No. 798,295. PATENTED AUG. 29, 1905.

I. F. PARMENTER.

ROTARY ENGINE.

APPLICATION FILED JAN. 24, 1905.

5 SHEETS—SHEET 1.

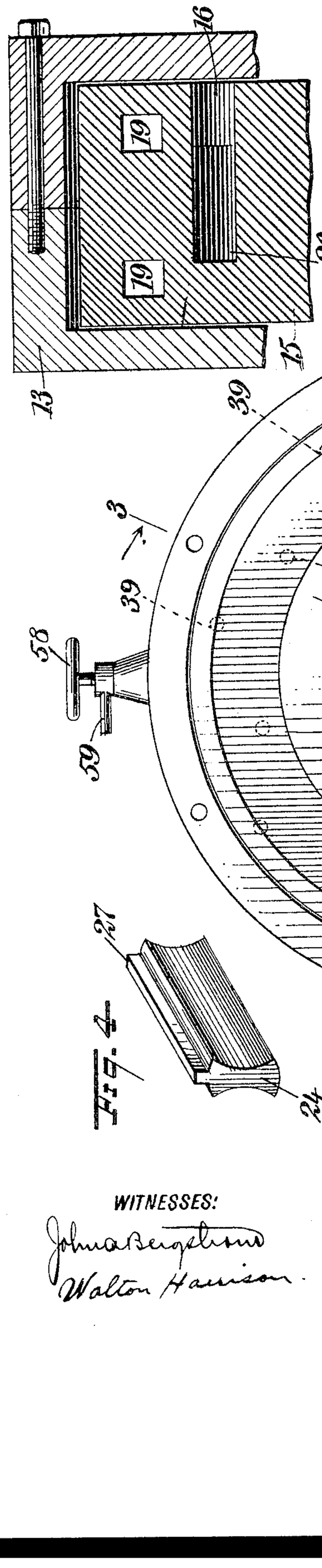

FIG. 2.

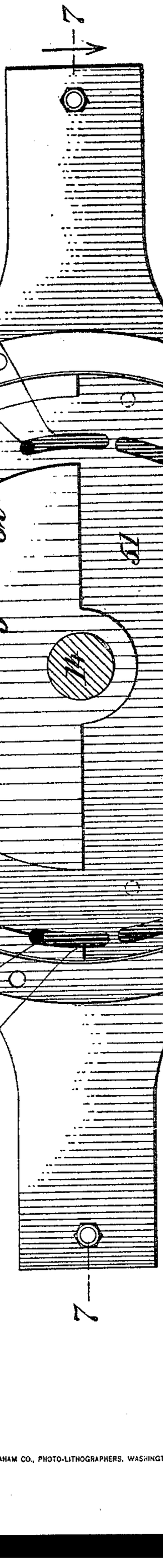

FIG. 3.

FIG. 4.

WITNESSES:

John A. Bergstrom

Walton Harrison

INVENTOR

Isaac F. Parmenter

BY Munn & Co.

ATTORNEYS

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5 SHEETS—SHEET 2.

