G. W. BARTLETT.

ROTARY ENGINE.

APPLICATION FILED DEC. 19, 1908.

957,860.

Patented May 17, 1910.

2 SHEETS—SHEET 1.

Fig. I.

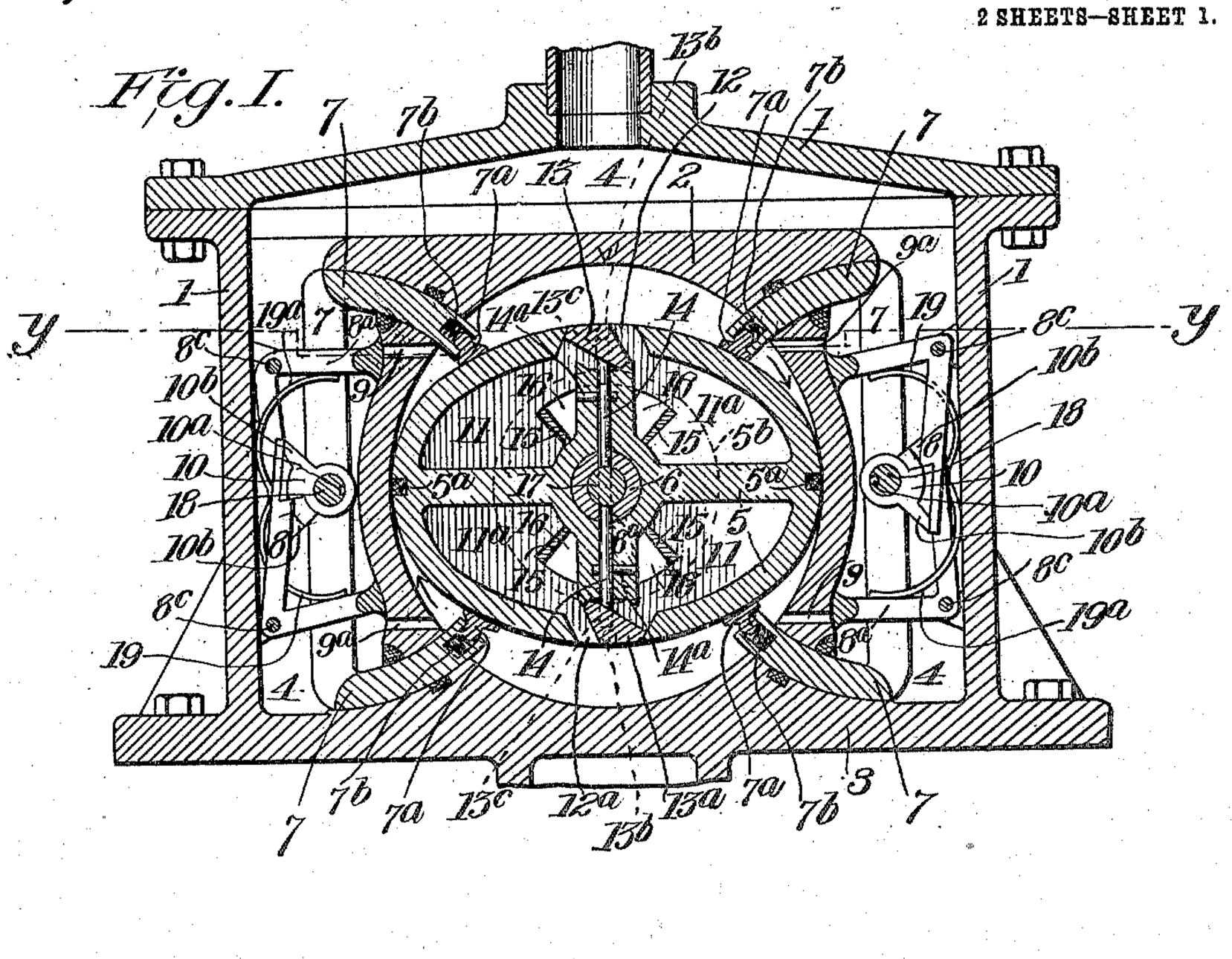

Fig. II.

