

No. 720,102.

PATENTED FEB. 10, 1903.

D. J. BLISS.  
ROTARY ENGINE.

APPLICATION FILED MAR. 26, 1901.

NO MODEL.

3 SHEETS—SHEET 1.

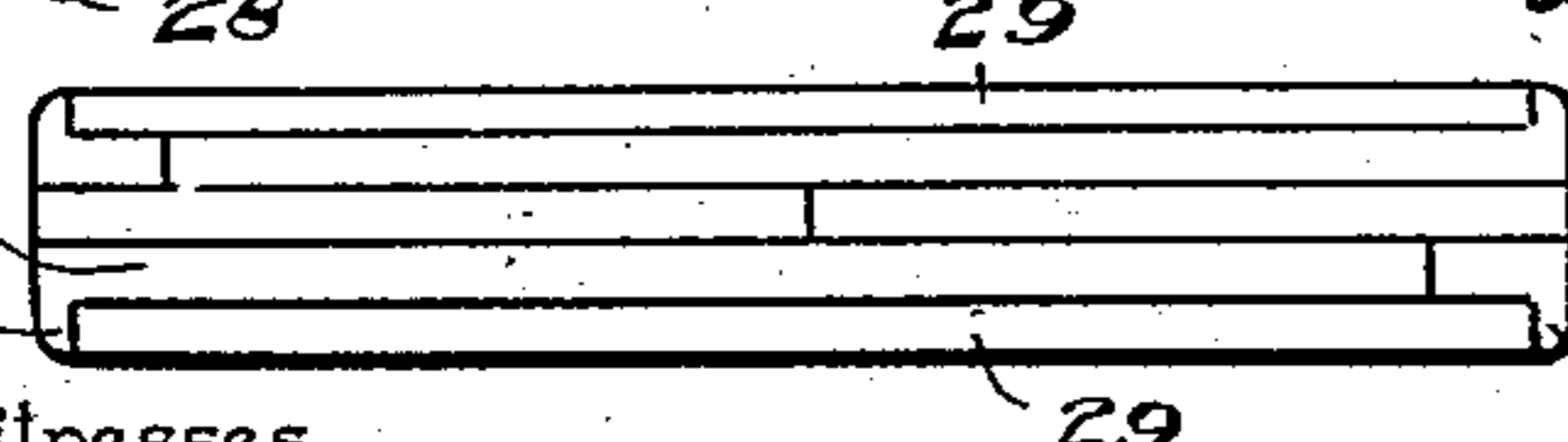
