(No Model.)

4 Sheets—Sheet 1.

H. J. McLOED.

ROTARY ENGINE.

No. 597,585. Patented Jan. 18, 1898.

Fig. 1,

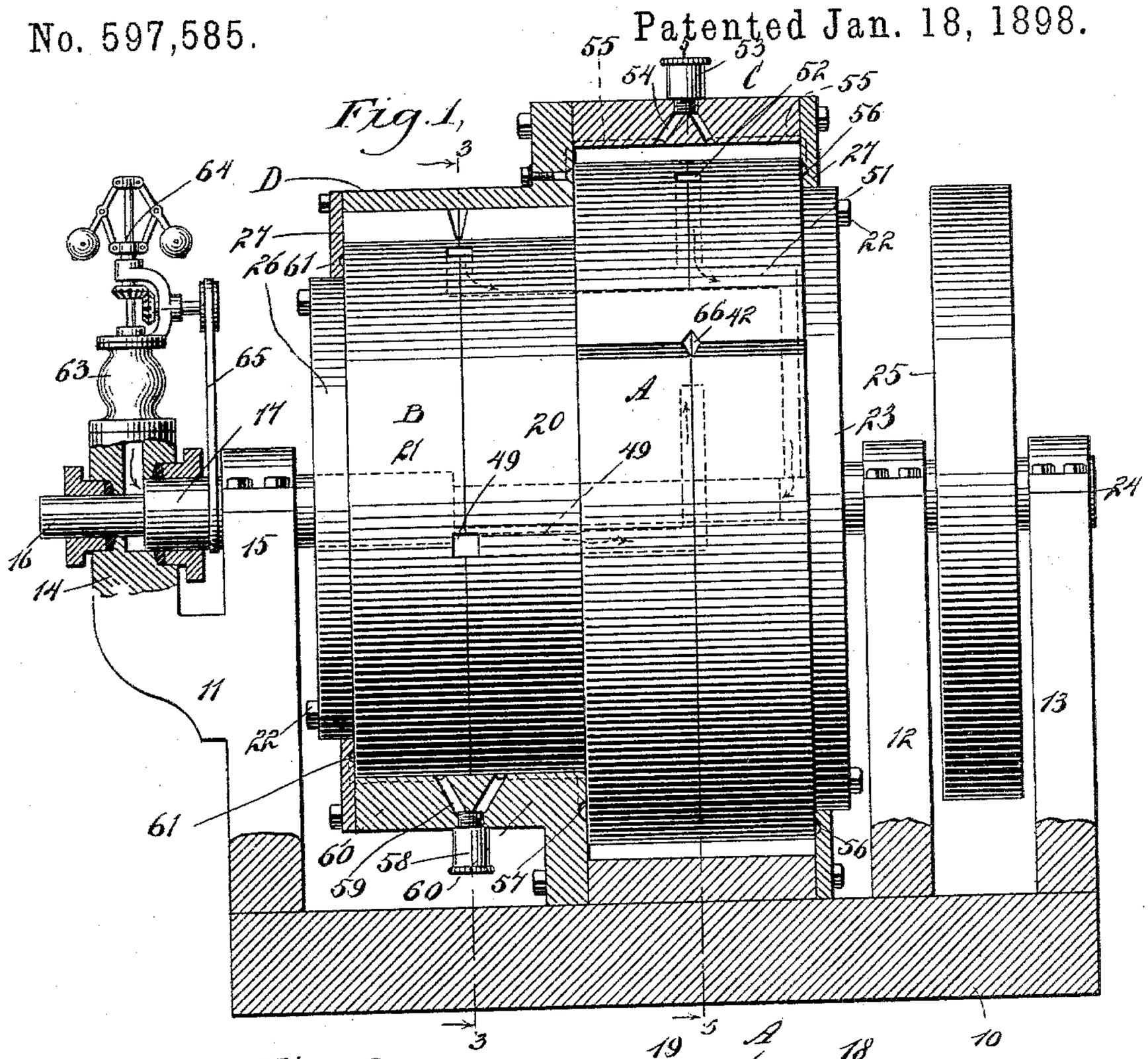
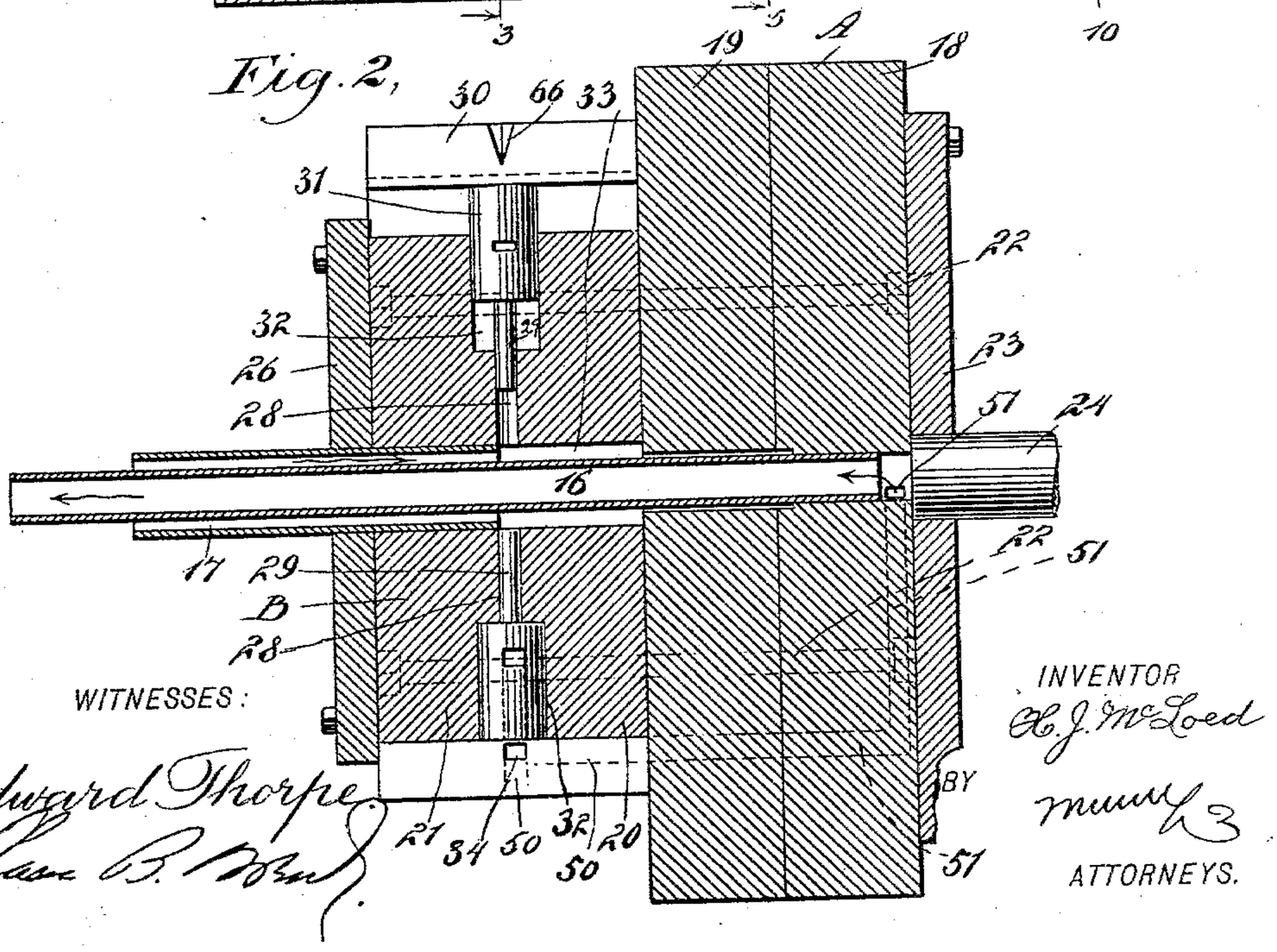