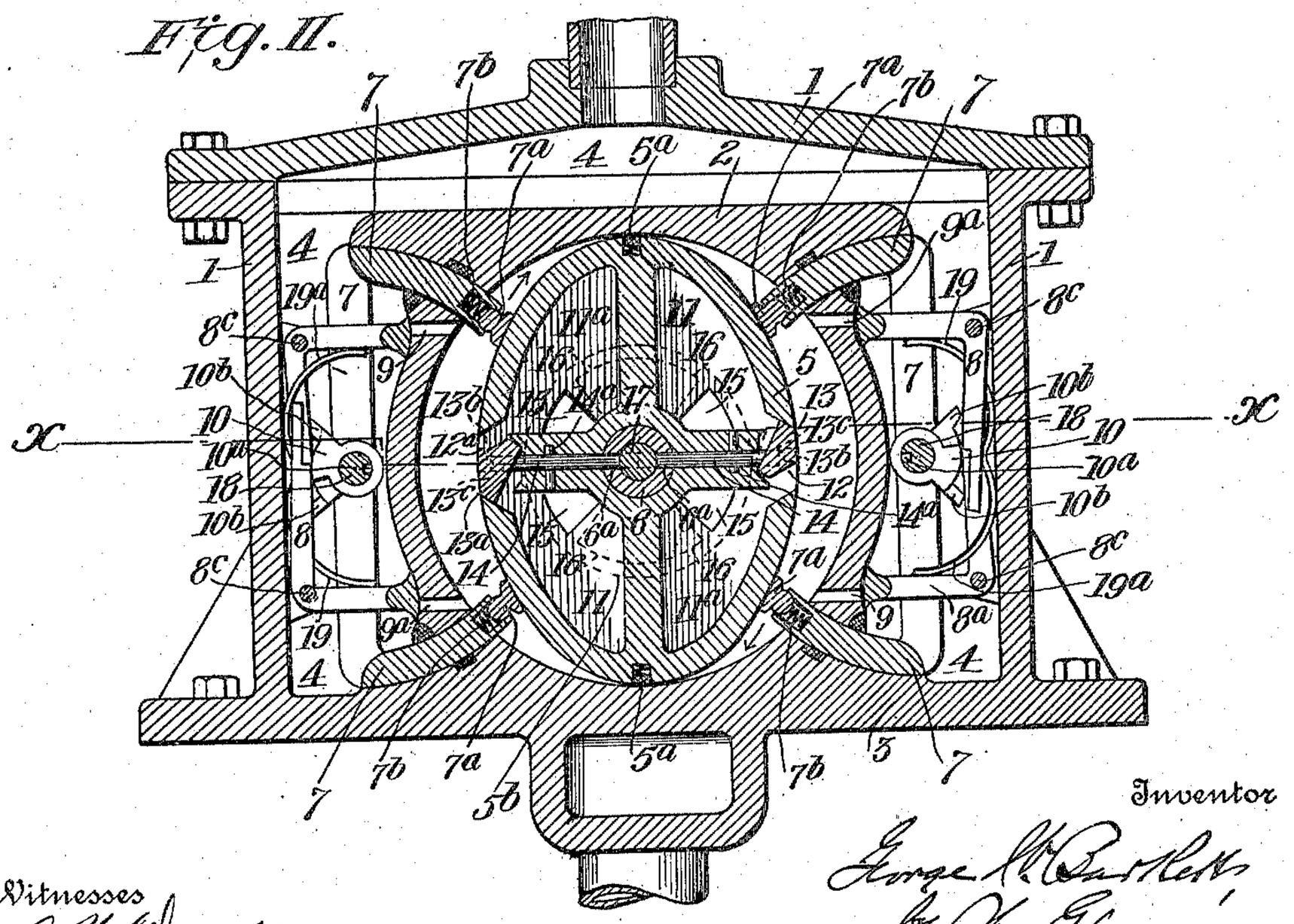

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Fig. III.