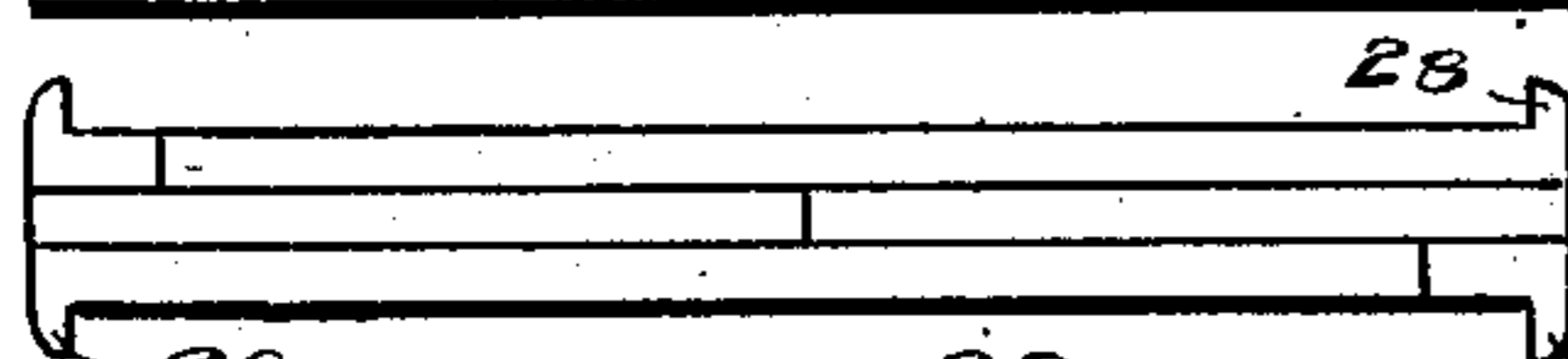
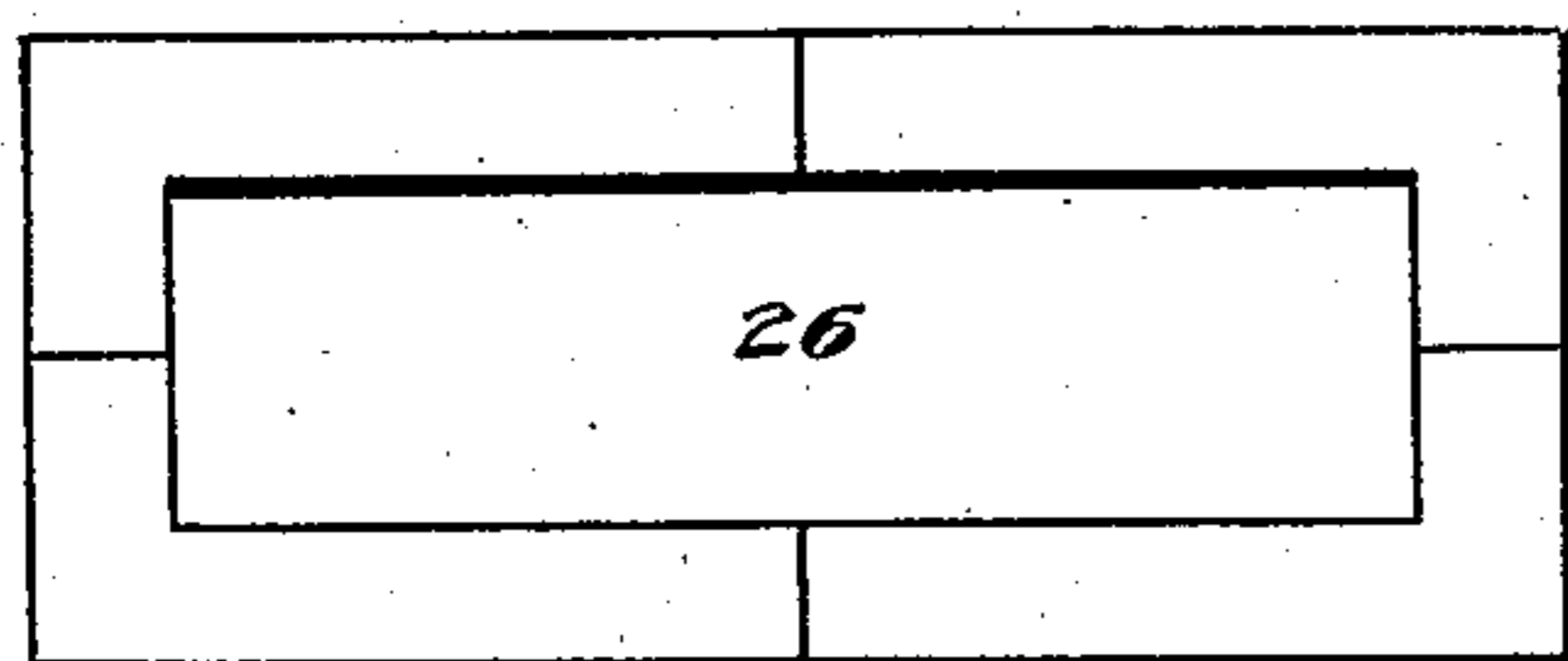
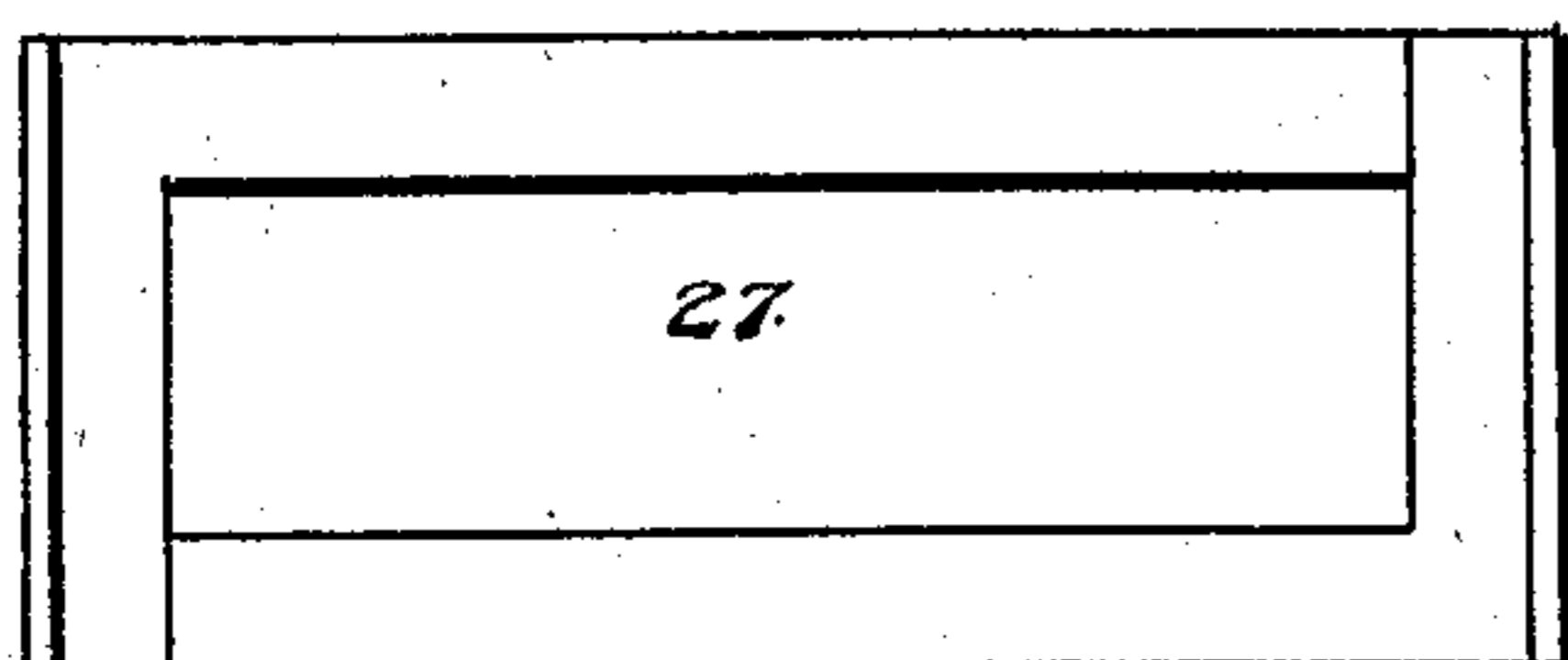
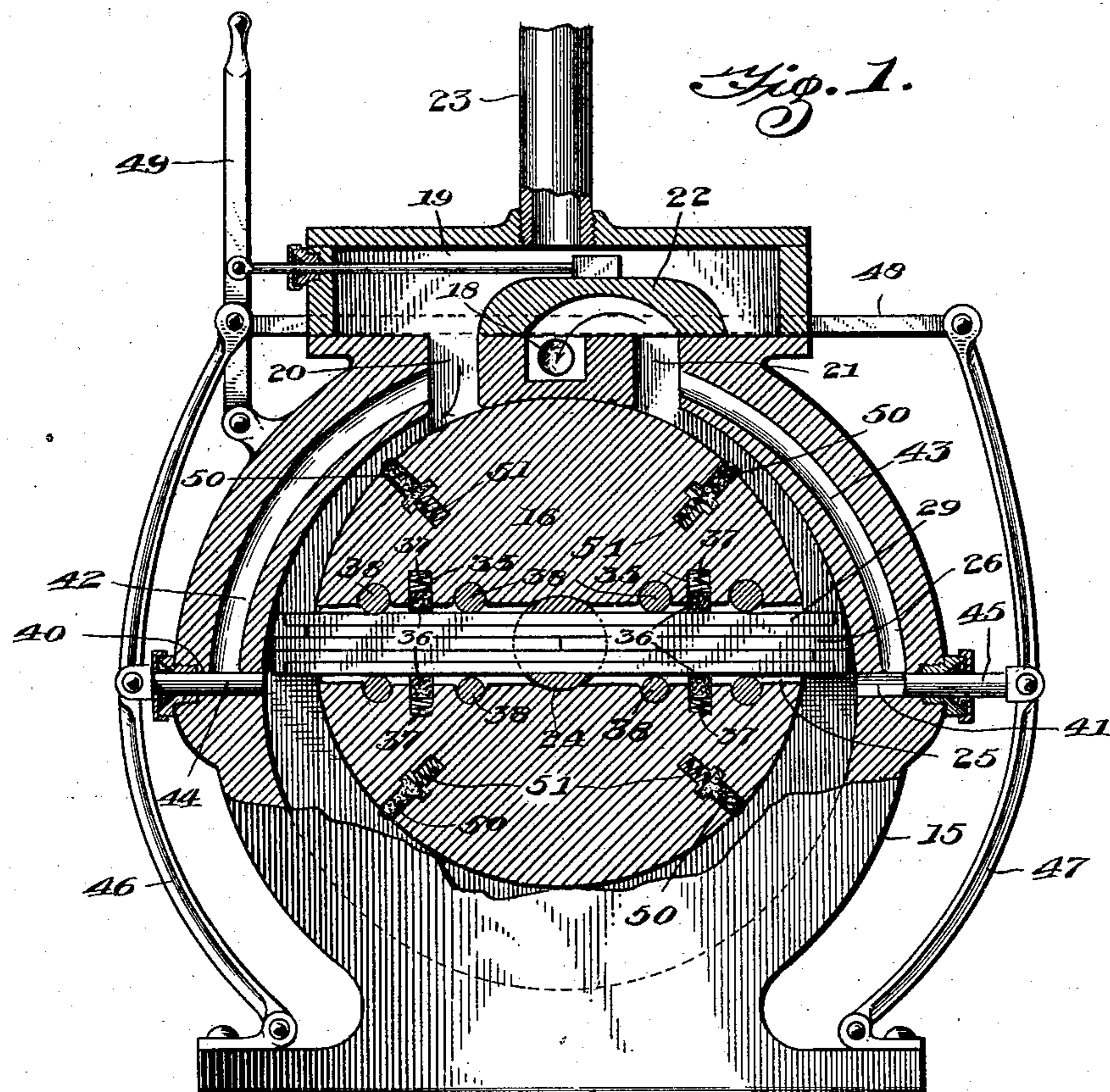