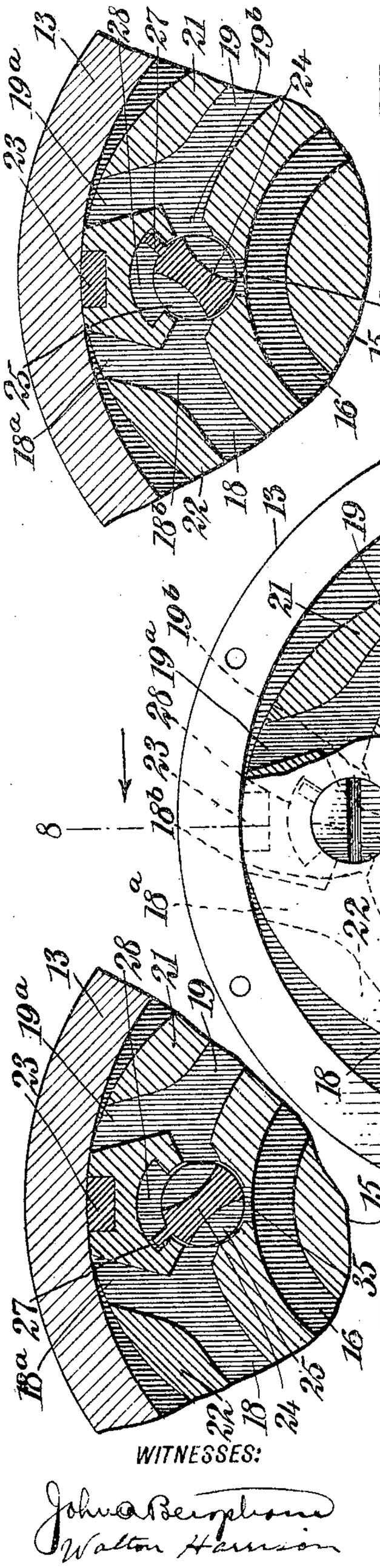

FIG. 6.

FIG. 7.

FIG. 5.

WITNESSES:

John A. Berglund

Walton Harrison

INVENTOR

Isaac F. Parmenter

BY

Munn & Co.

ATTORNEYS

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5 SHEETS—SHEET 3.