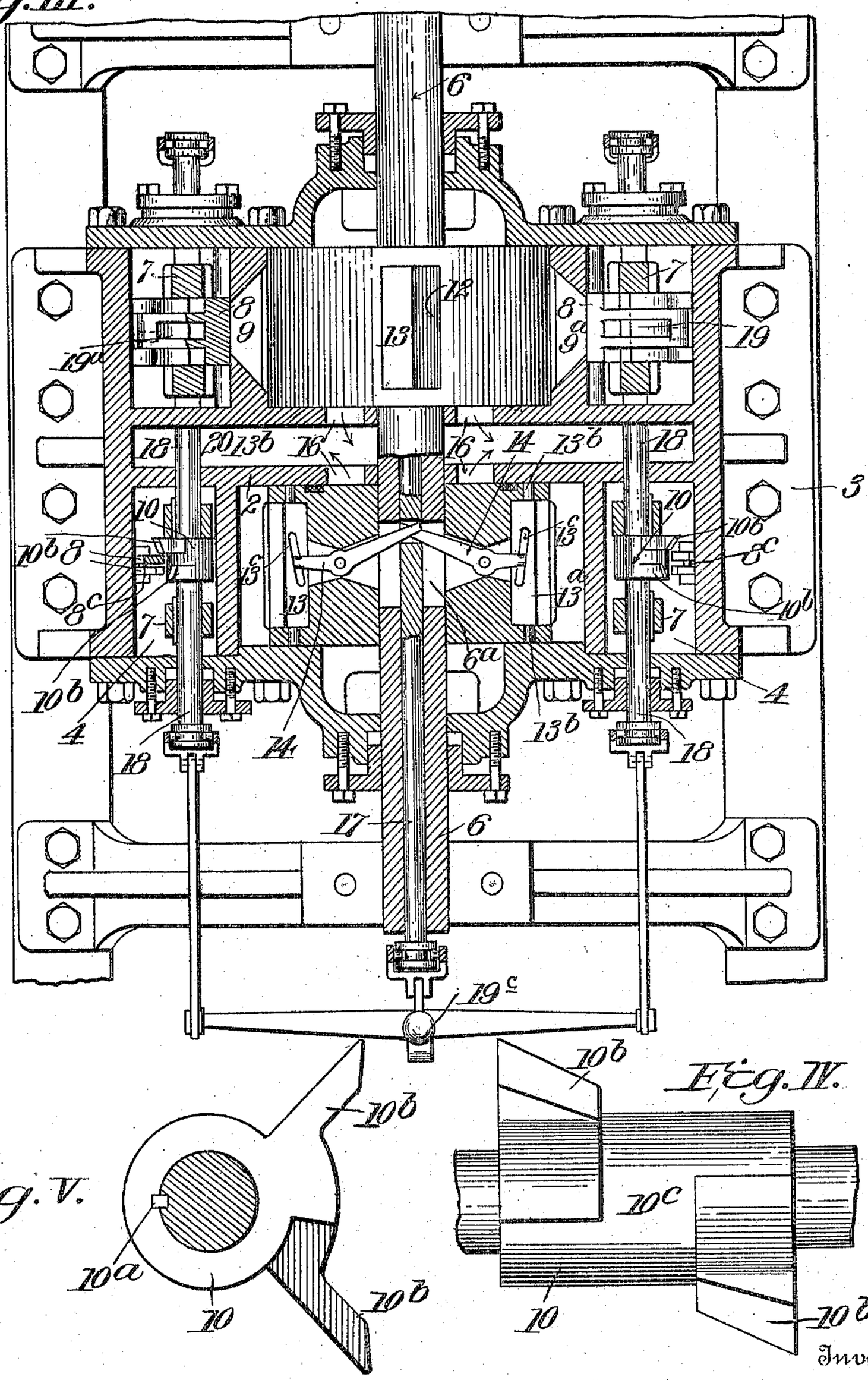


Fig. V.

