

No. 744,542.

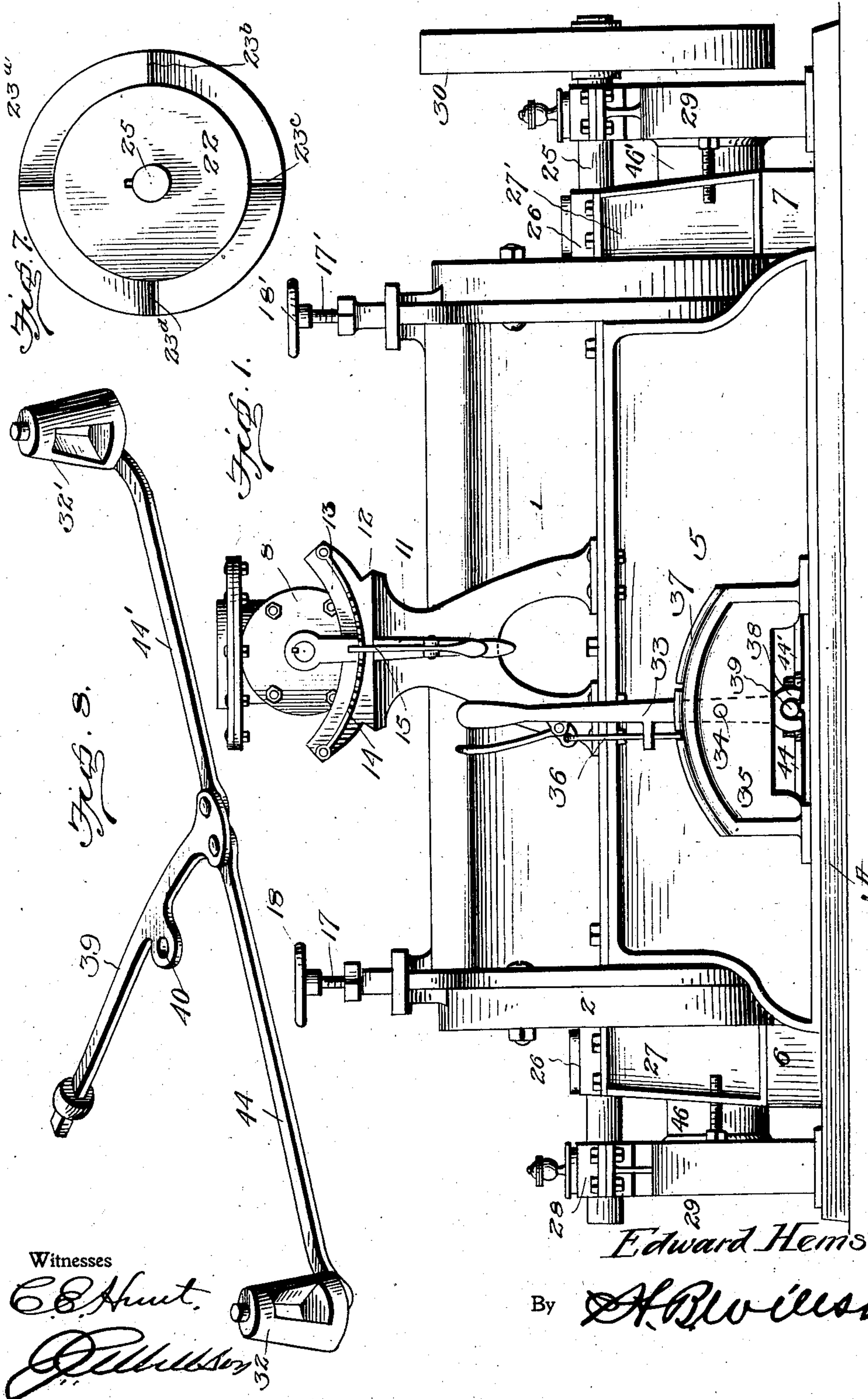
PATENTED NOV. 17, 1903.

E. HEMSTROM.
REVERSIBLE ROTARY ENGINE.

APPLICATION FILED AUG. 31, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



No. 744,542.