Fig. 2,



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(No Model.) 4 Sheets—Sheet 2

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ROTARY ENGINE.

No. 597,585. Patented Jan. 18, 1898.

Fig. 3,

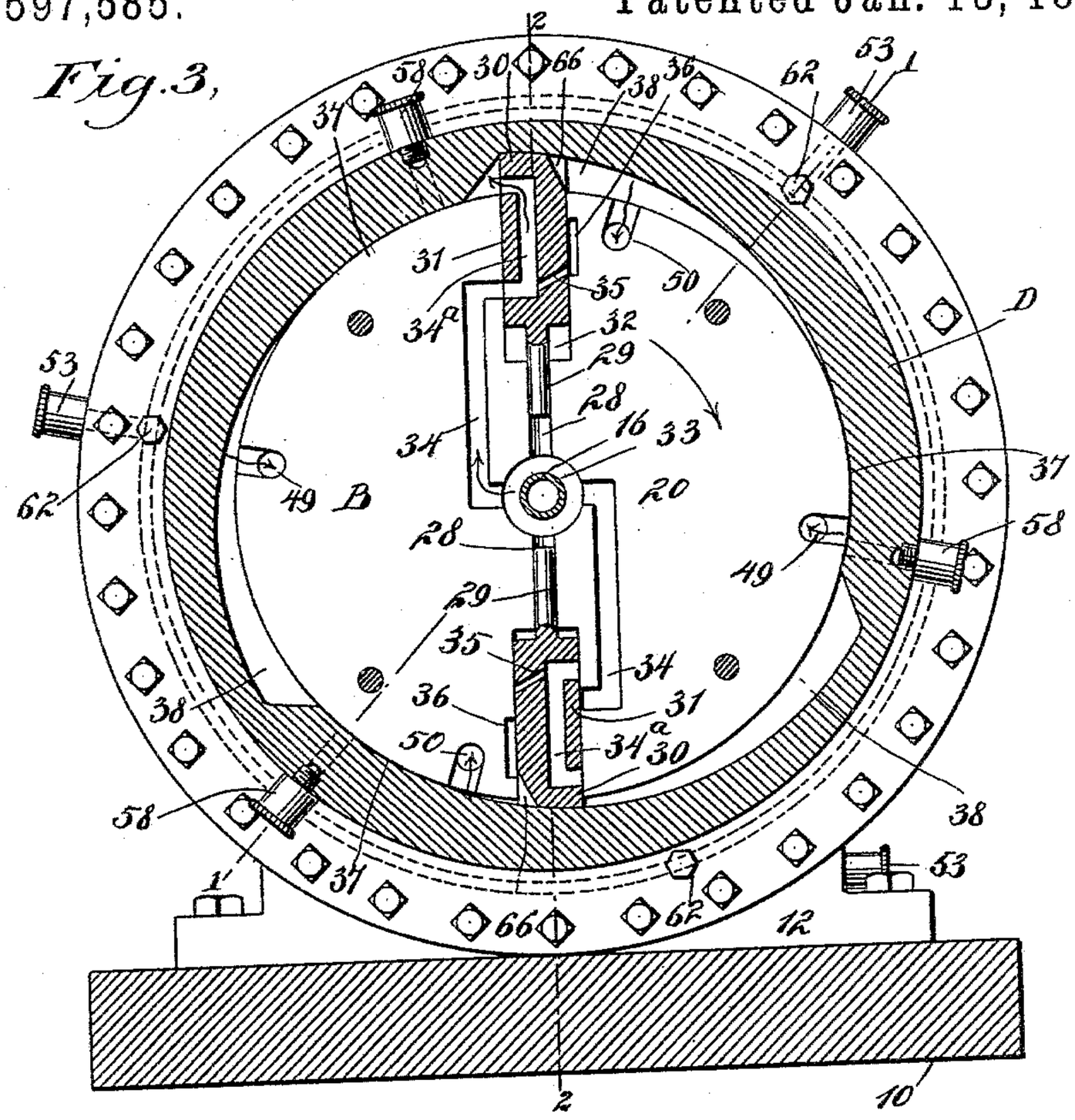
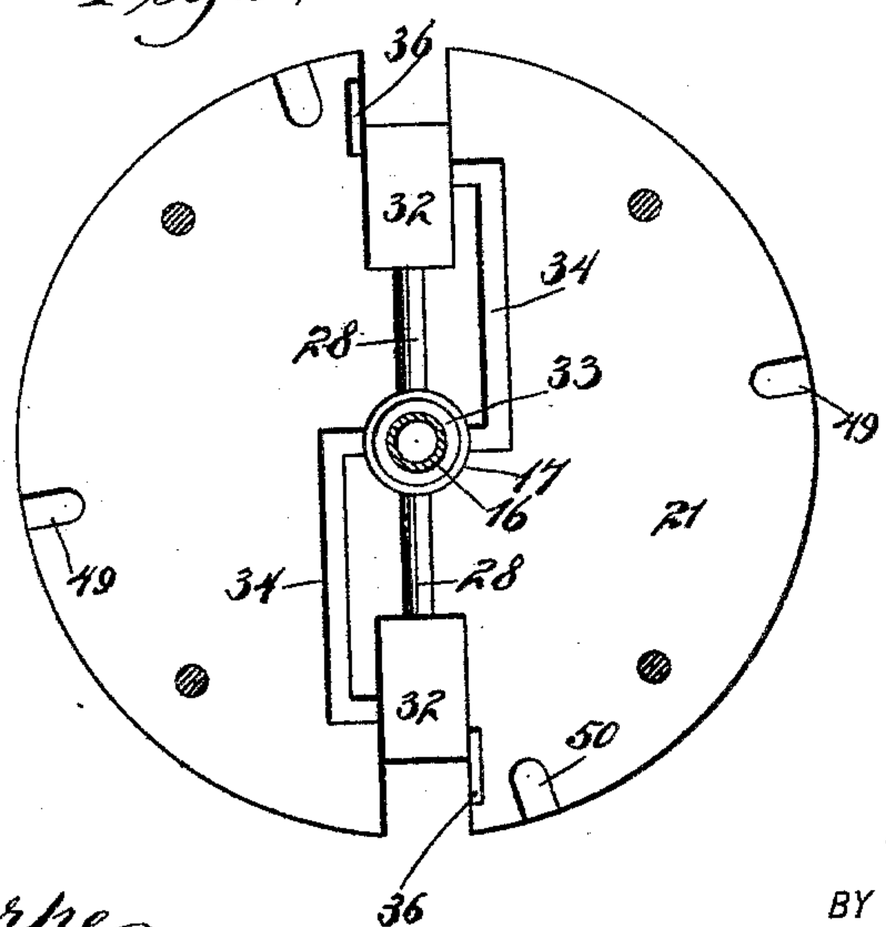


Fig. 4,



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4 Sheets—Sheet 3.