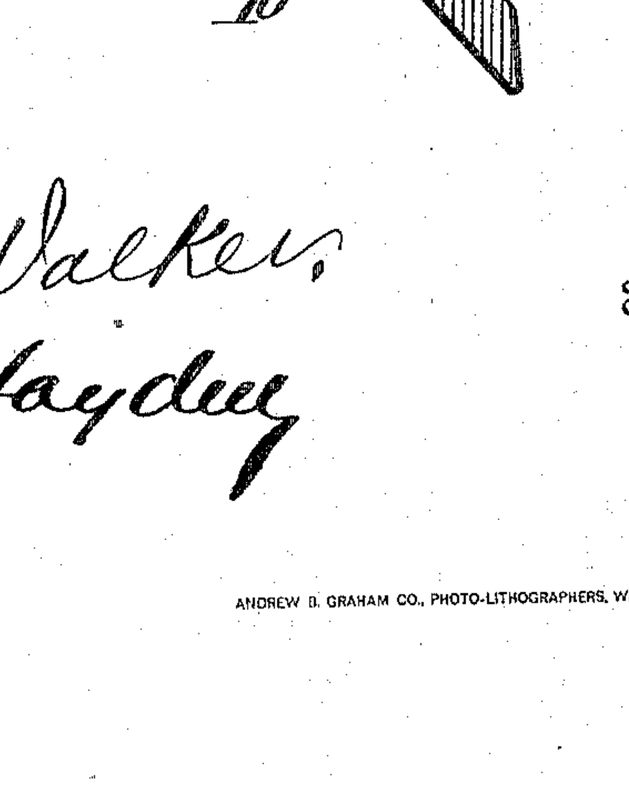
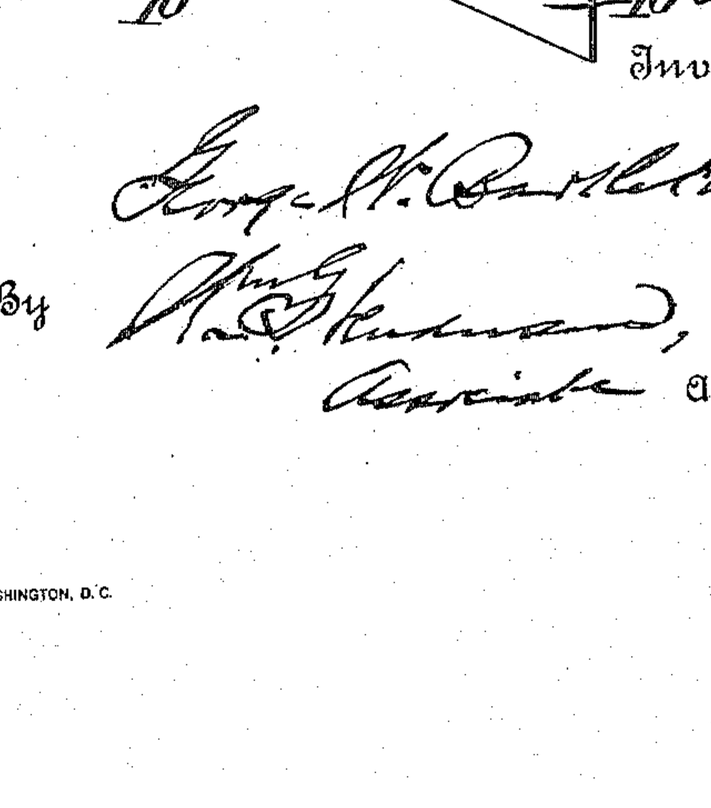


Fig. IV.



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UNITED STATES PATENT OFFICE.