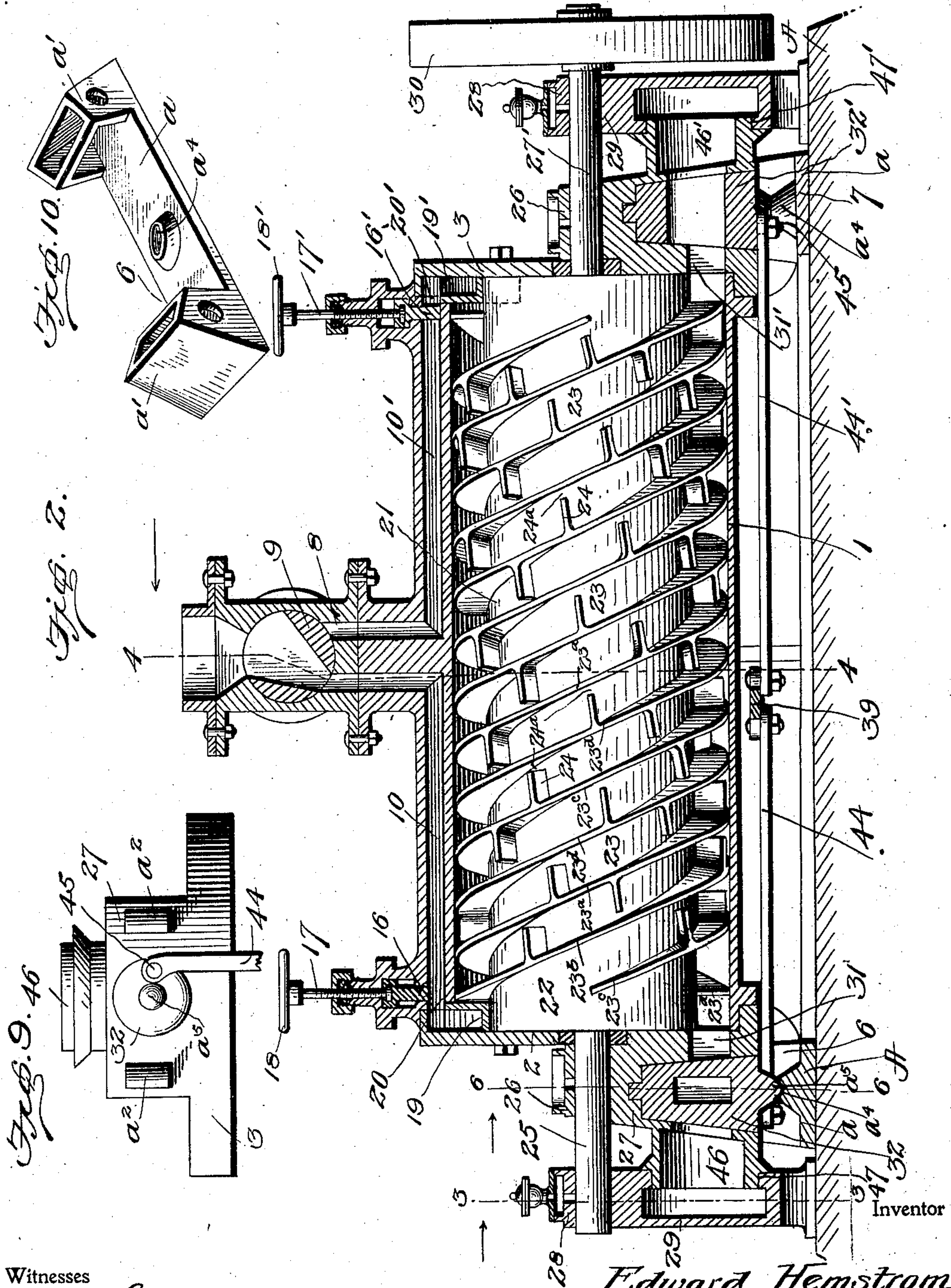
PATENTED NOV. 17, 1903.

E. HEMSTROM.
REVERSIBLE ROTARY ENGINE.

APPLICATION FILED AUG. 31, 1903.

NO MODEL.

3 SHEETS—SHEET 2.



Witnesses

C. E. Hunt.
A. B. Wilson

By

Edward Hemstrom

A. B. Wilson

Attorney

No. 744,542.