Fig. 4.

Fig. 8.

Fig. 5.

Fig. 6.

Fig. 7.

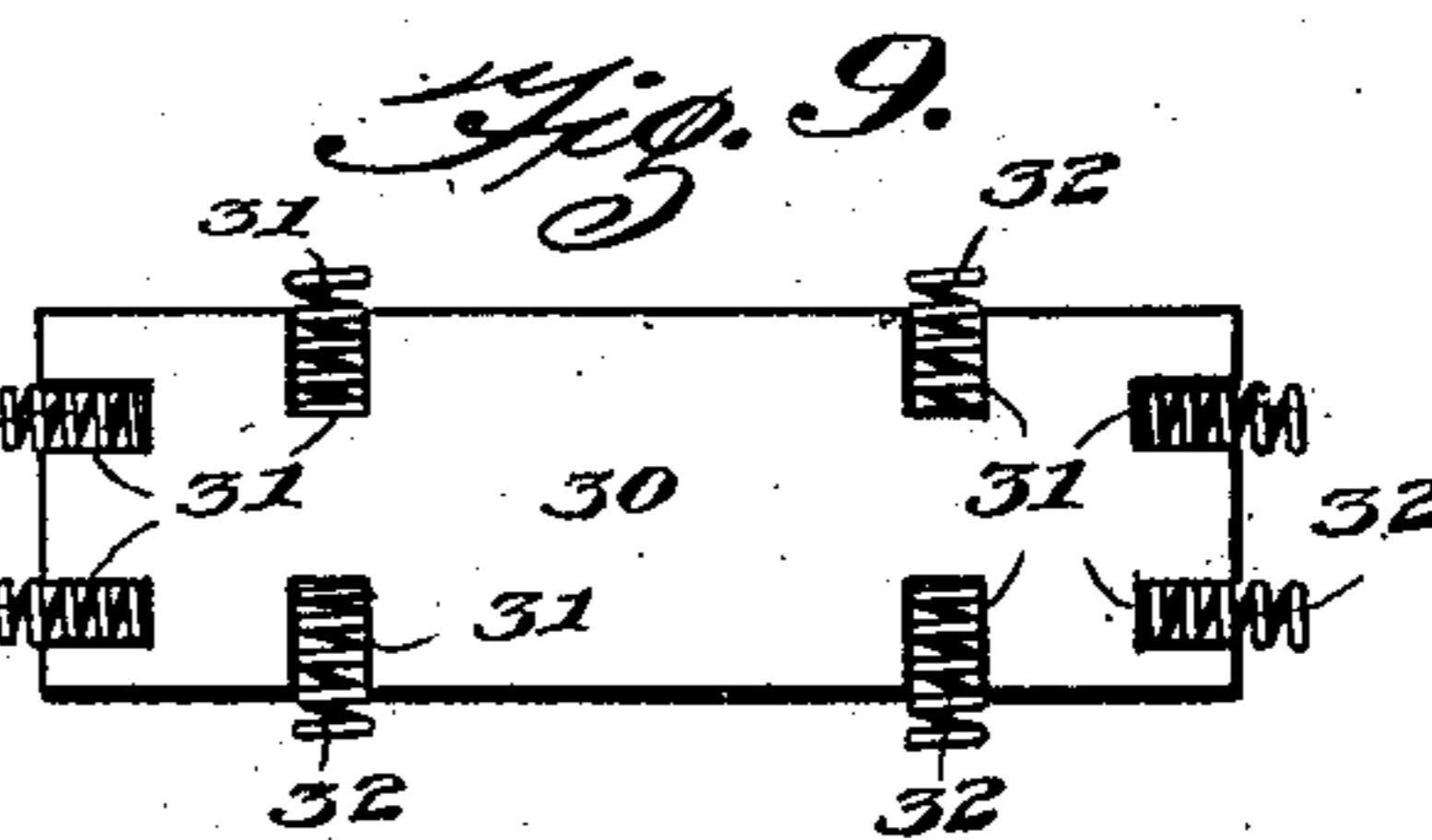
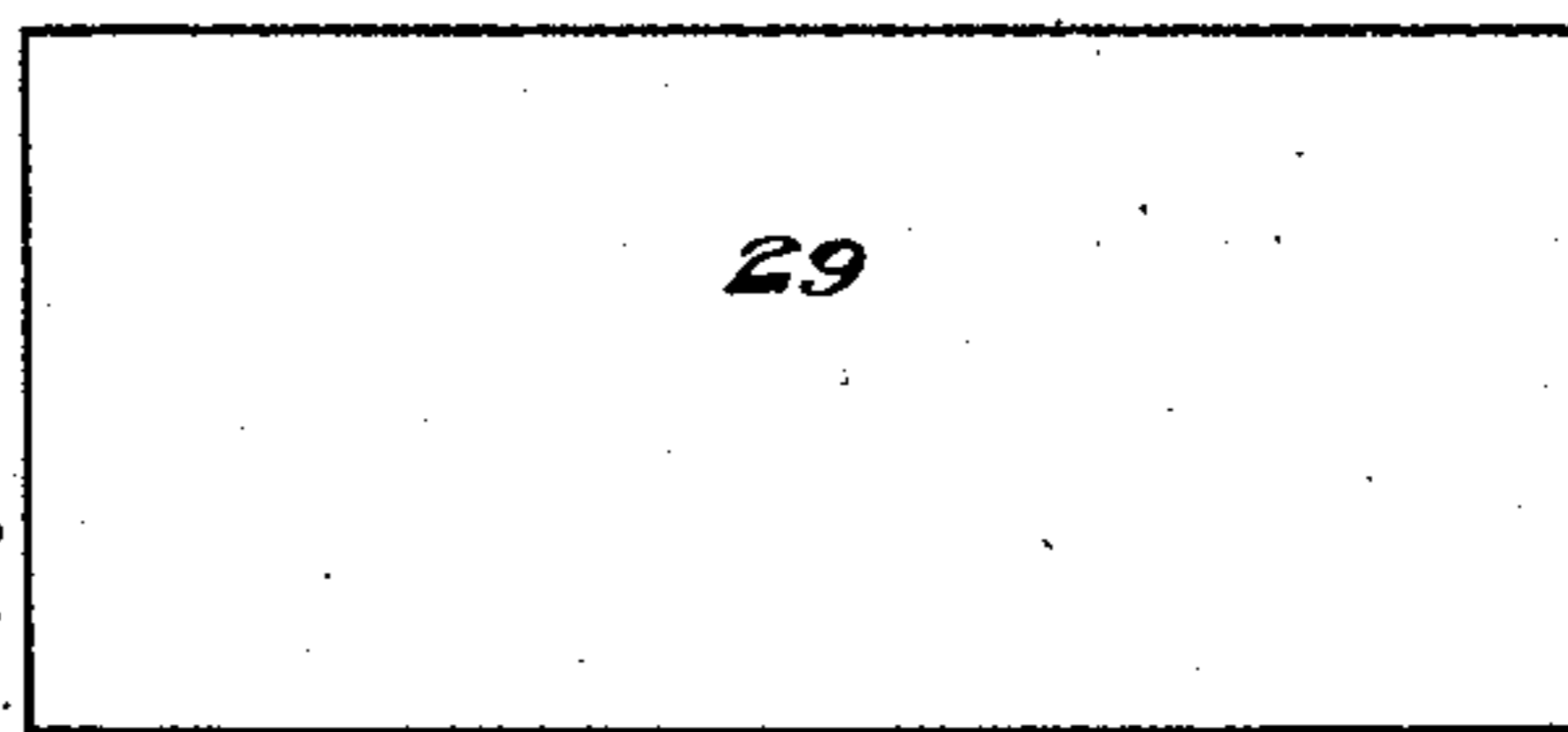