GEORGE W. BARTLETT, OF TACOMA, WASHINGTON, ASSIGNOR TO GEORGE W. BARTLETT ROTARY ENGINE COMPANY, OF TACOMA, WASHINGTON, A CORPORATION OF WASHINGTON.

ROTARY ENGINE.

957,860. Specification of Letters Patent. Patented May 17, 1910.

Application filed December 19, 1908. Serial No. 468,383.

To all whom it may concern:

Be it known that I, GEORGE W. BARTLETT, a citizen of the United States, residing at the city of Tacoma, in the county of Pierce and State of Washington, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification.

My invention relates to improvements in rotary engines in which an elliptically shaped piston revolves within a cylinder between the ends of rigid oscillating wings, and the object of my invention is to produce a reversible rotary engine that will use steam expansively, reduce friction and waste of steam and have equal power when running forward or backward. I attain these objects by the mechanism illustrated in the accompanying drawings in which—

Figure I represents a vertical cross-section of the engine; Fig. II represents a vertical cross-section of the engine showing the elliptically shaped piston at right angles to that shown in Fig. I, which would be the position when two engines are mounted on the same shaft and constructed together. Fig. III represents a detailed horizontal view of the engine when built tandem, the part toward the top of the sheet being on the line *y—y* of Fig. I, showing a side view of the piston head and the exhaust chamber between the two, and the other part thereof on the line *x—x* of Fig. II, showing the internal reversing gear. Fig. IV is a longitudinal view of the cam which operates the valves controlling the admission of steam through the cylinder; and Fig. V is a cross section of the cam shown in Fig. IV.

Similar figures refer to similar parts throughout the several views.

The casing 1 inclosing the cylinder 2 and joined to the base 3, makes the steam chest space 4. The elliptically shaped piston 5 is mounted upon the shaft 6 and is embraced in the wings 7. The valves 8 and 8ª automatically admit and cut off steam through the ports 9 and 9ª by reason of the operation of the cams 10, keyed to the shaft, and which are shown in detail in Figs. IV and V, and rock with the wings 7. The piston 5 is divided into four chambers 11 and 11ª. At the minor axis the face wall of the piston is cut making the openings or ports 12 and 12ª. In these openings are valves 13 and 13ª which are pivoted by pintles 13ᵇ to the sides of the piston, so that the movement of the rods 14, pivoted on the pivot pins 14ª, (which engage in a slot 13ᶜ in each of the valves 13 and 13ª and also with a center shaft 17 capable of sliding longitudinally within the main shaft 6 of the engine) will cause the valves 13 and 13ª to close the open, and open the closed part of the ports 12 and 12ª. The chambers 11 and 11ª in the piston are constructed to receive and contain the steam as it expands into them through the ports 12 and 12ª as the piston revolves and before it is exhausted therefrom through the ports 15 which do not engage with ports 16 until the piston has traveled a little over one-eighth of the circle of the cylinder after the apices thereof leave steam ports 9ª. The ports 15 are made in the side of the piston and lead out of the chambers 11 and 11ª therein to permit the steam to exhaust through openings 16, which are cut through the inner cylinder head when during the revolution of the piston the ports 15 register with the openings 16, allowing the steam to exhaust through ports 16 to the exhaust chamber 20.

At the ends of the wings 7 are shoes 7ª which ride on the face of the piston and as they wear are set out by springs 7ᵇ. In the ends of the piston are also shoes 5ª which ride flush with its face, are set out by springs and take up what wear there may be.

Encircling the ports 15 is a packing ring 5ᵇ in the piston which effectively prevents steam from escaping to the exhaust ports 16 until the ports 15 coincide with them.