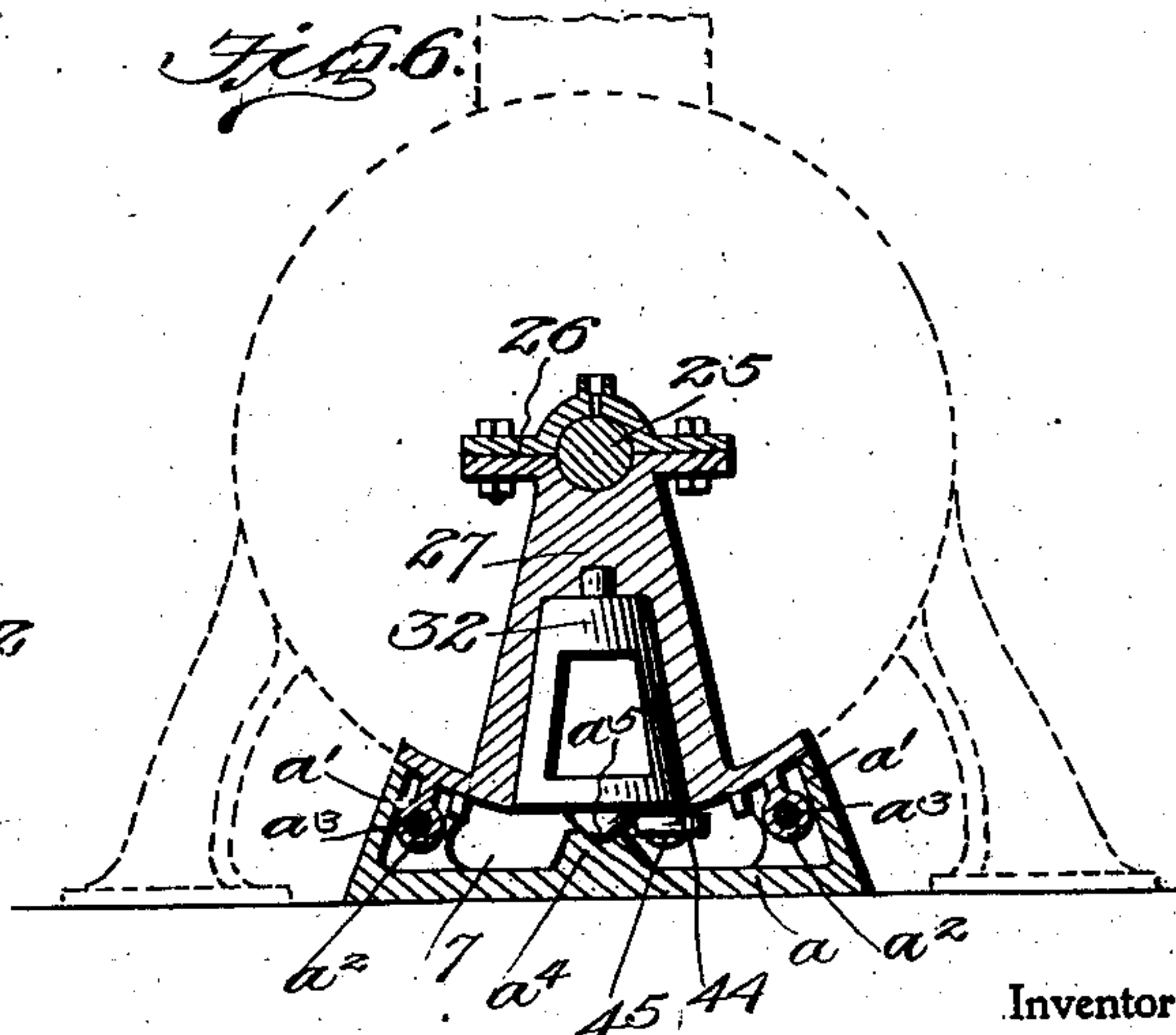
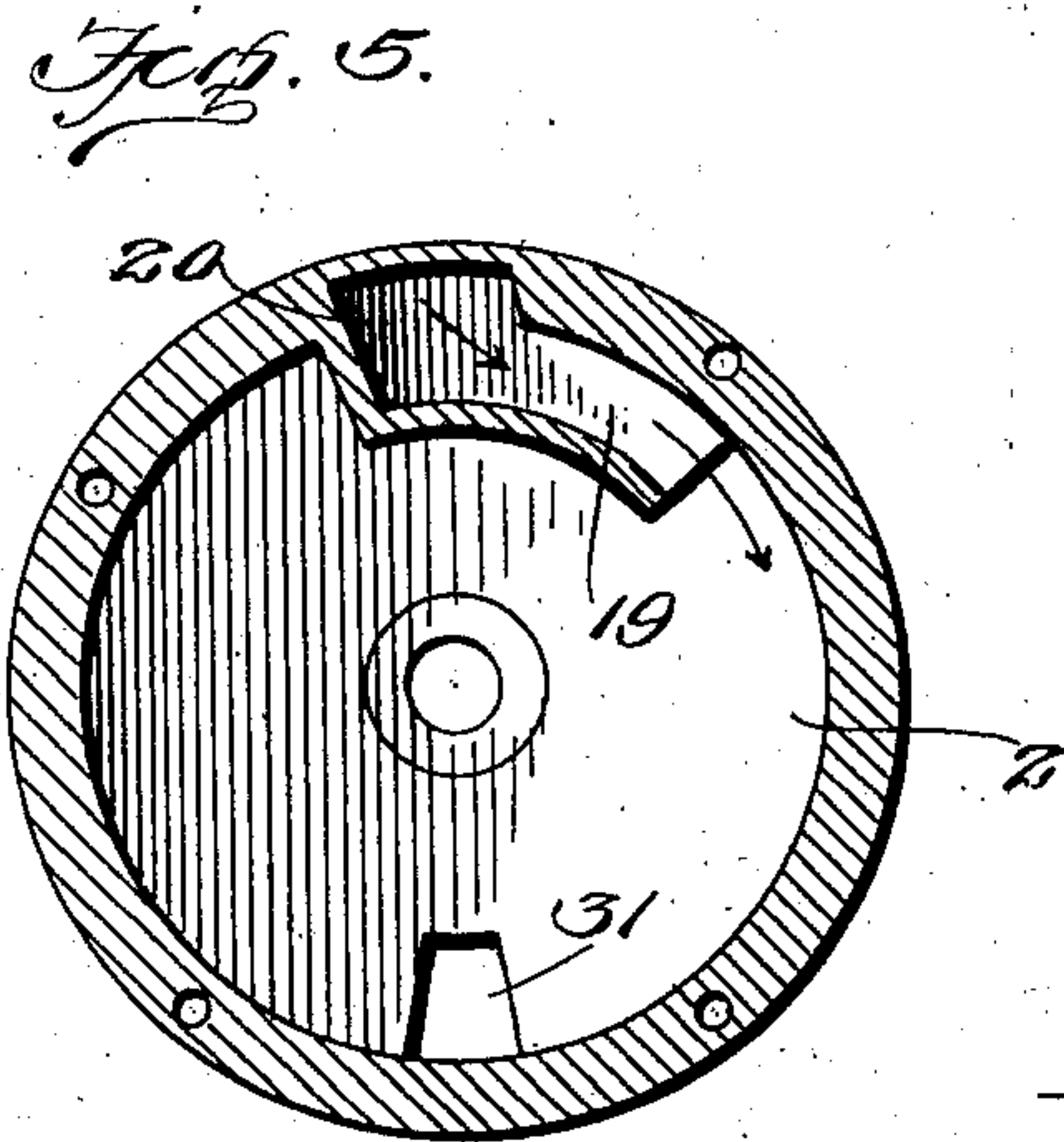
