No. 713,541. Patented Nov. 11, 1902.

G. M. WALKER.

ROTARY ENGINE.

(Application filed Apr. 12, 1902.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 2

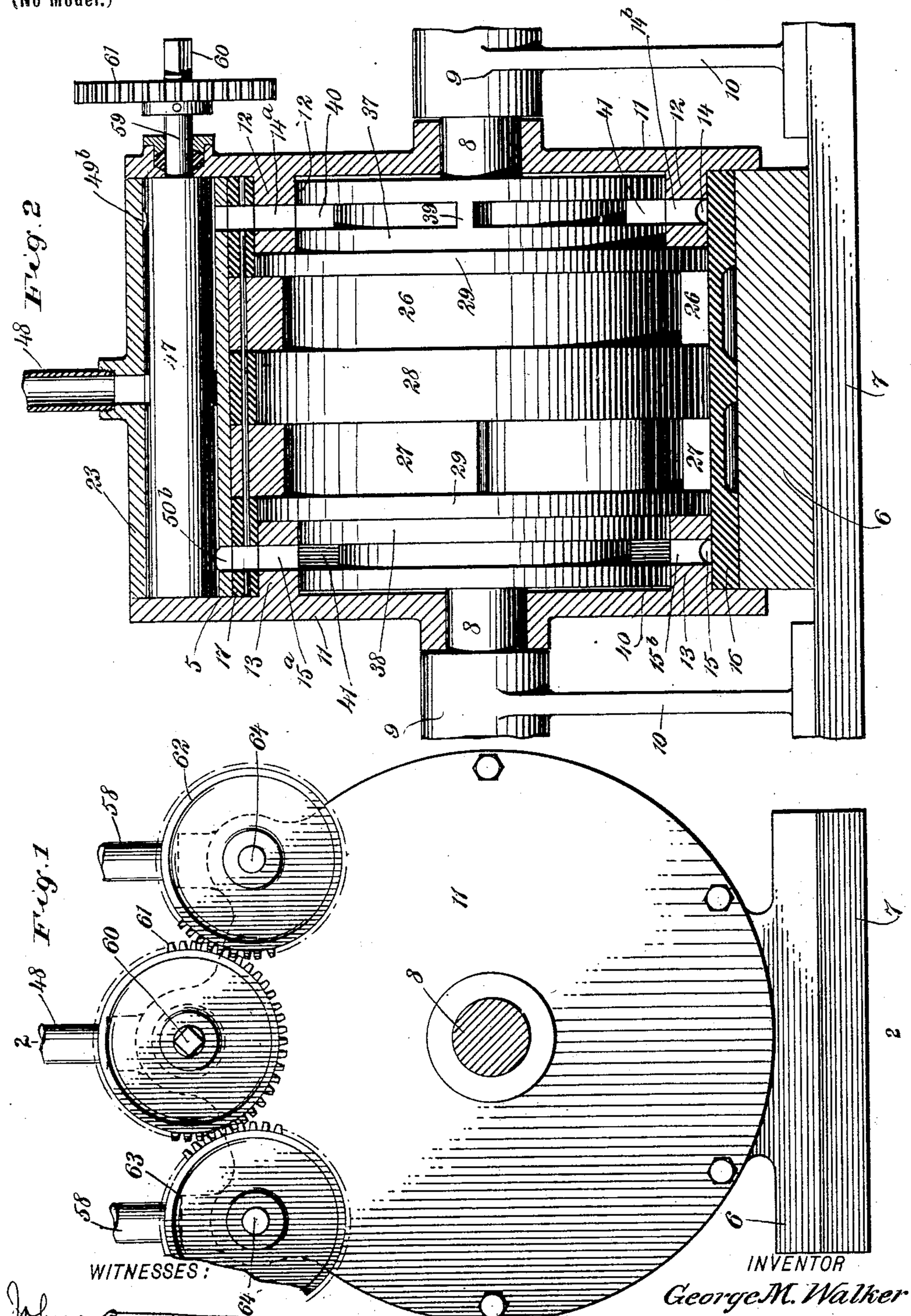

Fig. 1

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Fig. 4