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ROTARY ENGINE.

No. 597,585. Patented Jan. 18, 1898.

Fig. 5.

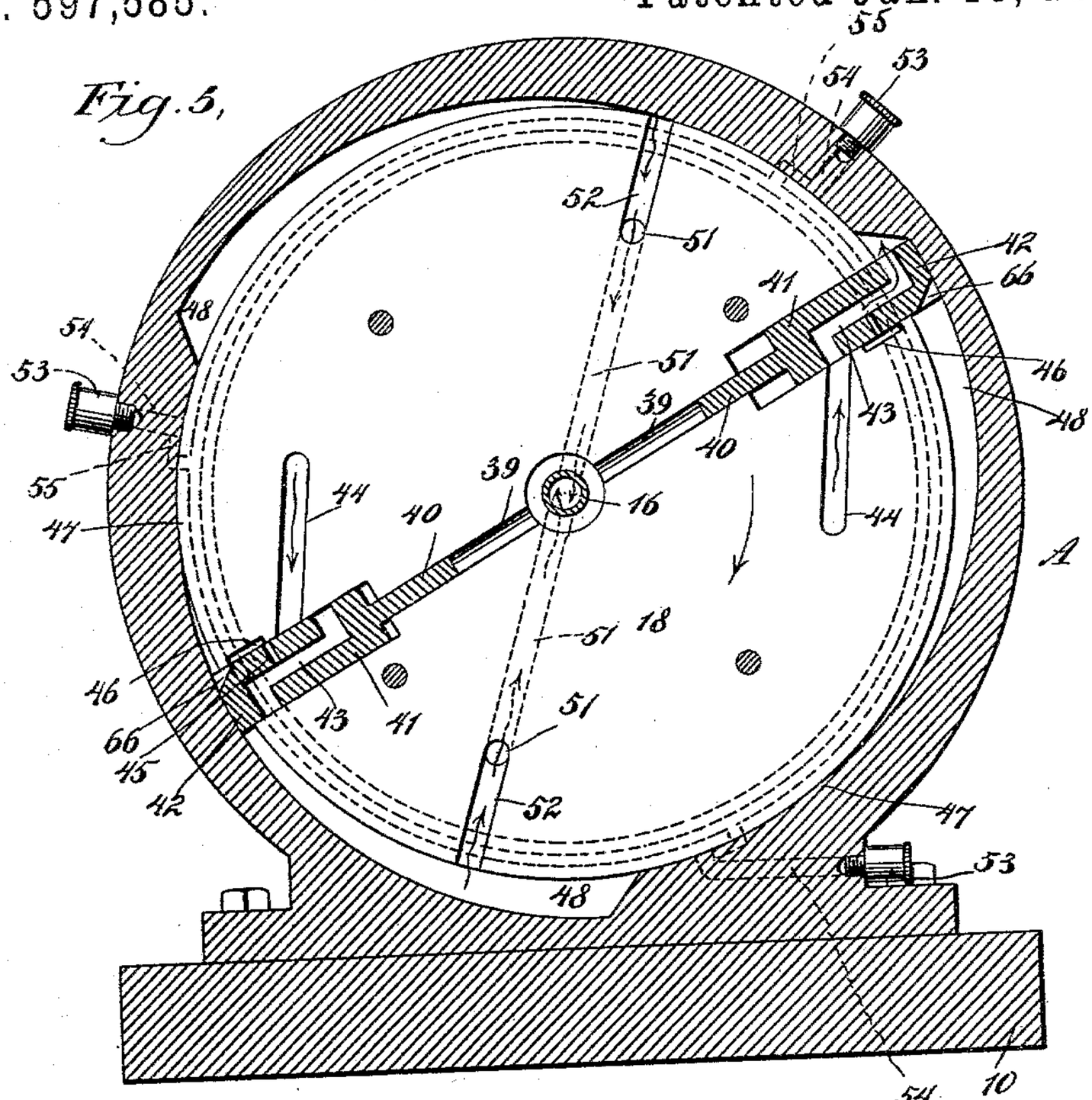
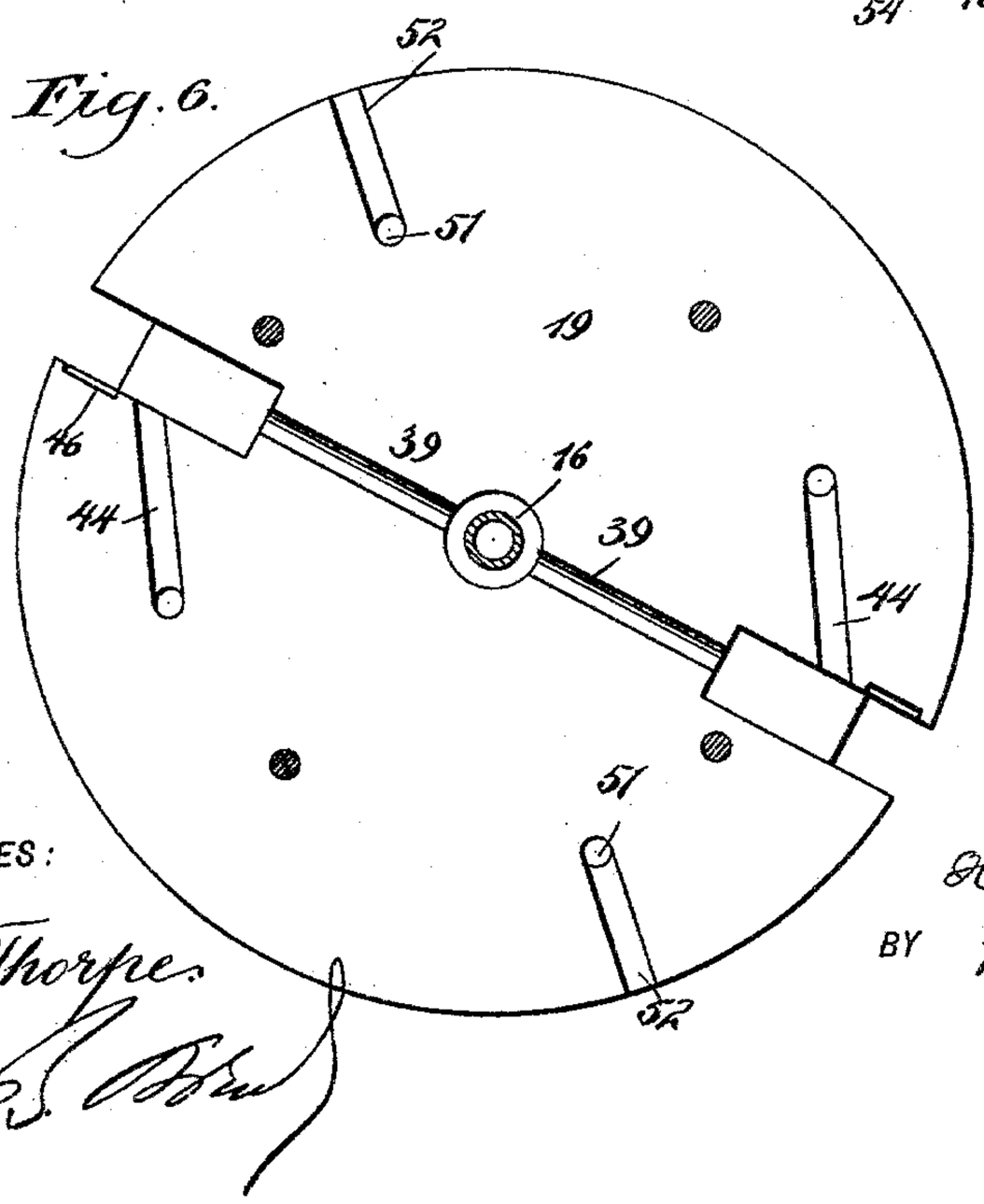