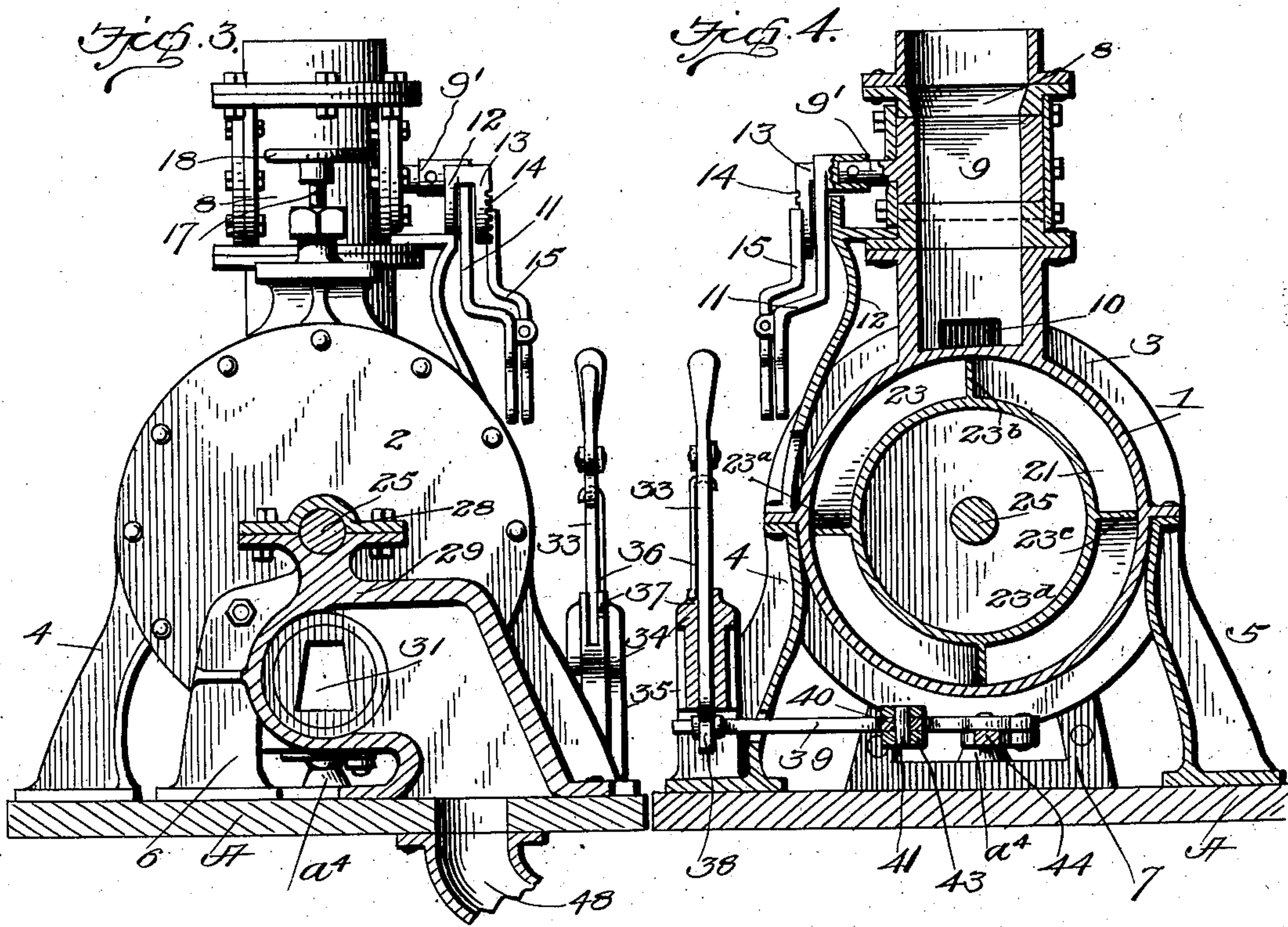
PATENTED NOV. 17, 1903.