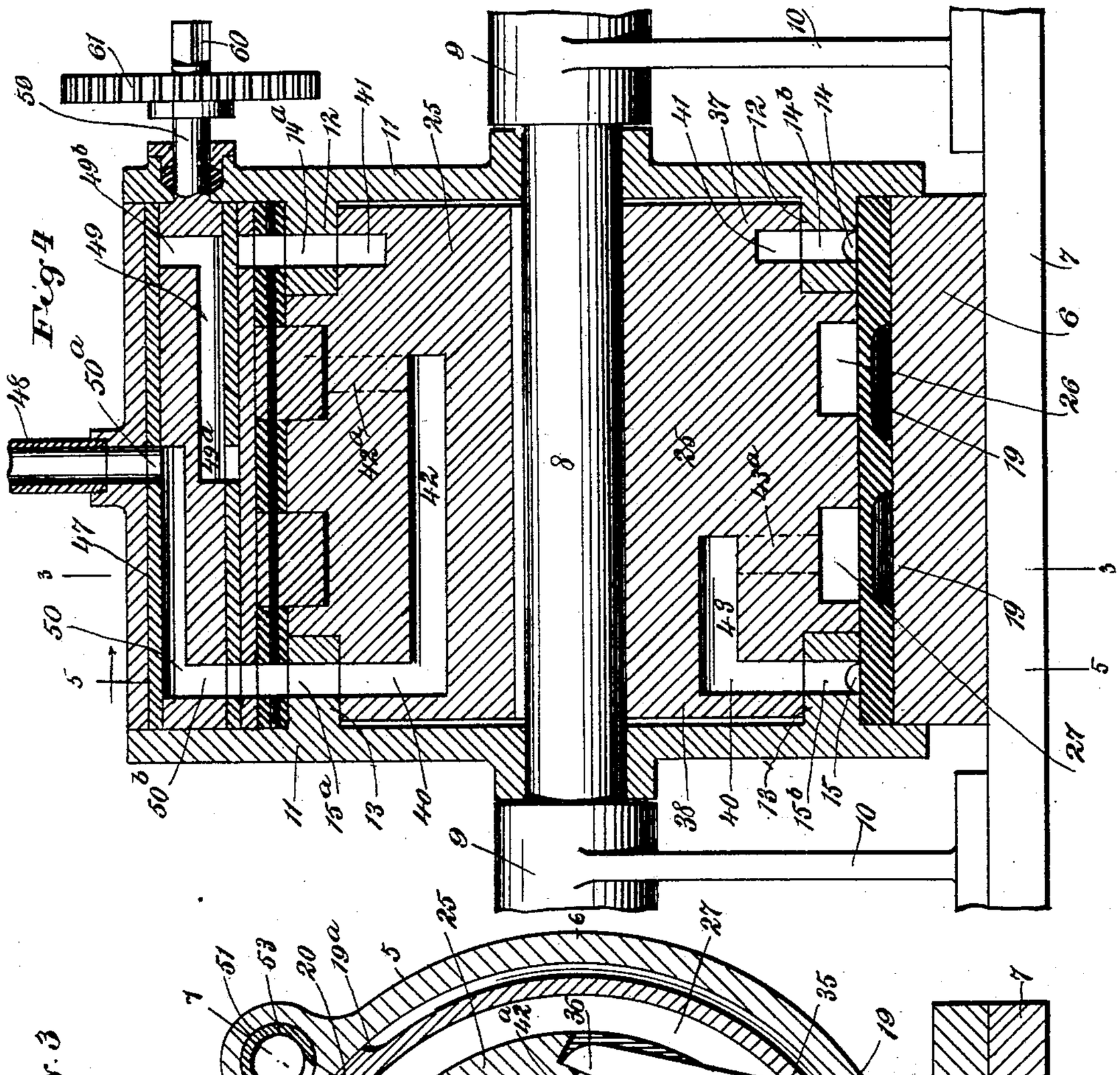

Fig. 3

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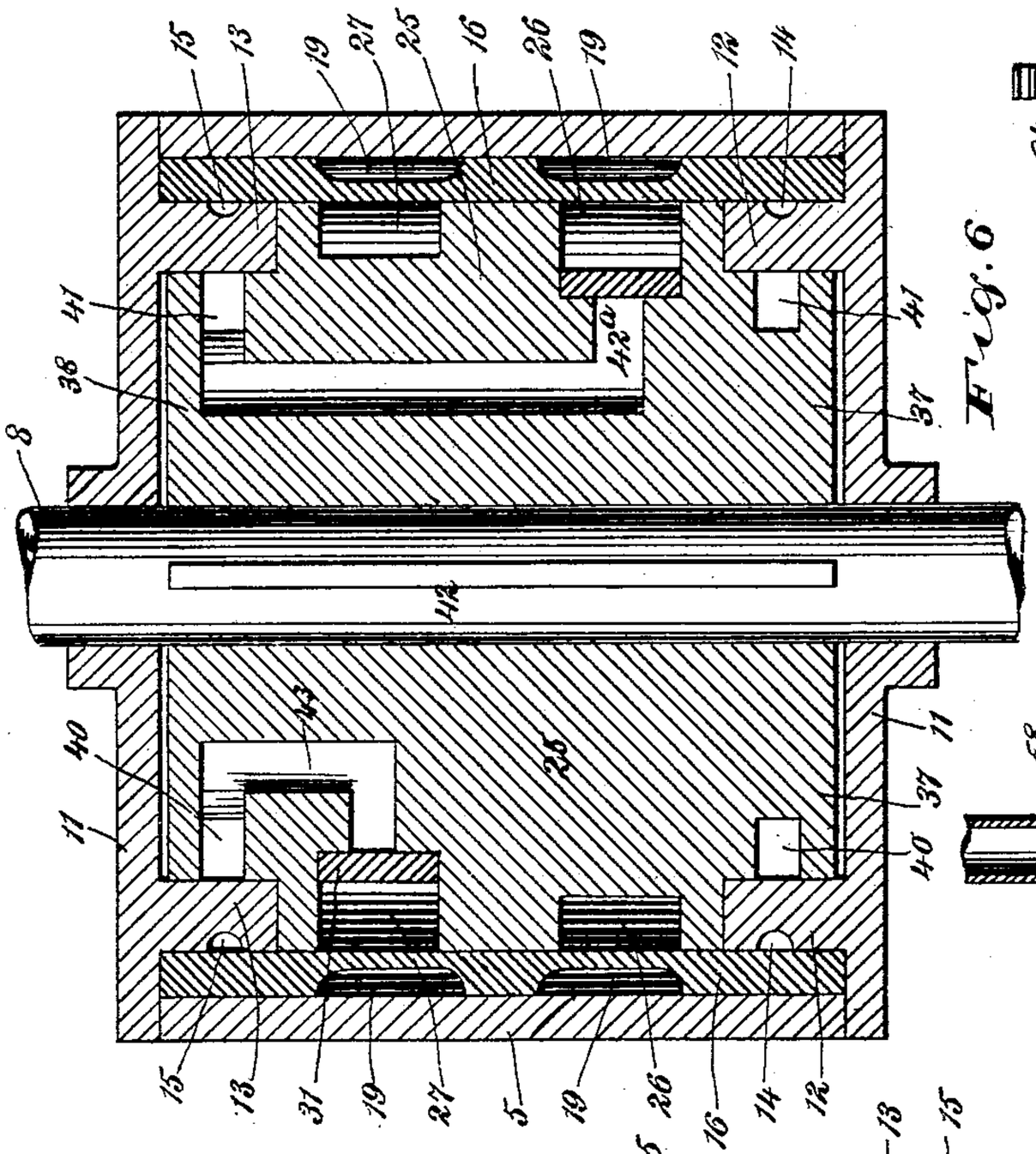