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

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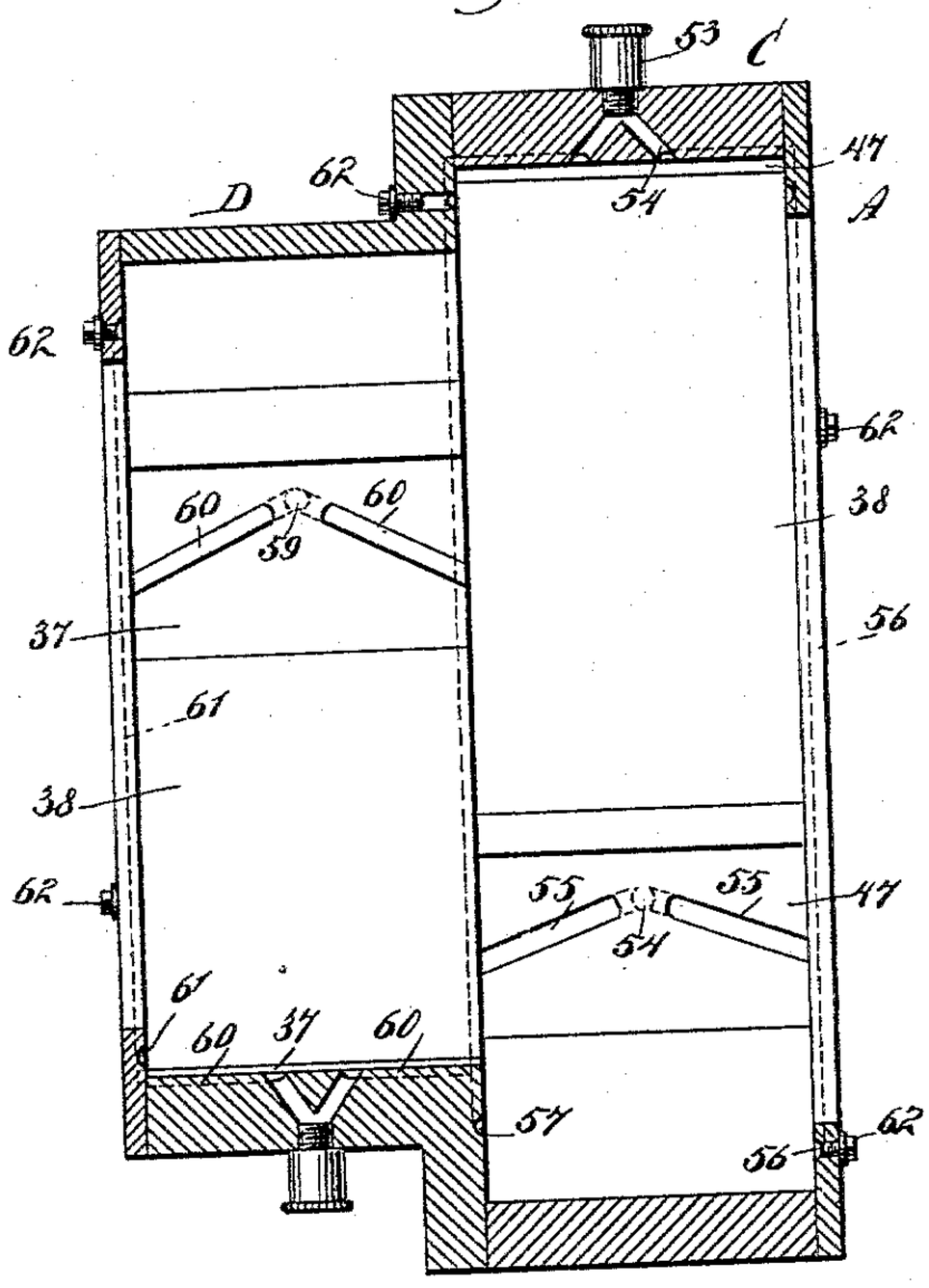
ROTARY ENGINE.

No. 597,585. Patented Jan. 18, 1898.

Fig. 1.



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UNITED STATES PATENT OFFICE.

HORACE J. McLOED, OF LOUISIANA, MISSOURI, ASSIGNOR OF ONE-HALF TO THOMAS J. NALLEY, OF SAME PLACE.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 597,585, dated January 18, 1898.

Application filed June 7, 1897. Serial No. 639,744. (No model.)

To all whom it may concern:

Be it known that I, HORACE J. McLOED, of Louisiana, in the county of Pike and State of Missouri, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

This invention is a rotary engine having high and low pressure cylinders, each containing a piston with radially-movable wings and with steam-passages leading from one to the other, so that the steam may be properly conducted and applied.

This specification is the disclosure of one form of my invention, while the claims define the actual scope of the conception.

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 sectional view on the line 1 1 of Fig. 3. Fig. 2 is a sectional view on the line 2 2 of Fig. 3, Fig. 2 omitting the casing and cylinders and showing only the pistons and their trunnions. Fig. 3 is a sectional view on the line 3 3 of Fig. 1. Fig. 4 is a view of that section of the high-pressure piston that is not shown in Fig. 3. Fig. 5 is a sectional view on the line 5 5 of Fig. 1. Fig. 6 is a face view of that section of the low-pressure piston which is not shown in Fig. 5; and Fig. 7 is a sectional view of the casing or cylinders, the view showing the oiling-passages and steam-chambers of the cylinders.