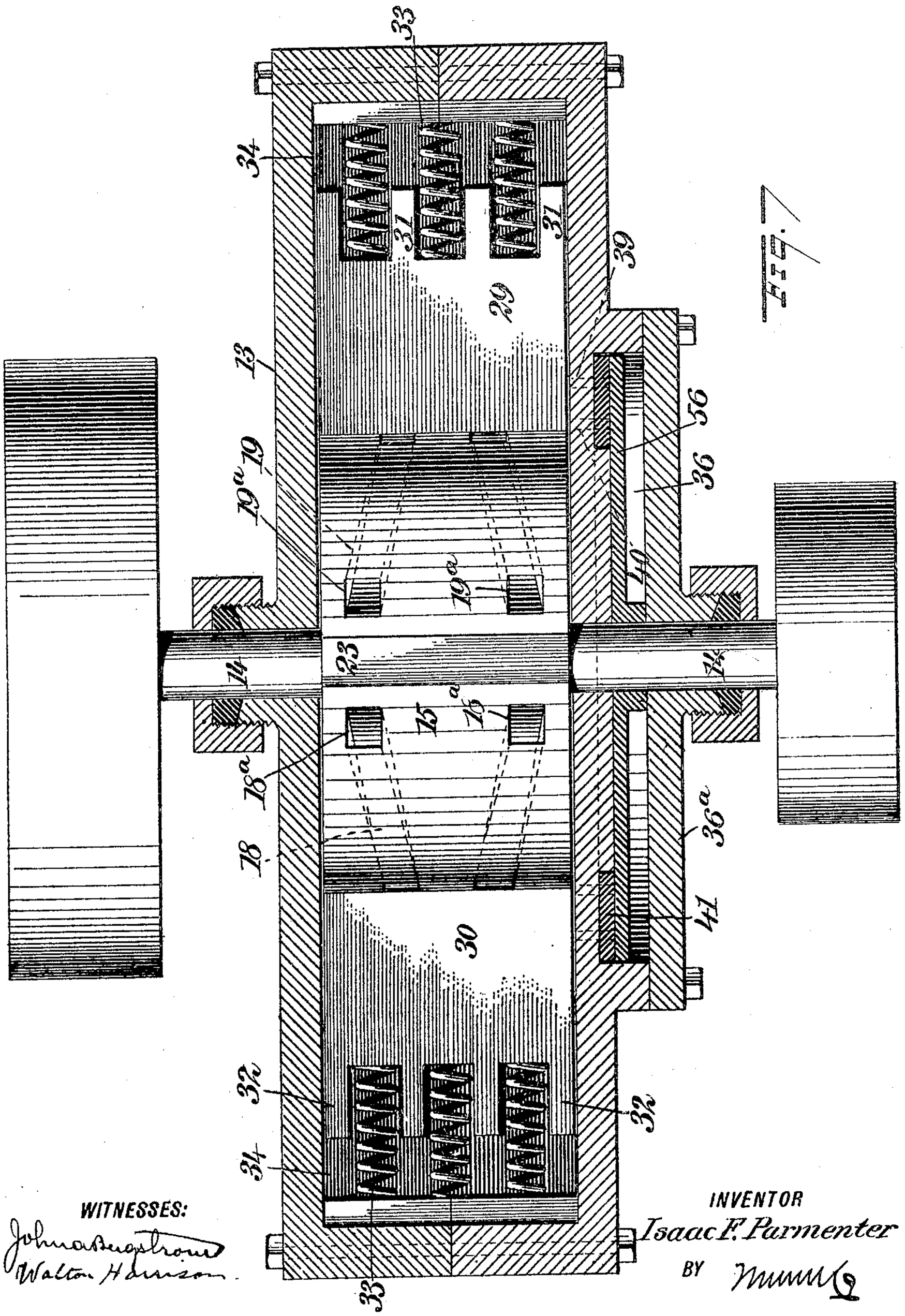

Fig. 1.

WITNESSES:

John A. Brogstrom

Walter H. Harrison

INVENTOR

Isaac F. Parmenter

BY Munn & Co

ATTORNEYS

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5 SHEETS—SHEET 4.

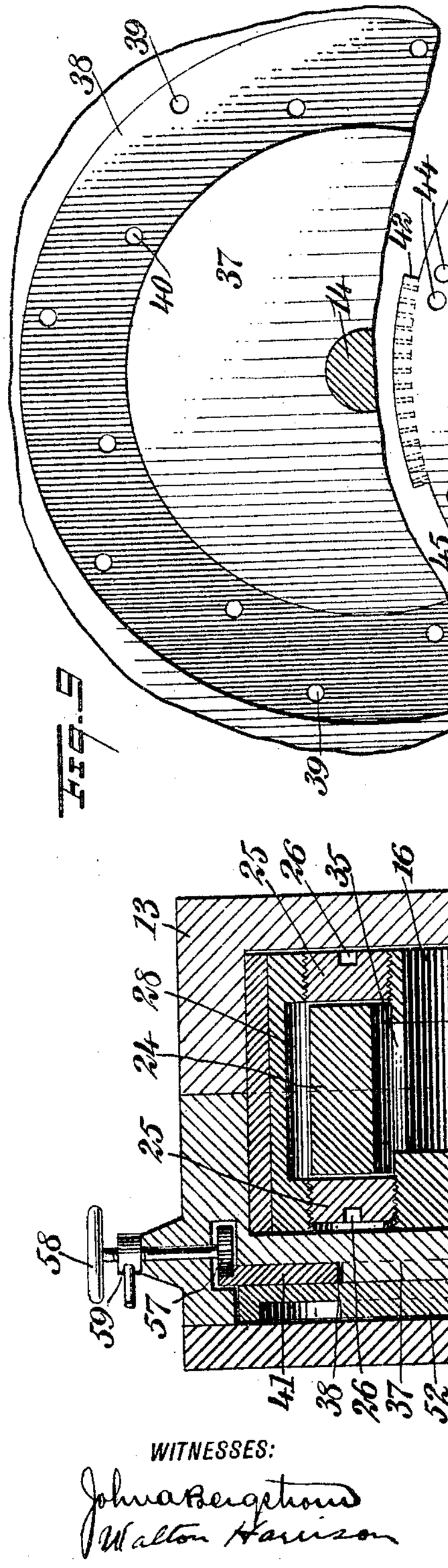

FIG. 9.