Fig. 9.

Witnesses

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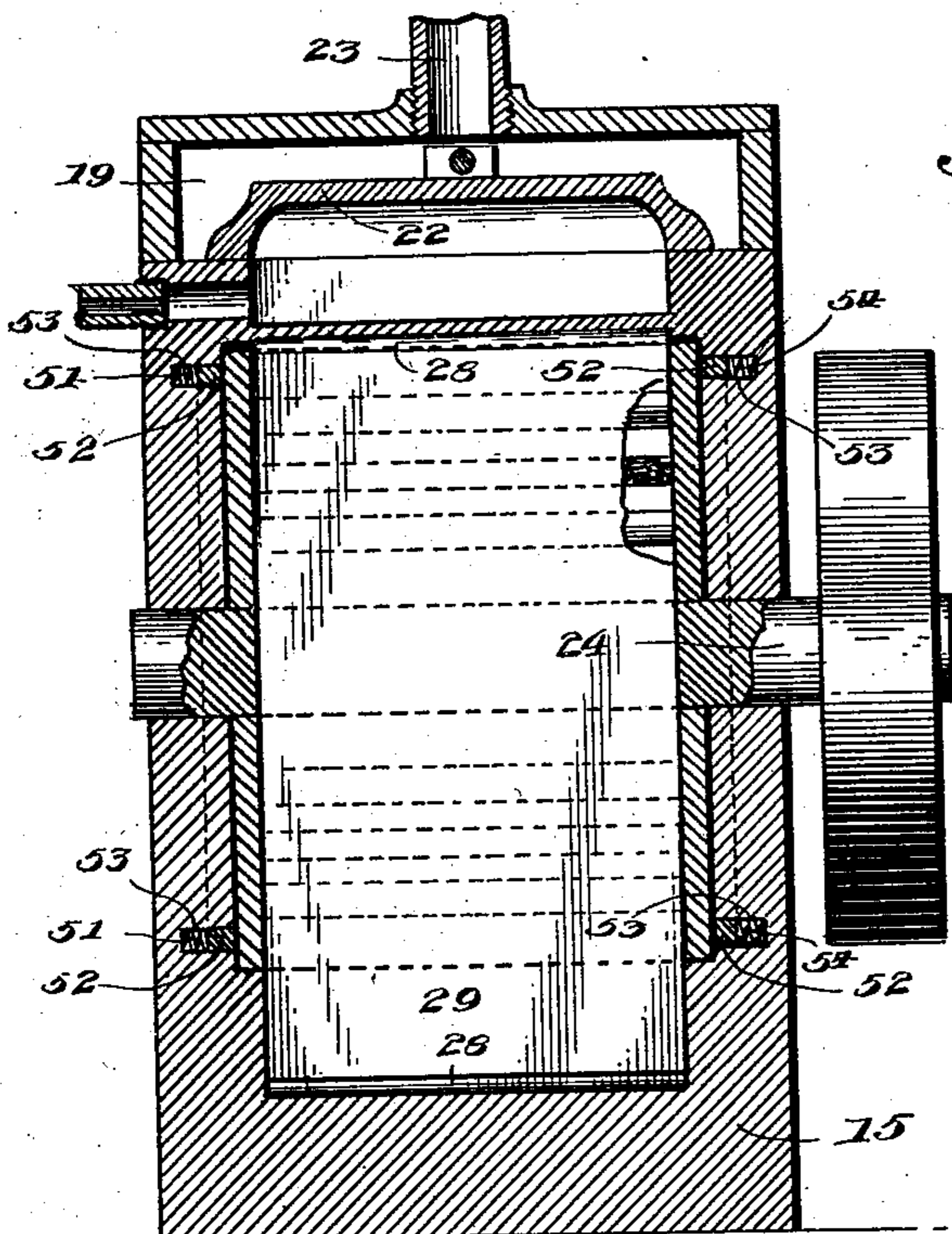