Fig. 5

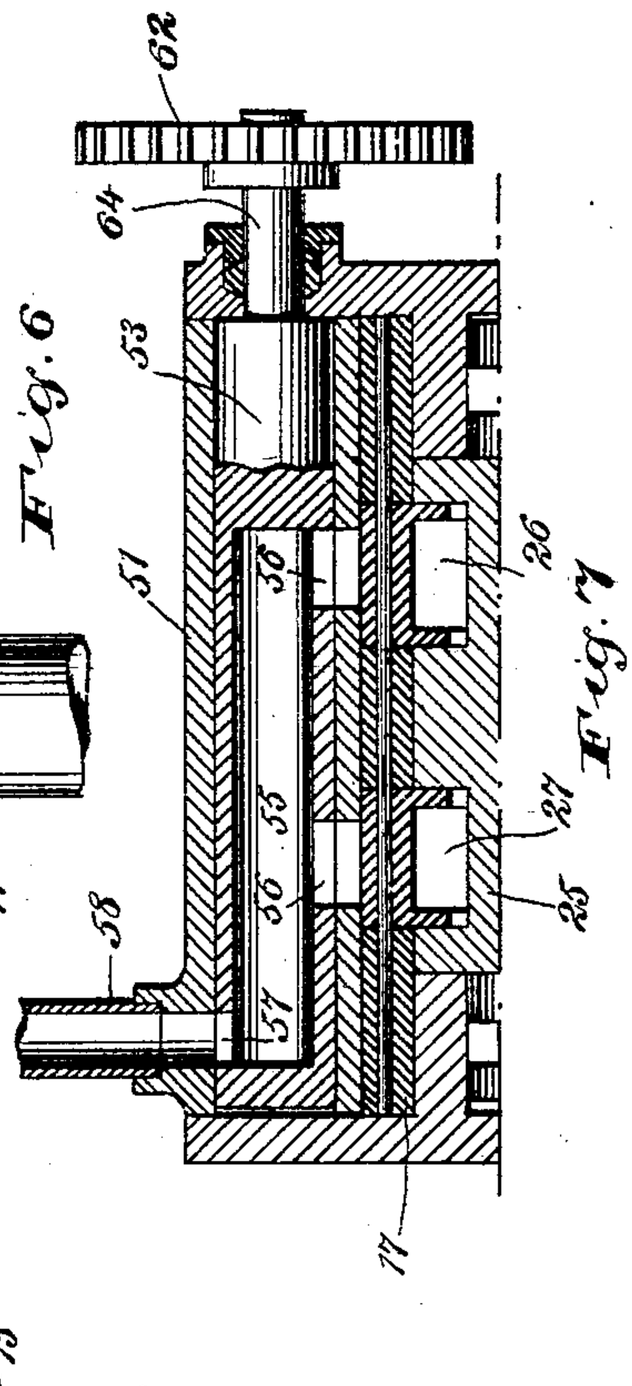

Fig. 6

Fig. 7

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UNITED STATES PATENT OFFICE.

GEORGE M. WALKER, OF LINCOLN, NEBRASKA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 713,541, dated November 11, 1902.

Application filed April 12, 1902. Serial No. 102,531. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. WALKER, a citizen of the United States, and a resident of Lincoln, in the county of Lancaster and State of Nebraska, have invented new and useful Improvements in Rotary Engines, of which the following is a full, clear, and exact description.

My invention relates to improvements in rotary engines of that class known as "rotary concentric piston," from the fact that the piston is disposed in concentric relation to a surrounding annular casing.

The objects that I have in view are the provision of means for utilizing the steam expansively in a rotary-piston engine; to automatically adjust the abutments of the rotary piston for operation according to the direction in which the engine is desired to be driven; to provide fluid-pressure means for reversing the positions of the abutments, and consequently to reverse the direction of rotation of the piston; to provide a simple valve mechanism for controlling the admission of the motive fluid to the piston and the exhaust of the fluid therefrom, and to simplify the construction, to secure efficiency in operation, and enable the engine to be manufactured at a moderate cost.