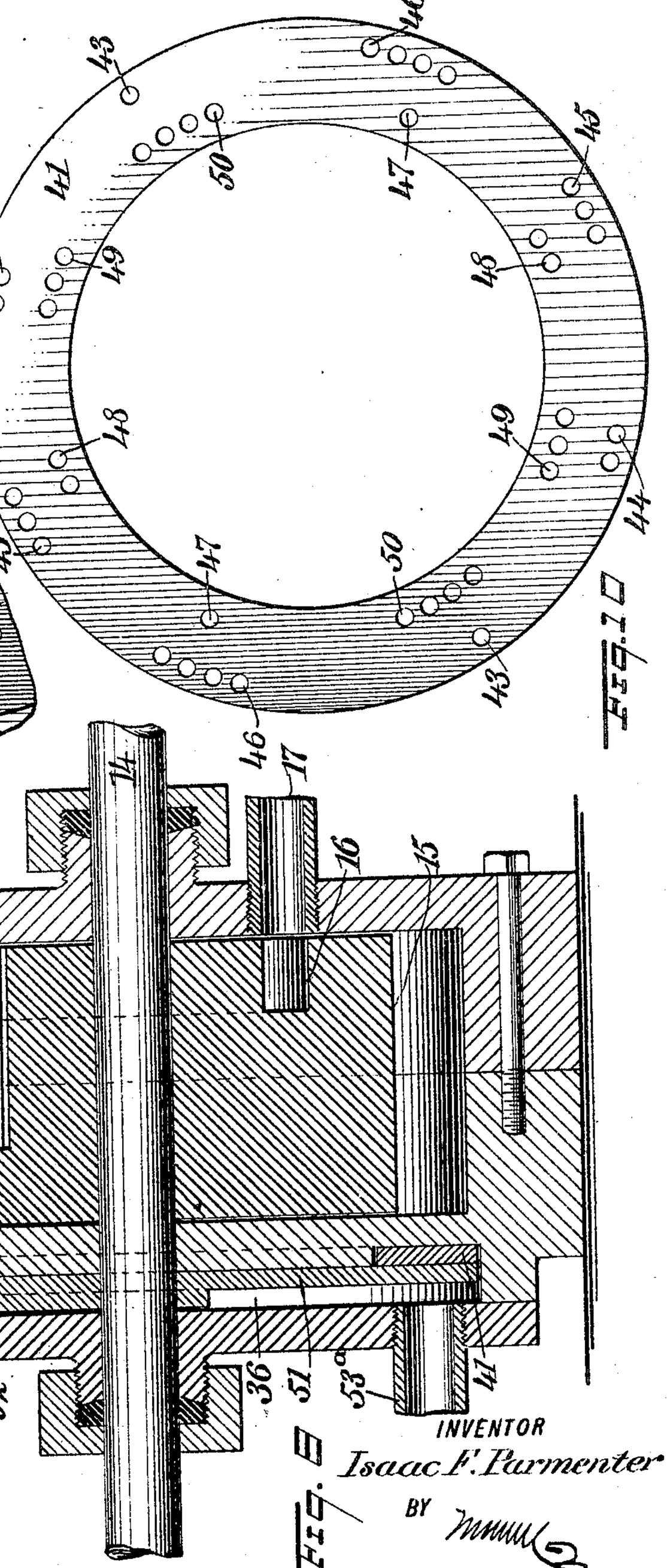

FIG. 10.

FIG. 8.

WITNESSES:

John A. Bergstrom

Walton Harrison

INVENTOR

Isaac F. Parmenter

BY Munn & Co.

ATTORNEYS

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5 SHEETS—SHEET 5.