E. HEMSTROM.
REVERSIBLE ROTARY ENGINE.

APPLICATION FILED AUG. 31, 1903.

NO MODEL.

3 SHEETS—SHEET 3.



Inventor

Edward Hemstrom

Witnesses

C. E. Hunt

J. P. Wilson

By

A. B. Wilson

Attorney

UNITED STATES PATENT OFFICE.

EDWARD HEMSTROM, OF GREATFALLS, MONTANA.

REVERSIBLE ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 744,542, dated November 17, 1903.

Application filed August 31, 1903. Serial No. 171,447. (No model.)

To all whom it may concern:

Be it known that I, EDWARD HEMSTROM, a citizen of the United States, residing at Greatfalls, in the county of Cascade and State of Montana, have invented certain new and useful Improvements in Reversible Rotary Engines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a reversible rotary steam-engine, having for its object the production of a simple, reliable, and efficient engine of this character; and it consists of the features of construction hereinafter fully described, and particularly defined in the appended claims.

In the accompanying drawings, Figure 1 is a view in side elevation of a reversible rotary steam-engine embodying my invention. Fig. 2 is a central vertical longitudinal section thereof. Fig. 3 is a cross-section through the engine on line 3 3 of Fig. 2. Fig. 4 is a cross-section on line 4 4 of Fig. 2. Fig. 5 is a cross-section through one of the cylinder-heads. Fig. 6 is a cross-section on line 6 6 of Fig. 2. Fig. 7 is an end view of the rotary piston. Fig. 8 is a perspective view of the exhaust-valves and their actuating devices. Fig. 9 is a bottom plan view of one of the heads, and Fig. 10 is a perspective view of one of the head-blocks.