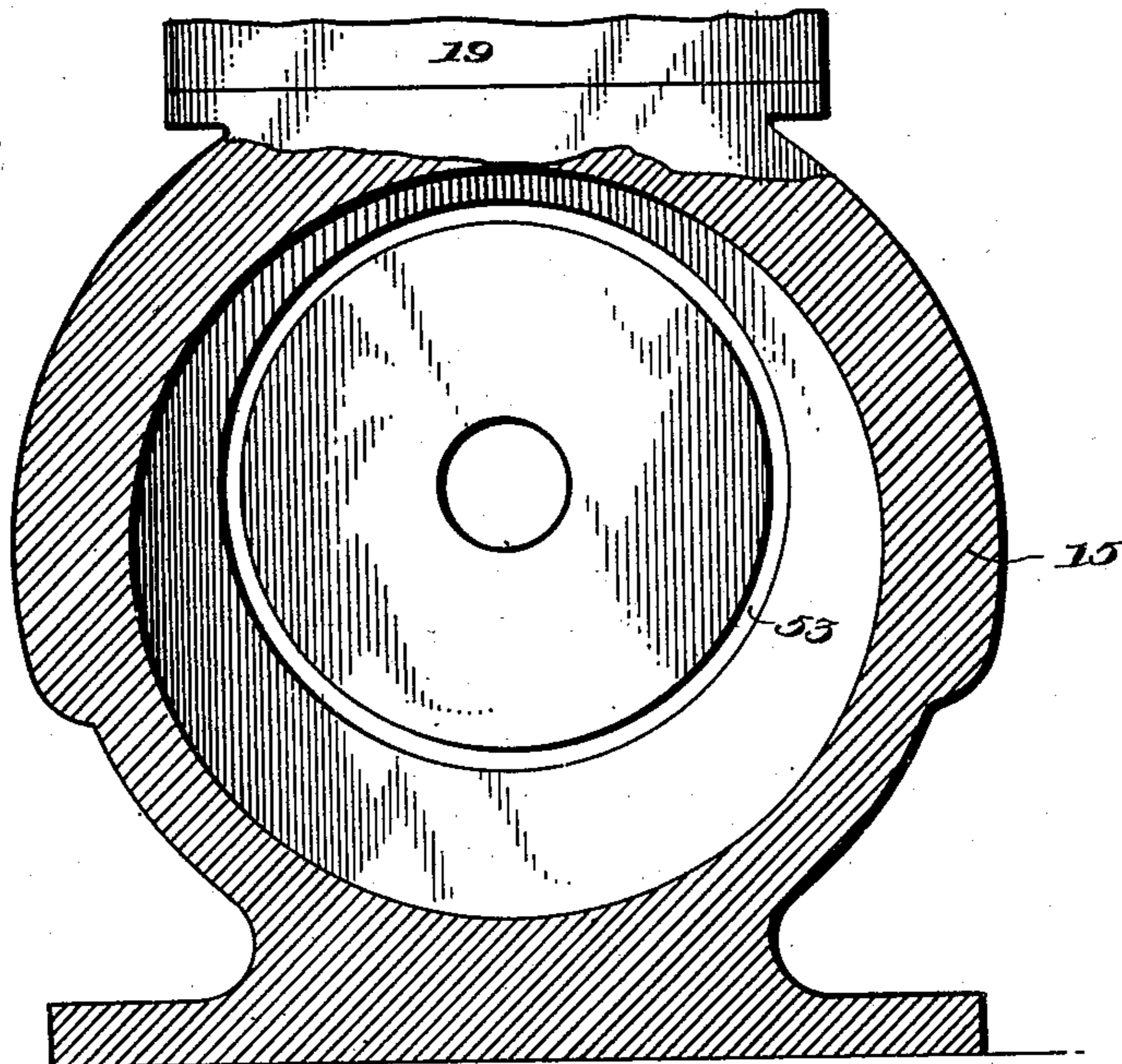
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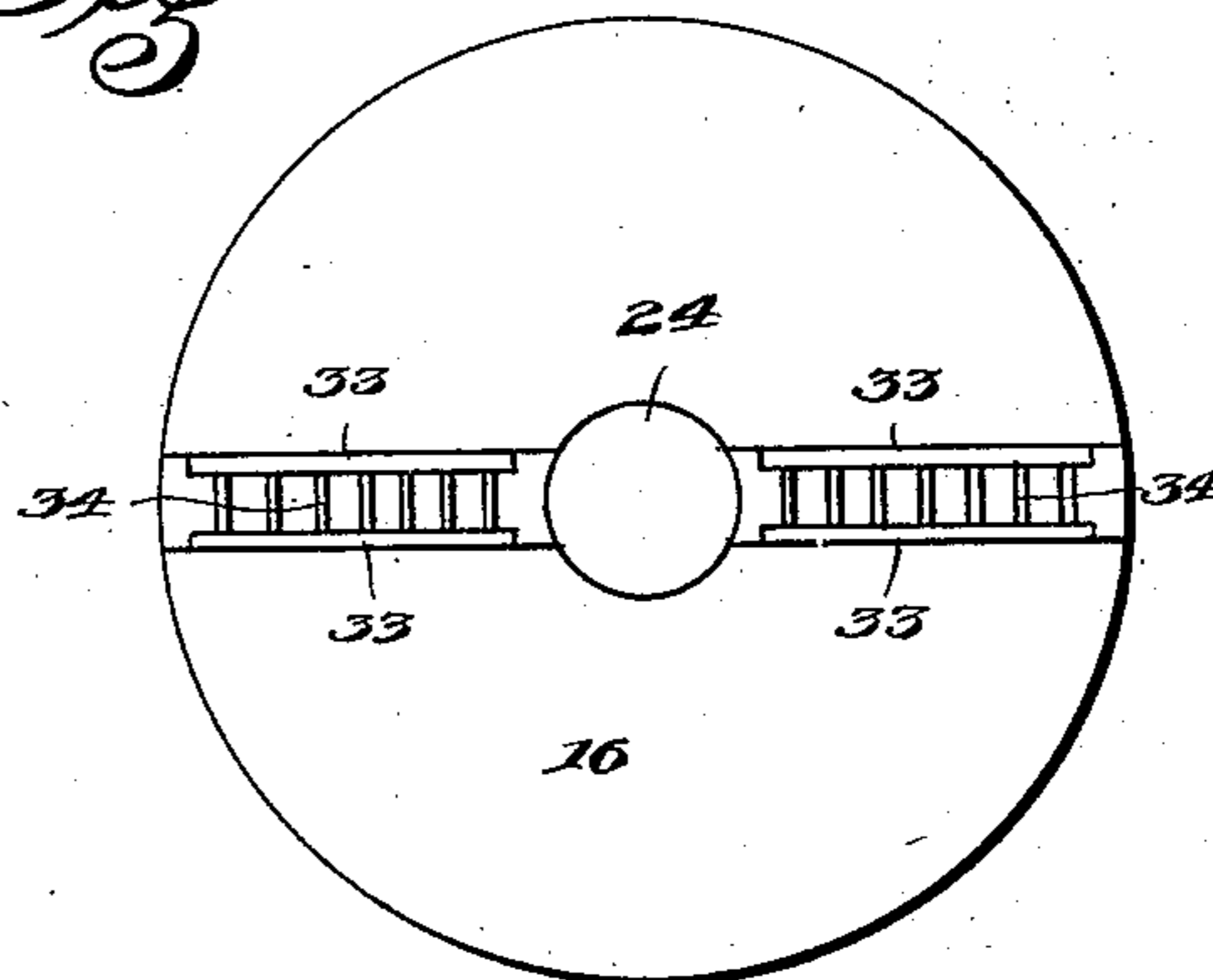
NO MODEL.