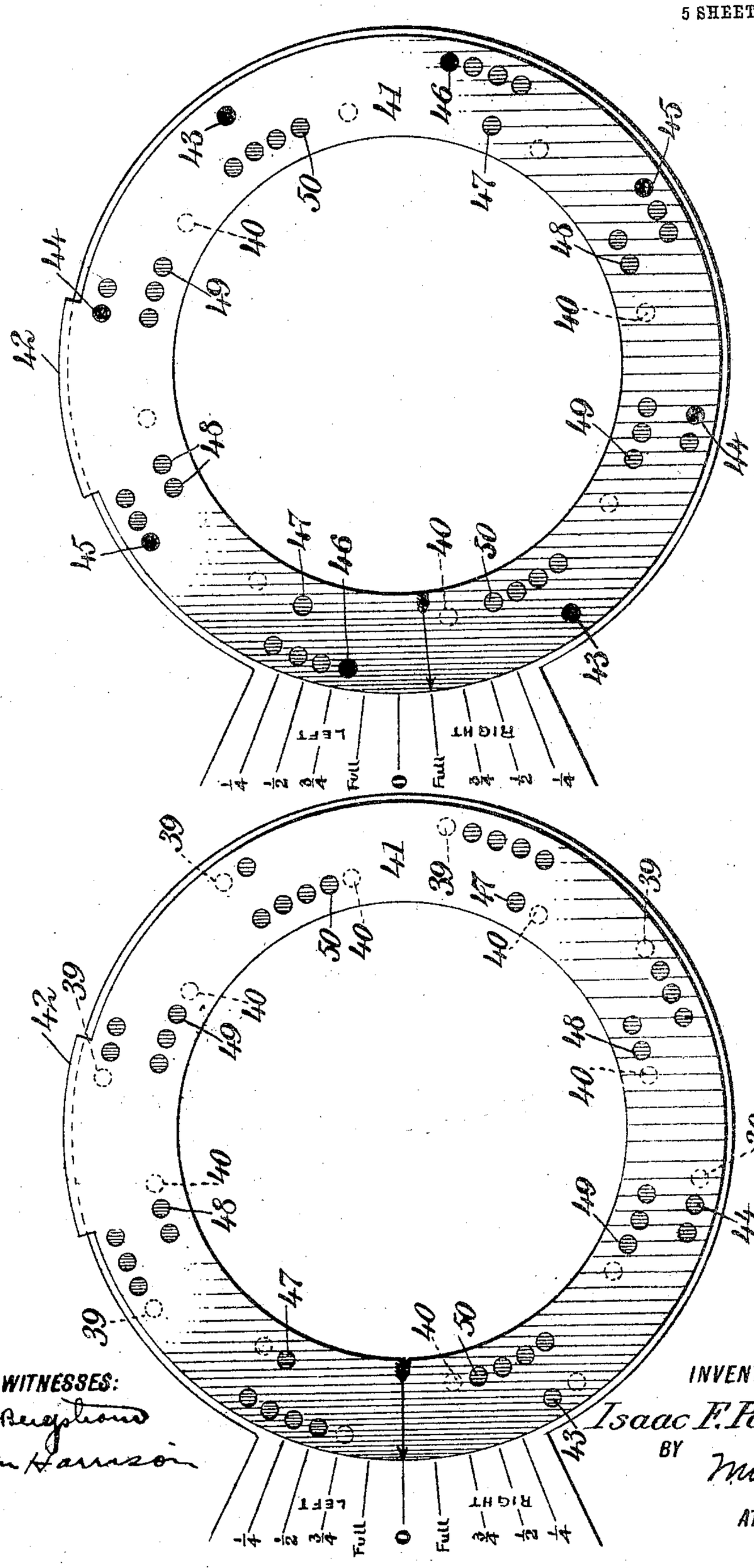

FIG. 7.

WITNESSES:

John A. Berglund

Walton Harrison

INVENTOR

Isaac F. Parmenter

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

ISAAC F. PARMENTER, OF BERLIN, MASSACHUSETTS.

ROTARY ENGINE.

No. 798,295. Specification of Letters Patent. Patented Aug. 29, 1905.

Application filed January 24, 1905. Serial No. 242,470.