The valves 8 and 8ª are each made in one piece and are pivoted at 8ᶜ. As the wings 7 rock up and down with the movement of the piston they rock the shafts 18 and the cams 10 attached thereto (the wings 7 being feathered to the shaft 18) thereby permitting the shaft to slide through wings 7 and carry the cams 10 (fastened to them with keys 10ª) and engage or disengage valves 8 or 8ª. When the engine is positioned as in Fig. I it is taking steam through the ports 9 and 9ª (being at diagonally opposite sides of the piston). As the impulse of the steam moves the apices of the piston in the direction of the arrows the wings 7 rock so that when the apices of the piston are under the ends of the wings nearest the steam ports 9, the shoes ride flush with the surface of the cylinder and the opposite ends of the wings are opposite the ports 12

and 12ª. At this position the wings 7 are rocked down to their limit and in so doing have caused the cams 10 to disengage the valves 8 by the wedge shaped lugs 10ᵇ of the cams swinging from under the ends of valves 8. Thereupon the springs 19 force the valves 8 back over the steam ports 9ª. The cams 10 can be positioned so as to admit any amount of steam desired, and by automatically cutting off through the action of the cams and springs as above mentioned will permit the steam to expand against the piston face until the apices of the piston reach the ends of the wings nearest ports 9. When the apices of the piston pass these ports the steam between the ends of the wings enters the openings 12 and 12ª and further expands imparting its propelling force against the walls of chambers 11ª until the ports 15 engage the openings 16, which would occur just after the apex of the piston passed the point marked V at the top of the cylinder in Fig. I. While the engine is running as above described the springs 19ª and valves 8ª are inactive, said valves resting upon the idler portion of the cam 10ᶜ keeping ports 9 closed at all times during the aforesaid movement.

The elliptical piston should be made in the proportion of 15⅛ inches as the length of its short axis and 21 inches as the length of its long axis, or approximately so, with a graduated curved circumference. To make the wings of proper proportion for the above described piston a circle is made with a diameter of 21 inches, and from the line of the diameter of the circle at its circumference 11½ inches is measured from both sides in the same direction and form the projecting portions of the wings. The wings are pivoted in their center at points 3⅝ inches, or substantially so, distant from the inner surface of the cylinder on the extension of the diameter line thereof. The piston when revolving between the ends of the wings (which are 90° apart in the cylinder) will have its surface at all times touched by the ends of the wings and will not at any point in the revolution of the piston bind between the ends of the wings upon the face of the piston. The wings are made in one piece and rigid and of very strong material to prevent any springing in them when steam is applied as above described and by this method of construction a solid buttress is provided for the steam to work against. The inner circumference of the cylinder is made with a diameter of 21 inches in which the piston revolves.

The engine is reversed by pulling the reverse lever 19ᶜ which draws forward the shaft 17 thereby moving the rods 14 which run through a slot 6ª in the main shaft 6 and engage in slots 13ᶜ running diagonally across valves 13 and 13ª thereby changing those valves, so they close the former open portion of the ports 12 and 12ª and open the formerly closed portion thereof, and at the same time pulling the shafts 18 and the cams 10 attached thereto from under the valves 8 (which fall upon the idler of the cam) and engage valves 8ª. The steam is then taken through ports 9 and the piston revolves in the opposite direction from that first described, and all other operations are the same as first described except the opposite side of the engine is the one in operation.

Ordinary packing is employed about the wings, shafts, steam chest and where needed.

Any number of engines such as above described can be mounted upon a shaft and started or reversed simultaneously, but for ordinary convenient working two engines as arranged in Fig. 3 is satisfactory, and by reason of the pistons being placed with their greater diameters at right angles to each other, the engine has no dead center point.

I have described with particularity the preferred details of the form of the invention illustrated but changes may be made in the form of the various parts without departing from the spirit of the invention and also be embraced within the scope of the appended claims.

Having described my invention and set forth its merits, what I claim is:—

1. A rotary engine comprising an elliptically shaped piston, oscillating wings disposed at opposite ends of the piston and bearing against the periphery thereof, a cylinder inclosing said piston, and formed with valve-controlled ports for the admission of steam into the cylinder between the piston and wings on opposite sides of the piston at diagonally opposite points, substantially as described.