With these ends in view the invention consists in the combination, construction, and arrangement of parts, which will be hereinafter fully described and claimed.

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

Figure 1 is a side elevation of the rotary engine embodying my improvement. Fig. 2 is a vertical transverse section through the casing, illustrating the revoluble piston in elevation, the plane of the section being indicated by dotted line 2 2 of Fig. 1. Fig. 3 is a vertical transverse section in the plane of the dotted line 3 3 of Fig. 4. Fig. 4 is a section at right angles to Fig. 3 and in the plane of the dotted line 4 4 of Fig. 3. Fig. 5 is a section at right angles to the shaft, the plane of the section being indicated by the dotted line 5 5 of Fig. 4. Fig. 6 is a horizontal section in the plane of the engine-shaft and as indicated by the dotted line 6 6 of Fig. 3; and Fig. 7 is a detail sectional view through one of the exhaust-valves and a part of the cylinder-lining, the plane of the section being indicated by the irregular line 7 7 of Fig. 3.

5 designates the casing or cylinder of my improved rotary engine, the same having the enlarged base 6, which is bolted on the bedplate 7. Through this cylinder extends the horizontal engine-shaft 8, which is mounted in the bearings 9 of the standards 10. The end portions of this circular casing or cylinder are closed by the application of the cylinder-heads 11, which may be secured to the casing or cylinder by any suitable means, so as to secure steam-tight joints, and these heads are provided with the annular flanges 12 13. Said flanges are provided on the inner opposing faces of the heads, and they are disposed in corresponding concentric positions, as clearly indicated by Figs. 4 and 6. The flanges 12 13 are provided in their upper surfaces with semicircular grooves 14 15, respectively, and these grooves terminate at the upper side of the flanges in the ports or openings 14^a 15^a, (see Fig. 4,) while the lower ends of the semicircular grooves terminate in the ports 14^b 15^b.

16 designates a metallic lining, which is of annular form and is secured firmly in place within the casing or cylinder 5. This metallic lining is provided at the top side of the casing with a removable section 17, which is equipped with the abutments 18. The annular lining is furthermore provided on its outer surface with the grooves 19, forming the annular spaces between the lining and the cylinder, which spaces terminate at the shoulders 19^a. (Shown by Fig. 3.) The lining is provided with the oppositely-placed exhaust-ports 20 21, having communication with the exhaust-passages 22, which are formed in the valve-chest 23, the latter surmounting the cylinder or casing 5. The rotary piston 25 is keyed or otherwise made fast to the shaft 8, so as to rotate therewith, and said piston is disposed within the cylinder or casing 5 in concentric relation thereto. The piston is provided with a series of annular grooves, the same being indicated at 26 27 in Figs. 2 and 6, although I reserve the right to form any desired number of grooves in the circumference of the rotary piston, according to the

desired capacity of the engine. The rotary piston has its chambers 26 27 separated or divided by the annular ribs or flanges, (indicated at 28 29,) and these annular flanges are disposed to fit snugly within the circular lining 16, whereby the annular steam-chambers are formed around the piston by the described construction and by arranging it within the lining of the cylinder. Each annular steam-chamber is provided with an adjustable abutment, the same forming a reversible surface, against which the steam is adapted to exert pressure in order to drive the piston in one direction or the other. In the drawings the two steam-chambers 26 27 of the piston are provided with the abutments, (indicated at 30 31 by full and dotted lines, respectively, in Fig. 3,) and these abutments are arranged at diametrically opposite points with relation to the piston.