To all whom it may concern:

Be it known that I, ISAAC F. PARMENTER, a citizen of the United States, and a resident of Berlin, in the county of Worcester and State of Massachusetts, have invented a new and Improved Rotary Engine, of which the following is a full, clear, and exact description.

My invention relates to rotary engines of the general type described in my Patent No. 779,308, dated January 3, 1905, my object being to produce certain improvements in construction hereinafter described, and pointed out in the accompanying claims.

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, the cylinder-head being removed. Fig. 2 is a side elevation showing the cylinder-head and the inner wall removed and the piston as partly broken away. Fig. 3 is a section upon the line 3 3 of Fig. 1 looking in the direction of the arrow and showing certain steam-channels of the piston. Fig. 4 is a perspective view of the automatic reversing-valve carried by the piston. Fig. 5 is a fragmentary central section parallel with the plane of the piston and showing the various steam-passages and the reversing-plug. Fig. 6 is a view similar to Fig. 5, but showing the reversing-plug as occupying a different position. Fig. 7 is a horizontal central section upon the line 7 7 of Fig. 1 looking in the direction of the arrow, the piston being shown in plan; and Fig. 8 is a vertical central section on the line 8 8 of Fig. 2 looking in the direction of the arrow. Fig. 9 is a fragmentary elevation of the inner wall 37. Fig. 10 is a front elevation of the distributing-ring 41. Fig. 11 is a view similar to Fig. 10, but showing the ring 41 as occupying a slightly-different position; and Fig. 12 is a semidiagrammatic elevation showing the distributing-ring 41 in its relation to the fixed steam-holes 39 40 of the inner wall 37.

The casing 13 is hollow, and extending centrally through it is a revoluble shaft 14, carrying an eccentric piston 15, provided with an annular exhaust-channel 16, which communicates with an exhaust-pipe 17. The piston 15 is provided with steam-channels 18 19, the channel 18 having upon the periphery of the piston external ports 18^a 18^c and an internal port 18^b, the channel 19 similarly having external ports 19 19^c and an internal port 19^b. This piston is further provided with a passage 20, extending laterally from the exhaust-channel 16, as indicated in Fig. 3, and the steam-channels 18 19 are covered by bridges 21 22. A packing 23 extends steam-tight across the face of the piston.

A valve-plug 24, having substantially the form of a double-concave prism, as indicated in Fig. 4, is mounted within the piston and is adapted to rotate back and forth to a limited extent. This plug is entirely disconnected from the moving parts and is actuated solely by the pressure of the expansive medium employed. Heads 25 are inserted upon the opposite faces of the piston and are adjustable relatively to each other and to the valve-plug 24, as will be understood from Fig. 8. Each of these heads is provided with a slot 26, into which may be inserted a screw-driver for the purpose of turning the head, the latter being threaded and operating in the same manner as a screw. The valve-plug 24 is provided with a wing 27, upon which the aeriform body may exert pressure for the purpose of causing a partial revolution of the plug 24. This wing extends into an arcuate chamber 28 and is as nearly as practicable rendered steam-tight. When steam or other aeriform body under pressure enters the channel 18, the plug 24 is automatically turned into the position indicated in Fig. 6; but when the aeriform body enters the channel 19 the plug is automatically turned into the position indicated in Fig. 5. The position of the plug in Fig. 6 is the one occupied when the piston is rotating to the "right"—that is, in a clockwise direction as seen in Figs. 1 and 2—whereas the position of the plug 24 as seen in Fig. 5 corresponds to the rotation of the piston to the "left" or in a contra-clockwise direction.

Slides 29 30 are disposed diametrically upon opposite sides of the piston and are free to move inward and outward in accordance with the eccentricity of the piston. The outer ends of these slides terminate in fingers 31 32, between which are compression-springs 33, the tension of which is to force the slides toward the shaft 14. The springs 33 are mounted in chambers 34, which are large enough to prevent the cramping of the springs.