Referring now more particularly to the drawings, 1 represents a horizontal engine-cylinder closed at its ends by heads 2 and 3 and secured at the sides to side frames 4 and 5, flanged to rest upon the bed-plate A. Upon these frames 4 and 5 and end head-blocks 6 and 7 the cylinder is mounted to rest with its bottom elevated a short distance above the bed-plate A.

Mounted upon the central portion of the cylinder is a steam-chest or throttle-valve casing 8, in which is a rotary throttle-valve 9, adapted to be adjusted to allow steam to flow through passages 10 10' to either end of the cylinder. The valve 9 is provided with a stem 9', to which is attached an operating hand-lever 11, which swings in a guideway formed between the upper portion of a bracket 12, secured upon one side of the cyl-

inder, and a segmental strip 13, secured to the said upper portion of the bracket, the said strip being provided with rack-teeth 14, adapted to be engaged by a pawl or dog 15, carried by a lever 11, whereby the latter may be locked in adjusted position. The flow of steam through the passages 10 10' is further controlled by vertically-sliding gate-valves 16 16', arranged at the ends of the cylinder, said valves being adjustable through the medium of the screw-stems 17 17' and their hand-wheels 18 18' to directly control the supply of steam from the ends of the passages to the cylinder. On the inner sides of the heads 2 and 3 are hollow bosses 19 19', having ports 20 20', communicating with the cylinder. Each of these bosses, which forms a steam-conductor, is closed at one end and open at the other end, as clearly shown in Fig. 5, the open ends constituting ports through which the steam from passages 10 10' discharges into the cylinder. The conductor 19 extends toward one side of the cylinder and the discharge-port 19' toward the other side, and consequently discharge steam on opposite sides of the longitudinal center line thereof.

In the cylinder is disposed a piston-wheel or turbine 21, which closely conforms to the internal diameter of said cylinder and comprises a rotary head 22, having a spiral steam-channel 23, provided with the wings or abutments 24, which receive the impact of the steam. This channel 23 is shown in the present instance as being composed of a series of four parallel spiral flanges 23^a, 23^b, 23^c, and 23^d, whose ends project in opposite directions at the opposite ends of the piston, thus forming inlets and outlets for the admission and exhaust of steam to and from the channel. Hence steam admitted at either end may enter the channel through either of the four entrances to the channel, which will thus take steam on each quarter-revolution of the piston. This construction also insures that one of the ports at either end will always be in position to take steam, as will be readily understood. The wings or abutments 24 are peculiarly disposed. As shown, they project longitudinally of the cylinder and alternately from opposite sides of the channel throughout the length thereof and are of less length than the width of the channel, so as to form

steam-passages 24^a first on one side and then on the opposite side of the channel, thereby causing the steam to take a sinuous or tortuous course and first impinge against one wing, then expand through a passage into the pocket between said wing and the next wing in advance, and then to act on the latter wing, and so on throughout the course of the channel, thereby forcing the piston to rotate in one direction or the other, according to the end at which the steam is admitted.

The head 22 is keyed or otherwise fastened to the engine-shaft 25, which is journaled at its ends in bearings 26 upon the upper ends of exhaust-valve casings 27 27', formed upon the heads 2 and 3, and in bearings 28 on pillow-blocks 29, resting on the bed-plate A outside the said heads 2 and 3. On one end of this shaft is a fly-wheel 30.

In the heads 2 and 3 and their respective casings 27 27' are exhaust-ports 31 31', controlled by rotary exhaust-valves 32 32'. These valves are of the plug type and turn within proper seats in the casings 27 27', which seats intersect the ports 31 31' and open exteriorly through the bases of the said casings immediately above the head-blocks 6 and 7. These blocks 6 and 7 consist each of a plate *a*, having at its ends hollow bosses or sockets *a'*, disposed at an inward angle and adapted to receive coupling-eyes *a''* on the base of the superposed exhaust-valve casing, the sides of the said bosses or sockets being pierced for the passage of bolts *a'''* or other suitable fastenings which secure the parts together. Between the bosses or sockets the block carries a bearing *a''''*, in which turns a journal *a'''''* on the lower end of the valve. It will thus be observed that upon detaching the heads 2 and 3 and removing the blocks 6 and 7 fastened thereto the exhaust-valves may be readily removed for cleaning, repairs, or replacement.