3 SHEETS—SHEET 2.

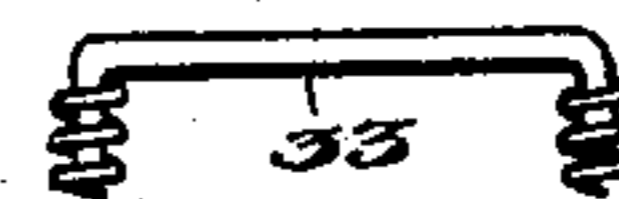
*Fig. 2.*



*Fig. 10.*



*Fig. 11.*



Witnesses  
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*Fig. 3.*

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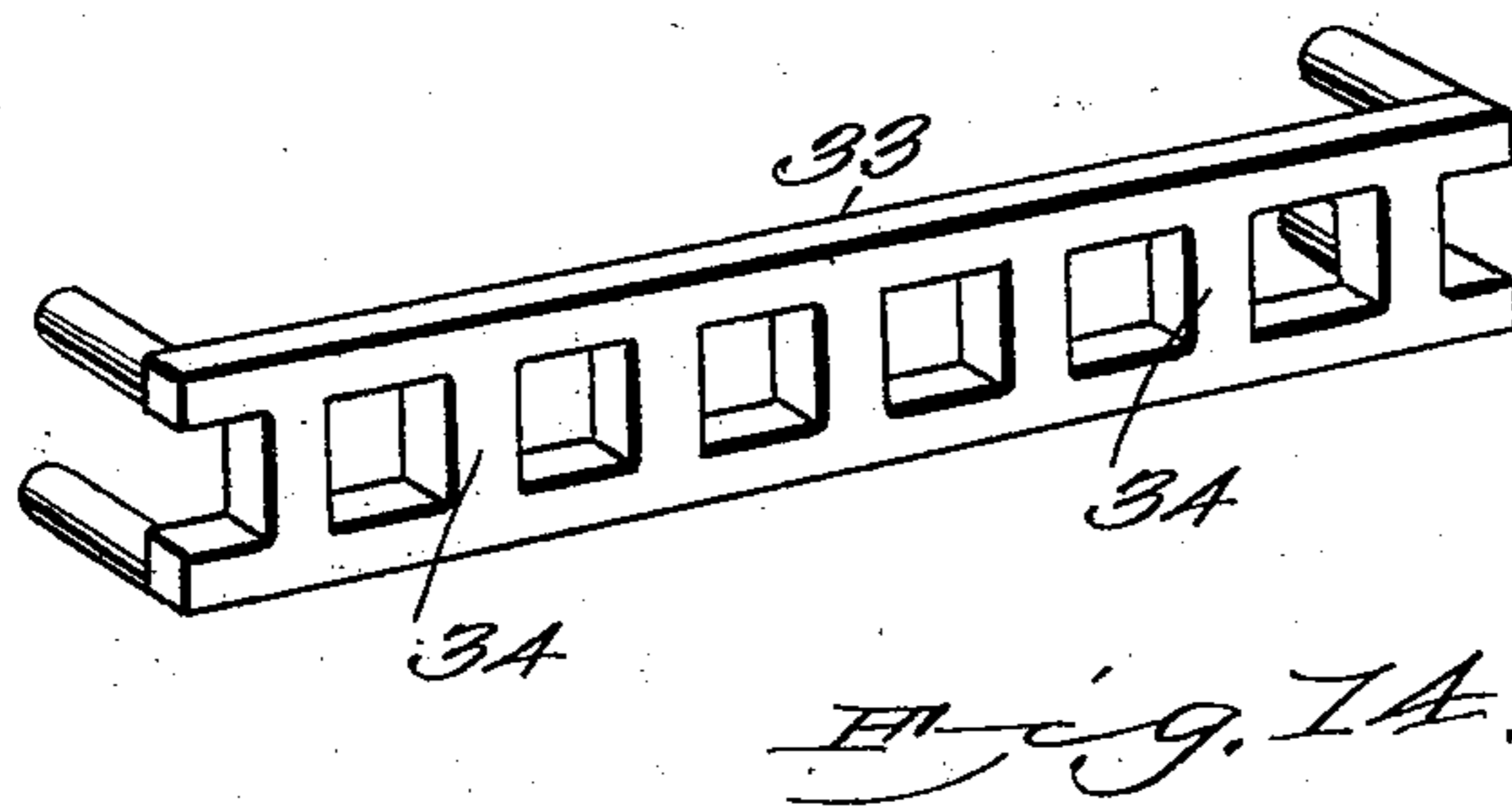
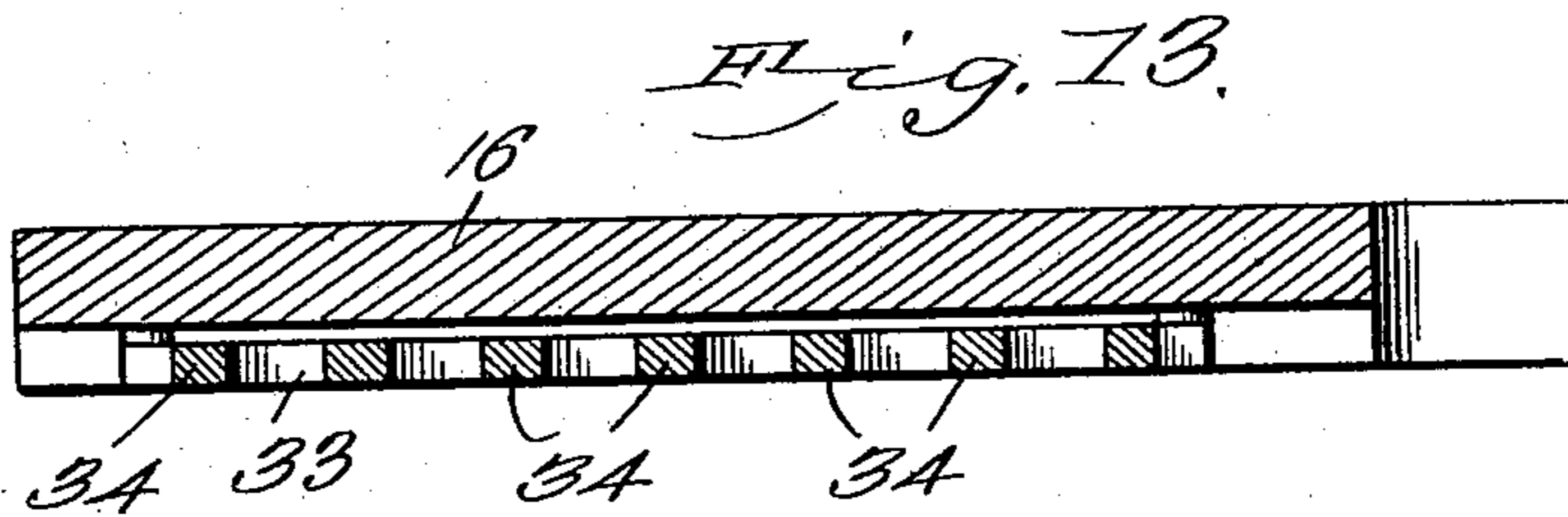
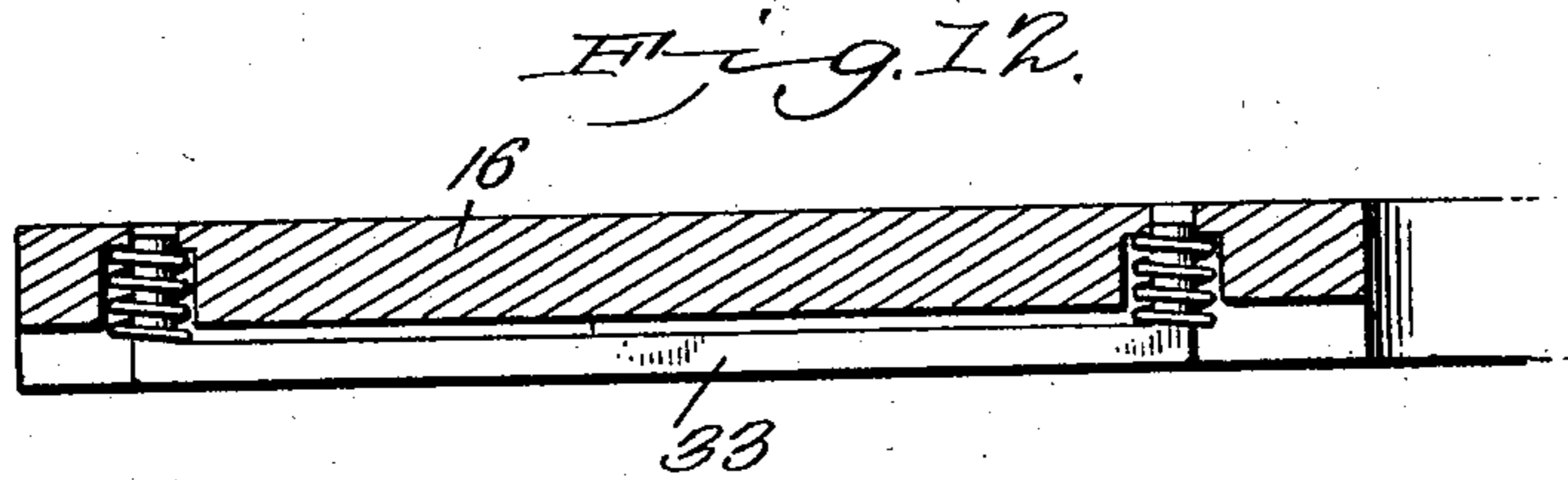
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3 SHEETS—SHEET 3.



Witnesses  
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Attorneys

# UNITED STATES PATENT OFFICE.

DWIGHT J. BLISS, OF CARTHAGE, MISSOURI.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 720,102, dated February 10, 1903.

Application filed March 26, 1901. Serial No. 52,989. (No model.)

*To all whom it may concern:*

Be it known that I, DWIGHT J. BLISS, a citizen of the United States, residing at Carthage, in the county of Jasper and State of Missouri, have invented a new and useful Rotary Engine, of which the following is a specification.

This invention relates to rotary engines, and more particularly to the class of expansion-engines; and it has for its object to provide a device of this nature which will have a high efficiency and wherein the parts will be so packed as to prevent leakage of steam from one portion to another.

A further object of the invention is to provide an engine, including an eccentric piston, having a slidable piston-head so constructed and arranged that its movement will absorb a minimum of energy; and a further object is to provide for even wearing of the moving parts, so that there will be a close fit at all times.