Of course an increased number of steam-chambers in the piston requires a corresponding increase in the number of abutments, and these abutments are arranged equidistant in order that they may be successively forced into service on the rotation of the piston. Each abutment is provided with a curved portion adapted to fit snugly in a recess 32, which is formed in the piston and is adapted to communicate with the socket 33, the latter being also provided in the piston and disposed in a position for communication with one of the annular steam-chambers 26 27. Each reversible abutment is pivoted to the piston by a pin, as at 34, and said abutment has the laterally-extending wings 35 36. The abutment is pivoted to the piston in such a position that one or the other of the wings thereof may be extended from the recess 32 and into the steam-chamber 26 or 27. In the position shown by Fig. 3 of the drawings the piston is adapted to rotate in the direction indicated by the arrow, so that the steam will exert pressure against the wings 35, the latter projecting across the steam-chambers. In order to reverse the engine, however, it is necessary to change the positions of the abutments 30 31 and to reverse the valves, thus driving the abutments to the reverse position to that shown in Fig. 3 and making the wings 36 take active positions across the steam-chambers of the piston. The means for reversing the pivoted abutments by the pressure of the motive fluid will be hereinafter described.

The end portions of the rotary piston beyond the annular collars 29 are reduced in diameter, so as to form the annular steam-chests, (indicated by the numerals 37 38, the same being provided at the opposite end portions of the piston. These chests are arranged to extend into the annular flanges 12 13 on the opposite heads 11 of the cylinder, and thus the end portions or the steam-chests of the rotary piston are revoluble with the piston therein. This arrangement of the parts makes the annular flanges 12 13 extend into the end portions of the circular lining 16, as shown by Figs. 2, 4, and 6, and thus said annular flanges 11 12 are disposed between the steam-chests 37 38 of the piston and the lining 16 of the cylinder. The steam-chests 37 38 are provided with the radial partitions 39, forming the separate compartments 40 41 in the steam-chests, and the radial compartments of the steam-chest 37 lie in alternate relation to the corresponding positions of the compartments of the other steam-chest 38, thus arranging the compartments 40 41 of one steam-chest in alternate relation to the compartments of the other steam-chest. The compartments of one steam-chest are adapted to communicate with one of the semicircular chambers 14 or 15, which are formed by the semicircular grooves in the outer faces of the annular flanges 12 13, and each steam-chest is adapted to be supplied with steam through the ports of one of the semicircular chambers 14 or 15, as indicated more clearly by Fig. 5. With the compartments 40 41 of the steam-chest 38 communicate the steam-passages 42 43, as shown by Fig. 6, and the passage 42 is arranged to terminate in a port 42^a in rear of the wing 36 on the reversible abutment 30, while the other passage 43 terminates in a port 43^a below the wing 36 of the other abutment 31, as indicated by dotted lines in Fig. 3, whereby the compartments of one steam-chest are adapted to supply steam to corresponding wings of the different abutments. In like manner the compartments 40 41 of the other steam-chest 37 have passages 44 45 in communication therewith, and one passage 44 terminates in a port 44^a, which opens in rear of the wing 35 on the abutment 30, while the other passage 45 has a port 45^a disposed in like relation to the wing 35 on the other abutment 31. The different compartments of the steam-chests disposed at opposite ends of the piston thus have individual communication with different wings of the respective abutments, and these abutments may be simultaneously shifted by steam-pressure, which is supplied to the compartments of the steam-chests 37 38 through the semicircular chambers 14 15, which are provided in the annular flanges 12 13.

The valve-chest 23 is provided with a central compartment 46, adapted to receive an inlet-valve 47, and to this compartment of the valve-chest is united a feed-pipe 48. The inlet-valve 47 is of the rocking type, and it is provided with two passages 49 50, which do not communicate with each other and which extend toward the opposite ends of the valve. The passage 49 terminates at one end in an inlet-port 49^a and at its other end in a port 49^b, adapted to register with the port 14^a, by which steam may be supplied in one position of the valve to the steam-chest 37 and thence through the passages 44 45 to the chambers 27 28 of the engine. The other passage 50 of the valve terminates at one end in an in-