The exhaust-valves 32 32' are simultaneously adjusted to open one and close the other, and vice versa, by means of a lever 33, pivoted at 34 in a guide-frame 35 on one side of the cylinder and having a pawl 36 to engage a rack 37 on said frame to lock it in adjusted position. The lower end of this lever is forked or bifurcated, as at 38, to engage the outer end of a transverse rod or bar 39, which is formed intermediate its ends with a lateral eye or offset 40 to receive a pivot 41, by which it is pivoted to a bracket 43, carried by the cylinder 1 or the side frame 5, to swing in a direction longitudinally of the engine. The said outer end of the rod or bar 39 works in a longitudinal slot in the frame 5 and is pivotally connected at its inner end to the inner ends of connecting-rods 44 44', disposed between the bed-plate and cylinder and connected at their outer ends to eccentric crank or wrist pins 45 on the lower ends of the valves 32 32', so that the movement of the lever 33 in one direction will open valve 32 and close valve 32' and a reverse move-

ment of said lever will open valve 32' and close valve 32.

The exhaust-valve casings 27 27' have discharge-pipes 46 46', receiving the exhaust-steam from the ports 31 31'. These pipes enter openings 47 47' in the sides of the pillow-blocks 29 29', which blocks are hollow or chambered, as clearly shown in Figs. 1 and 3. The exhaust-steam enters the block and discharges through the bottom thereof into an exhaust-pipe 48, which conveys it to a suitable point of discharge. By this means the exhaust-steam may be conducted through the engine-frame and concealed piping to the atmosphere.

In operation the adjustment of the throttle-valve 9 and gate-valve 16 to admit steam through passage 10 and the opening of the valve 32' will cause the steam to pass into the piston-channel 23 from one end of the cylinder and rotate the piston in one direction and finally exhaust through pillow-block 29' to the atmosphere. A reverse adjustment of valve 9 and the closing of valves 16 and 32' and opening of valves 16' and 32 will, on the contrary, permit steam to flow through passage 10' to the other end of the channel 23 and rotate the piston in the reverse direction and finally exhaust through pillow-block 29 to the atmosphere. Thus it will be seen that the engine may be driven in either direction at will.

Any desired form of governor may be used to control the operation of the engine.

From the foregoing description, taken in connection with the accompanying drawings, the construction and operation of the invention will be readily understood without requiring a more extended explanation.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

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

1. In an engine of the character described, a cylinder provided with exhaust-ports at its opposite ends, exhaust-valves governing the said exhaust-ports, and means for simultaneously closing one exhaust-valve and opening the other exhaust-valve, said means comprising a lever, a swinging rod or bar actuated thereby, and rods pivoted to the rod or bar and eccentrically connected to the valves.

2. In an engine of the character described, a piston provided with a spiral steam-channel formed by a series of parallel spiral flanges, and wings or abutments extending alternately from opposite sides of the channel and shorter than the width of the channel to form steam-pockets and alternately opposite restricted passages between them providing a sinuous or tortuous conduit for the flow of the steam, substantially as described.

3. In an engine of the character described,

the combination of a cylinder provided with steam-passages to the opposite ends thereof, and also having exhaust-ports at its ends, a piston in said cylinder provided with a spiral steamway, heads closing the ends of said cylinder and provided with reversely-projecting steam-conductors communicating with said passages and discharging on opposite sides of the center line of the cylinder, hollow pillow-blocks communicating with the exhaust-ports, exhaust-valves governing said exhaust-ports, and means for simultaneously closing one exhaust-valve and opening the other exhaust-valve, substantially as described.

4. In an engine of the character described, a cylinder having heads provided with exhaust-chambers, pillow-blocks communicating with said chambers, and exhaust-valves

in said exhaust-chambers, substantially as described.

5. In an engine of the character described, a cylinder having heads provided with exhaust-chambers open at their lower ends, pillow-blocks communicating with said chambers, head-blocks secured to the exhaust-chambers and provided with bearings, rotary exhaust-valves in the chambers provided at their lower ends with journals turning in said bearings, and means for operating said valves, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDWARD HEMSTROM.

Witnesses:

R. E. WILLIAMS,
JOS. MCCrackEN.