The engine is mounted on a base 10, having pedestals 11, 12, and 13. The pedestal 11 has two arms 14 and 15. Revolubly mounted in the arm 14 is a hollow shaft 16, and revolubly mounted in the arm 15 is a hollow shaft 17, that incloses the shaft 16. The shaft 16 is fixed centrally in the low-pressure piston A, and the shaft 17 is fixed centrally in the high-pressure piston B. The low-pressure piston A is formed of two disk-like blocks 18 and 19, and the high-pressure piston B is formed of two disk-like blocks 20 and 21, the pistons A and B being held rigidly together by means of tie-bolts 22. Fixed to the outer face of the section 18 of the low-pressure piston A is a circular plate 23, which fixedly carries a rigid shaft 24, revolubly mounted in the pedestals 12 and 13 and carrying between said pedestals the balance-wheel 25. The outer face of the section 21 of the high-pressure piston B is provided with a circular plate 26, similar to the circular plate 23, but of less diameter than the plate 23. The casings or cylinders C and D are formed in one rigid structure having two heads or end plates 27, which are circularly orificed to receive the disks 23 and 26, so that a steam-tight joint is effected. The cylinders C and D are rigidly supported on the base 10.

The sections 20 and 21 of the high-pressure piston B are of uniform size and lie face to face, as shown in Fig. 1. The sections 20 and 21 each have two radially extending and registering passages 28, forming round openings receiving the reciprocal stems 29 of the wings of the high-pressure piston B. The piston B has two wings, each of which consists of a transversely-extending portion 30, rigidly attached to a cylindrical body portion 31. The body portions 31, respectively, run radially in enlarged passages 32, formed jointly in the sections 20 and 21 and having the passages 28 centrally coincident thereto. The section 20 of the high-pressure piston has a cavity 33 located centrally therein. The passage 33 communicates with grooves, two of which are formed in each inner face of the sections 20 and 21. The grooves register with each other to form for the high-pressure piston two passages 34, leading from the cavity 33 to the L-shaped passages 34^a, respectively formed in the wings of the high-pressure piston.

The passages 34^a of the high-pressure piston are designed to receive live steam from the passages 34 and deliver the steam laterally from the wings, so that the steam will react on the piston to turn the same. Each body portion 31 of the wings of the high-pressure piston is provided with a diagonally-extending passage 35, leading to a balance-chamber 36, formed jointly in the sections 20 and 21. The steam passing through the wings exerts itself in the direction of the arrows shown in Fig. 3, and to prevent the wings from binding against the piston and thus preventing the action of the wings the high-pressure piston is provided with the said balance-chambers 36, the steam forcing itself into these cham-

bers, so as to throw the wings back and prevent them from binding with the pistons.

The interior of the high-pressure cylinder D is provided with three concentric surfaces 37, and against these concentric surfaces the concentric periphery of the high-pressure piston bears. Intermediate of the surfaces 37 the interior of the cylinder D is provided with a series of cavities 38. The transverse portions 30 of the wings of the high-pressure piston bear continually against the inner surface of the high-pressure cylinder. When the wings are engaged with the concentric portions 37 of the high-pressure cylinder, the wings are forced down into the high-pressure piston. When the wings pass the concentric portions 37, the force of the steam acting on the stems 29 of the piston B throws the wings outward and causes them to travel through the eccentric portions 38 of the high-pressure cylinder. This obviates the necessity for metallic springs to force the wings out against the inner face of the cylinder. The steam passing out of the passages 34 will exert itself laterally within the spaces inclosed by the portions 37, thus turning the piston in the direction of the arrow shown in Fig. 3.

The low-pressure cylinder is composed of two sections 18 and 19, as before explained, and such sections are shaped to form two oppositely-extending radial passages 39, in which the stems 40 of the wings of the low-pressure piston respectively reciprocate. Each stem 40 is attached to a body portion 41, similar to the body portions 31 before described, the outer ends of the portions 41 carrying transversely-extending portions 42. Each wing of the low-pressure piston has a steam-passage 43 leading from a steam-feed port 44, formed in the sections 18 and 19 of the low-pressure piston A. Each wing of the low-pressure piston is also provided with a short passage 66, adapted to communicate with balance-chambers 46. The low-pressure cylinder A is constructed similarly to the high-pressure piston B, and has therefore three internal concentric portions 47. Between the concentric portions 47 the piston A has three eccentric portions forming cavities 48, in which the wings of the piston are adapted to swing and in which said wings may exert their pressure. The steam passing from the feed-ports 44 and through the passages 43 will escape laterally and react on the wings so as to turn the low-pressure piston in the direction indicated by the arrow in Fig. 5. When the wings move into the respective pistons, the steam is exhausted from the balance-chambers by means of the V-shaped ports 66, formed in the wings.

The high-pressure piston B is provided with two pairs of ports, (respectively designated 49 and 50.) The ports 49 lead to the feed-ports 44 of the low-pressure piston, and the ports 50 lead to passages 51, formed in the low-pressure piston and comprising the exhaust thereof. In the operation of the high-pressure piston a portion of the exhaust passes out through the ports 49 and runs to the ports 44 to feed the low-pressure piston. A second portion of the exhaust of the high-pressure piston passes out of the ports 50 and runs to the ports 51, which ports are the exhaust-ports of the low-pressure piston. Communicating, respectively, with the ports 51 and formed in the low-pressure piston are ports 52, that lead from the periphery of the low-pressure piston and carry the exhaust to the ports 51. The ports 51 run inward to the hollow shaft 16, with which they communicate and into which they discharge the exhaust.