Immediately below the valve-plug 24 is a

vertical passage 35, which enables the steam-channel 18 and the steam-channel 19 to be alternately connected with and disconnected from the annular exhaust-channel 16, as will be understood from Figs. 5 and 6.

The steam-chest is shown at 36 being covered by a cylinder-head 36ª, bolted upon the casing. The inner wall 37 constitutes the back wall of the steam-chest and is provided with an annular channel 38 and with an outer circle of steam-holes 39 and with an inner circle of steam-holes 40, these holes being staggered, as indicated in Fig. 9, so that each hole 40 is equidistant from two adjacent holes 39, and vice versa. Fitting into the annular channel 38 is a distributing-ring 41, provided with a toothed sector 42, integral therewith, and also provided with distinct groups of holes 43, 44, 45, and 46, duplicated, as shown in Fig. 10, and constituting an outer circle of holes, the ring 41 being further provided with groups of holes 47, 48, 49, and 50, duplicated and arranged in the form of an inner circle, also as indicated in said figure. The number of holes in each group ranges from one to four.

A revoluble disk 51 is provided with a comparatively thick portion 52, this shape being preferable in order that the disk may or may not have mounted upon it the shutter mechanism and accompanying parts shown in my patent previously referred to. This thick portion 52, however, is not essential to my present invention. Steam is admitted through the pipe 53ª. The disk 51 is further provided with arcuate slots 53, 54, 55, and 56, the two slots last mentioned being comparatively near the center of the disk, so as to correspond with the position of the holes 40 in the inner casing and also to correspond with the general positions occupied by the several groups of holes 47, 48, 49, and 50 of the ring 41. The slots 53 54 correspond in distance from the center of the shaft 14 with the distances of the outer circles of holes 39 in the inner wall and the outer circles of holes in the ring 41. The disk 51 is rigid upon the shaft 14, and therefore revoluble therewith.

The toothed sector 42 meshes with a wheel 57, which is revoluble by means of a hand-wheel 58, the latter being locked in position by means of a hand-lever 59.

The operation of my device is as follows: When the engine is at rest, the arrow at the left of Fig. 11 occupies the central or zero position, the sector 42 being so disposed that the wheel 57 engages its center. With the parts in this position no steam can enter the engine, and when the engine is thus idle the relative position of the plug 24 is immaterial, its position being governed by the direction in which the piston turned when the engine was last used. If now it be desired to "go ahead" at full pressure, the operator turns the wheel 58 slightly in a clockwise direction, so as to move the distributing-ring 41 a little to the left or until the arrow arrives at the point indicated by the legend "Full." It will now be observed that eight of the holes of the outer circle of the ring 41, each hole selected from a group, are in registry with the eight holes 39 of the outer circle of the inner wall. (Shown in Fig. 9.) Steam being now admitted to the steam-chest through the pipe 53ª finds its way through the slot 53, the lowermost hole of the group 46, and one of the holes 39 of the outer circle, (indicated in Fig. 9,) the two holes last mentioned being in registry with each other, as above explained. Suppose now that the piston 15 occupies the position indicated in Fig. 2. The plug 24 must either occupy the position indicated in Fig. 5 or in Fig. 6. If it happens to occupy the position indicated in Fig. 6, it continues to occupy this position after the steam is admitted. If, however, it happens to be found in the position indicated in Fig. 5, it quickly turns into the position indicated in Fig. 6. Live steam now enters above the slide 30 and being unable to pass the packing 23 drives the piston around in a clockwise direction, as seen in Fig. 2. Air or spent steam which may be either above or below the slide 29 passes out through the steam-channel 19, port 19ᵇ, and downward through the vertical passage 35 into the annular exhaust-passage 16 and thence out through the exhaust-pipe 17. The pressure above and below the slide 29 is equalized by means of the channel 19—that is to say, as the space above and the space below the channel 19 virtually communicate with the open air there can be but little, if any, binding upon the slide 29 due to the pressure of the steam or other aeriform body at this moment. As the slots 53 54 pass each successive pair of holes in registry with each other, as above described, steam is continually admitted always upon the same side of the packing 23 and the spent steam continually makes its escape as above explained. As the upper and the lower halves of the engine are exactly alike, the process above described with reference to admitting steam above the slide 30 is repeated with reference to admitting steam below the slide 29, the equalizing of the pressure around the slide 30 and the exhaust into the air being virtually the same as that already described with reference to the slide 29. If now the distributing-ring 41 be in the position indicated in Fig. 12 and is moved still farther in a contra-clockwise direction by means of the hand-wheel 51, so that the arrow shown at the left of the ring 41 registers with the point marked "¾," the hole 43 will no longer register with the holes underneath it, and consequently only six holes will be in registry, three of these holes being in the bottom half and three in the top half