2. A rotary engine comprising an elliptically shaped piston, oscillating wings at opposite ends of the piston and bearing against the periphery thereof, a cylinder inclosing said piston and formed with steam inlet ports opening into spaces between the piston, cylinder and oscillating wings at opposite ends of the piston, valves arranged to control said ports, and means for actuating said valves to close the several ports, or open one set of diagonally disposed ports, substantially as described.

3. A rotary engine comprising an elliptically shaped piston formed with a plurality of internal chambers each having a steam inlet and steam exhaust port, and a cylinder inclosing said piston and formed with steam inlet ports, the inlet ports of the piston and of the cylinder being so disposed in relation to each other that when the ports of the piston are brought in communication with the steam spaces in the cylinder steam will pass into the chambers of the piston com-

municating therewith, substantially as described.

4. A rotary engine comprising an elliptically shaped piston formed with a plurality of internal chambers each having a steam inlet and a steam exhaust port, oscillating wings at opposite ends of the piston and bearing against the periphery thereof, a cylinder inclosing said piston and formed with steam inlet ports opening into spaces between the piston, cylinder and oscillating wings at opposite ends of the piston, valves controlling said ports, and means for actuating said valves to close one set of diagonally disposed ports, the inlet ports to the piston chambers being so disposed in relation to the inlet ports of the cylinder that when the piston ports are between the oscillating wings steam admitted through the ports of the cylinder will pass into chambers of the piston and exert an impelling force therein and exhaust from said chambers, substantially as described.

5. A rotary engine comprising an elliptically shaped piston formed with a plurality of internal chambers each having an inlet and an exhaust port, a cylinder inclosing said piston and having inlet ports, valves controlling the inlet ports to the chambers of the piston, and means for actuating said valves to direct steam into one or another of said chambers in the movement of said valves, substantially as described.

6. A rotary engine comprising an elliptically shaped piston formed with a plurality of internal chambers each having an inlet and an exhaust port, a cylinder inclosing said piston and having inlet ports, valves controlling the inlet ports to the chambers of the piston, and means for actuating said valves to direct steam into alternately disposed chambers of said piston and cut-off the steam from other alternately disposed chambers, substantially as described.

7. A rotary engine comprising an elliptically shaped piston, oscillating wings at opposite ends of the piston and bearing against the periphery thereof, a cylinder inclosing said piston and formed with steam inlet ports opening into the spaces between the piston, cylinder and wings, valves for controlling said ports, rotatable shafts at opposite ends of the piston cylinder upon which said wings are mounted, and cams upon said shafts and operatively connected with said valves to actuate them for the admission and cut-off of steam to and from said ports, substantially as described.

8. A rotary engine comprising a piston formed with a plurality of internal chambers each formed with an inlet port, valves for said ports, a rod operatively connected with said valves for cutting-off the supply of steam to certain of the chambers and admitting it to others, a cylinder inclosing the piston and formed with inlet ports for steam, valves controlling said ports, shafts provided with cams operatively connected with said valves for controlling the inlet of steam, and means for actuating the rod connected with the piston valves and the shafts carrying the actuating cams of the cylinder-valves to shift the valves to change the direction of flow of steam and reverse the engine, substantially as described.

9. A rotary engine comprising an elliptically shaped piston, a cylinder inclosing said piston and formed with inlet ports so disposed that steam may be admitted to opposite sides of the piston, oscillating wings having portions passing through the cylinder to embrace a plurality of said ports within the space between said portions and bearing against the piston, said wings being unyielding throughout their length but capable of oscillation, valves for controlling the inlet ports, and means for actuating said valves to open diagonally disposed ports for admitting steam at opposite sides of the piston, said wings and piston being so relatively proportioned that the piston may freely rotate in constant contact with the cylinder and wings without binding on either, substantially as described.

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

GEORGE W. BARTLETT.

Witnesses:
L. H. Higgins,
I. H. Hill.