let-port 50ª and at the other end in a port 50ᵇ, which in the position of the valve shown by Fig. 4 brings the port 50ᵇ into communication with the passage 15ª, whereby steam may be admitted by the passages 42 43 to the compartments of the other steam-chest 38, thus admitting steam to the chambers 26 27 in rear of the reversible abutments. It will be understood that this valve 47 may be changed within the valve-chest, so as to bring either passage 49 or 50 into postion for service, and thus the steam may be directed to either of the steam-chests 37 38 and against either of the wings of the reversible abutments. Of course if the valve 47 is reversed the pressure of the steam against corresponding wings of the abutments will change the positions of the latter and the piston will be caused to rotate in an opposite direction.

The valve-chest 23 is furthermore provided with the compartments 51 52, which accommodate the exhaust-valves 53 54, respectively, one of said valves being shown more clearly by Fig. 7. Each exhaust-valve is provided with a chamber or passage 55, having ports 56 arranged to communicate with the chambers 26 27 of the engine, and said valve is furthermore provided with an egress-port 57, which has communication with the exhaust-pipe 58.

The inlet-valve 47 is provided with a spindle 59, having a polygonal end 60 adapted for the application of a suitable means for turning the valve, and said valve-spindle is equipped with a spur-gear 61, having intermeshing engagement with similar spur-gears 62 63 on the spindles 64 of the exhaust-valves 52 53, whereby the exhaust-valves are actuated simultaneously with the inlet-valve, and the valves may be adjusted to bring one of them into service at the same time that the other valve is cut out of communication with the chambers 26 27 of the engine.

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

1. A rotary engine, having a concentric piston provided with reversible abutments, and with means whereby the abutments may be automatically reversed by the pressure of the motive fluid.

2. A rotary engine, having a concentric piston provided with steam-chambers and with steam-chests, reversible abutments mounted in the piston and adapted to assume operative positions across the steam-chambers therein, steam-passages between the steam-chests and the chambers of the piston, and a valve mechanism arranged to control the supply and exhaust of steam through the valve-chests and the chambers.

3. A rotary engine comprising a casing, a revoluble concentric piston provided with steam-chambers and at its ends with independent steam-chests, reversible abutments individually pivoted in the steam-chambers of said piston, passages connecting each steam-chest of the piston with one steam-chamber therein and adapted to alternately direct the motive fluid against the reversible abutments, and an inlet-valve operable to direct the course of the motive fluid into either of the valve-chests.

4. A rotary engine, comprising a casing having its head formed with inwardly-extended annular flanges which are provided with separate steam-chambers, a rotary piston provided at its end portions with steam-chests which are disposed within the annular flanges of said heads, annular steam-chambers in the piston and having communication with the steam-chests, reversible abutments in the steam-chambers of the piston, an inlet-valve controlling the admission of the motive fluid to the steam-chests separately, and exhaust-valves arranged individually to have communication with the steam-chambers of the piston.

5. A rotary engine, having a concentric piston provided with steam-chambers and end steam-chests, an inlet-valve arranged to control the admission to the chests individually, reversible exhaust-valves operatively connected with the inlet-valve and adapted to separately communicate with the steam-chambers of the piston, and reversible abutments mounted in the piston.

6. A rotary engine, comprising a piston having at its end portions separate steam-chests and also provided with intermediate annular steam-chambers, each steam-chamber communicating with a recess into which open separate passages leading from the respective steam-chests, combined with an inlet-valve arranged to direct steam into either of the steam-chests, and exhaust-valves having communication individually with the steam-chambers.

7. In a rotary engine, a concentric piston provided with a series of annular steam-chambers, and a series of divided steam-chests, each having passages leading therefrom to the different steam-chambers, and a reversible abutment pivoted in each steam-chamber and provided with means arranged separately in the paths of the connecting passages from the steam-chests, combined with a cylinder, and suitable inlet and exhaust valves.

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

GEORGE M. WALKER.

Witnesses:
ARTHUR R. SHELDON,
ALEXANDER SCOULLER.