply of motive fluid to said cylinders, and means operated by the shaft for effecting the movements of the latter valve mechanisms.

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:

MAGARET YATES,

AGNES OLIVER.