In order to lubricate the pistons, I provide the following-described oiling devices: The high-pressure cylinder D is provided with three compression oil-cups 53, and each oil-cup 53 leads to a forked passage 54, each forked passage 54 leading to one of the three concentric portions 47 of the low-pressure cylinder. The arms of the passages 54 respectively lead to grooves 55, formed two in each concentric portion 47 of the low-pressure cylinder and running diagonally therein, so that the transverse portions of the wings of the low-pressure cylinder in swinging around said cylinder will not move in parallelism with the grooves 55 and thereby take the oil from the passages in excessive quantities. The plate 27 at the outer side of the low-pressure cylinder C is provided on its interior face with an annular groove 56, communicating with one groove 55 of each pair of said grooves. The remaining grooves of each pair 55 communicate with an annular lubricating-groove 57, formed in the web that connects the cylinders C and D with each other. The high-pressure cylinder D has three oil-cups 58, respectively leading to forked or V-shaped passages 59, that in turn communicate with diagonally-extending grooves 60, formed, respectively, in the concentric portions 37 of the high-pressure cylinder. One of the grooves 60 of each pair of grooves communicates with the groove 57, and the remaining groove of each pair of grooves 60 communicates with an annular groove 61, formed in the plate 27 at the outer face of the high-pressure cylinder. By these means the cylinders are effectively lubricated. In order to permit the cleaning out of the lubricating-passages, I provide the plates 27 with openings communicating with the passages 56 and 61 and normally closed by plugs 62. These plugs may be withdrawn and the grooves 56 and 61 readily reached to be cleaned.

Steam for the engine is fed to the shaft 17, the steam passing through a globe-valve 63. The globe-valve 63 is controlled by a governor 64, driven from the shaft 17 by a belt 65. By these means the amount of steam admitted to the engine is automatically regulated and the speed of the engine correspondingly controlled. The shaft 16 carries off the exhaust of the engine. The wings reciprocating in their respective pistons move with reference

to the steam-feed ports, so as to open and close said ports. When the wings move in, the steam-feed passages will be closed and no steam will escape through said passages. Consequently the steam will not act on the wings when the wings are moved inward. When the wings are moved outward, they register with the steam-feed passages and the steam passes through the wings and exerts its force for the operation of the engine. When the wings move in, they place the ports 66 in communication with the balance-chambers and exhaust said chambers.

Various changes in the form, proportion, and minor details of my invention may be resorted to without departing from the spirit and scope thereof. Hence I do not consider myself limited to the precise construction herein shown, but believe that I am entitled to all such variations as come within the terms of my claims.

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

1. In a rotary engine, the combination of a piston formed of two sections, each with matching orifices, a wing movable radially in said matching orifices, and a hollow shaft whereon the piston is mounted, the hollow shaft communicating with the pistons and leading the steam thereto.

2. A rotary engine, having a revoluble piston provided with a radially-extending passage having a balance-chamber in one wall thereof, and a wing slidable in said radially-extending passage and having a port leading to the balance-chamber to fill the same, the wing also having a port capable of communicating with the balance-chamber to exhaust said chamber.

3. The combination of a high-pressure and low-pressure cylinder, a high-pressure and a low-pressure piston respectively working in the cylinders, and a radially-movable wing carried by each piston, the high-pressure piston having two ports, one of which exhausts through the low-pressure cylinder and the other of which feeds to the live-steam passage of the low-pressure cylinder, and the low-pressure cylinder having an exhaust running into the first-named exhaust of the high-pressure cylinder.

4. In a rotary engine, the combination of two cylinders, a piston within each cylinder, wings carried by the pistons and coacting with the cylinders, and hollow shafts on which the pistons are carried, one shaft serving as a steam-supply and the other shaft serving as a steam-exhaust, one piston having passages leading from the steam-supply to the periphery of the piston, and said piston also having a passage leading to the remaining piston so that the exhaust-steam of the first piston is supplied to drive the second piston, and the said second piston having exhaust-passages leading to the exhaust and in communication with a similar passage from the first-named cylinder.

5. In a rotary engine, the combination of a piston having a passage therein and having a steam-port leading to said passage, a wing movable radially in the passage and having a steam-port capable of communicating with the port of the piston, the wing âlso having a diagonally-extending passage leading to a balance-chamber in the cylinder, and the wing also having a port in its outer portion capable of communicating with the balance-chamber whereby to exhaust the steam therefrom.

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