of the engine. The ring 41 being turned still farther in the direction indicated, only two holes will admit steam, and moving still farther into its extreme position only one hole in the lower half and one hole in the upper half will admit steam. If, however, beginning with the ring 41 in the position indicated in Fig. 11, the ring be turned in the opposite or clockwise direction, the rotation of direction of the pistons is reversed, and the gradations are made according to the legends "¾," "½," and "¼." (Shown at the left of Figs. 11 and 12.)

It is apparent from the above description that the action of the distributing-ring 41 of the engine shown in the accompanying drawings is substantially the same as the action of the ring 94 shown in Fig. 16 of my patent above referred to, the chief difference being that in the present instance the distributing-ring 41 rests directly against the inner wall of the casing, so that the necessity for a reversing-ring is obviated.

The valve-plug 24, together with its fittings, constitutes a sort of automatic reversing-valve which requires little or no attention. It will take care of itself no matter in what direction it may be desired that the piston shall rotate. Not only is the channel 18 filled with steam or other motive agant, but all of the space between the piston-head and the last closed slide is filled with live motive agent that has not been expanded, and this condition continues till the piston-head has moved away from the last closed slide in whatever direction the engine is moving, whether clockwise or otherwise—that is, if the engine is adjusted for "full steam."

The apertures 53, 54, 55, and 56 may be of the shape shown in order to permit the addition of the shutters described and shown in my patent above mentioned. It will be understood, however, that I do not limit myself to the number, size, or shape of the apertures employed.

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

1. In a rotary engine, the combination of an inner wall provided with holes, a distributing-ring movable relatively to said wall and provided with holes adapted to register with those of said wall for the purpose of controlling the distribution of steam therethrough, a revoluble piston mounted within said casing and provided with steam-channels, a reversing-plug carried by said piston and adapted to open and close said steam-channels, slides coacting with said piston, and connections for admitting an aeriform body into said casing and for disposing of said aeriform body after tne same is exhausted.

2. In a rotary engine, the combination of a piston provided with steam-channels, a revoluble plug mounted within said piston and adapted to open and close said channels, and a head connected with said piston at a point adjacent to said plug and adjustable relatively to said plug.

3. In a rotary engine, the combination of a casing provided with a pipe for admitting steam thereinto, a revoluble piston mounted within said casing and provided with steam-channels, a reversing-valve mounted within said piston and acted upon automatically by pressure of an aeriform body for the purpose of opening and closing said channels, and slide mechanism coacting with said piston.

4. In a rotary engine, the combination of a casing, an eccentric piston mounted therein and provided with steam-channels having ports and bridges disposed intermediate of said ports, slides mounted within said casing and engaging said piston, a revoluble plug mounted within said piston and provided with a wing for enabling it to be rocked by pressure of an aeriform body, said plug being so disposed as to control the opening and closing of said steam-channels, an annular exhaust-channel in communication with said plug, an exhaust-pipe communicating with said exhaust-channel, and means for admitting steam into said casing.

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

ISAAC F. PARMENTER.

Witnesses:

DANIEL W. STRATTON,

OLIVE C. FLAGG.