Other objects and advantages of the invention will be apparent from the following description.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a vertical section taken through the engine and illustrating the piston with its slidable head and the packing and supporting friction-rollers. Fig. 2 is a view showing the interior of the cylinder with the piston removed and illustrating the recess that receives the packing-ring. Fig. 3 is a section through the cylinder in the plane of the shaft and showing the piston partly in elevation and partly in section. Fig. 4 is a plan view showing one of the packers of the piston. Fig. 5 is a plan view showing the central packer of the piston. Fig. 6 is a side elevation showing the three packers assembled. Fig. 7 is an elevation showing the packers and top and bottom plates of the piston-head assembled. Fig. 8 is a plan view of one of the outside plates of the piston-head. Fig. 9 is a plan view showing the central member of the piston-head with the helical springs for holding the packers yieldably extended. Fig. 10 is an end elevation of one of the disks forming a part of the piston. Fig. 11 is an elevation of one of the packing-strips in the slotted end disk of the piston.

Fig. 12 is an enlarged sectional view of a portion of one of the piston-disks on the line 12-12 of Fig. 10. Fig. 13 is a similar view in a plane slightly below that shown in Fig. 12. Fig. 14 is a detail perspective view of one of the packing-strips detached.

Referring now to the drawings, the present engine comprises a cylinder 15, eccentrically of which and within the cylinder is mounted a cylindrical piston 16, which is in contact with the inner periphery of the cylinder at the uppermost point of the latter through a distance of about twenty degrees, and at each side of which contacting portion there opens a port 20 and 21, respectively, leading from the steam-chest 19 upon the cylinder. An outlet-port 18 also leads from the steam-chest, and a valve 22, disposed within the chest, is slidable to communicate the steam-chest with the cylinder through the ports interchangeably by uncovering the ports and when covering a port to connect it with the outlet or exhaust port 18, above referred to. A steam-feed pipe 23 is connected with the steam-chest, and it will be seen that steam will be fed to the cylinder at either side of the point of contact of the piston with the cylinder, depending upon the position of the reversing-valve 22.

The piston 16 is mounted upon a shaft 24, and the ends of the piston lie in the recessed ends of the heads of the cylinder, the expansion-chamber of the cylinder being of less length than the piston, as shown in Fig. 3. Transversely and centrally through the piston is formed a cross-sectionally-oblong passage 25, the width of which is equal to the width of the expansion-chamber, and in this passage is disposed a slidable piston-head, the ends of which engage the inner periphery of the cylinder, while the side edges of those portions projecting from the passage are adapted to contact with the heads of the cylinder, which form the ends of the expansion-chamber of the cylinder. The piston is built of sections, including a central oblong packer 26, which is cut into four sections on the lines of its diameters, this packer being of hard steel. At each side of the packer 26 is another packer 27, of which there are of course two, each packer 27 being oblong in form and of the same longitudinal and transverse dimen-

sions as the packer 26, and including two L-shaped sections, as shown, so that when the three packers are assembled they will break joints. The packers 27 also are formed of hard steel. At the ends of the packers 27 are formed flanges 28, which project from the outer faces thereof and at right angles thereto, and upon these outside packers and between the flanges of each is disposed an outside plate 29, the side edges and outer face of which only are exposed. This portion of the piston-head is in the form of a box, and within this box is disposed an aluminium block 30, having recesses 31 in its end and side edges, and in which are disposed helical springs 32, which bear upon the sections of the packers and act to press them outwardly, so that they will press against the ends of the passage through the piston, against the ends of the expansion-chamber of the cylinder, and against the annular wall of the expansion-chamber formed by the inner periphery of the cylinder.

In the end walls of the passage through the piston are formed recesses, in which are disposed packing-strips 33, which bear against the side edges of the plates 29 to pack them and prevent leakage of steam along the edges of these plates. The plates 29 of the piston-head wear with their side edges against the strips 33. The end portions of the packers of the head project alternately from the piston and rub against the ends of the cylinder, while the central portions thereof rub only against the ends of the passage through the piston. The end portions, which rub against the ends of the cylinder, of course are worn away much faster than the inner portions, which rub only against the ends of the passage, and for this reason under ordinary circumstances the end portions would be soon so worn that they would not have a packing effect, but instead would permit of leakage of steam past them, owing to their being held away from the ends of the cylinder by the middle unworn portions of greater width. For this reason the ends of the passage are ribbed, as shown at 34 in Figs. 10 to 14, or these ribs may be formed upon a separate plate disposed at the end of the passage. These ribs presenting little surface would wear away rapidly as compared to the end portions of the packers, which would be permitted to lie at proper times in close contact with the adjacent surfaces or ends of the cylinder. The piston-head is thus kept properly packed at all times.

In the upper and lower walls of the passage through the the piston are formed longitudinally-extending slots 35, and in these slots are disposed packing-strips 36, which are held against the outer plates 29 of the piston-head by means of the springs 37, and thus prevent leakage of steam longitudinally of the piston-head. To reduce the friction of the piston-head as it slides through the passage in the piston, friction-rollers 38 are provided and are disposed in recesses in the

upper and lower walls of the passage through the piston and are so positioned as to bear against the piston-head and receive the direct weight and pressure thereof.

It will be noted that while the piston is eccentric to the cylinder and the passage through the piston is central thereof the piston-head is of such width that its length at its extreme point is equal to the diameter of the cylinder, and thus as the piston rotates the ends of the piston-head will lie in intimate contact with the inner face of the cylinder at all times.

While the ports 20 and 21 act alternately as outlet-ports, it is desirable that the dead steam be exhausted before a complete rotation is made for obvious reasons, and in order that there may be an exhaust from behind the piston-head after three-fourths of a rotation in either direction supplemental exhaust-ports 40 and 41 are provided and are formed through the wall of the cylinder at diametrically opposite points, and communicating with these ports are passages 42 and 43, leading to the ports 20 and 21. Plug-valves 44 and 45 are provided for the ports 40 and 41, which when pressed inwardly close the ports and when drawn outwardly open them, and when 21 is the exhaust-port the port 41 is open, and when port 20 is an exhaust-port the port 40 is open. To shift valves 44 and 45 automatically, they are attached to levers 46 and 47, which are pivotally mounted and are connected by rod 48, which is also the shift-rod for the reversing-valve, and which rod is provided with a shift-lever 49.

To pack the periphery of the piston where it enters the recesses in the ends of the cylinder, packing-strips 50 are disposed longitudinally of the piston in grooves and are held against the annular walls of the recesses by helical springs 51, disposed behind them, while to pack the ends of the piston between them and the ends of the recesses of the cylinder-heads packing-rings 52 are disposed in annular recesses 53 in the ends of the recesses of the heads and are pressed outwardly by springs 54 against the ends of the piston.

What is claimed is—

1. The combination in a rotary engine, of a cylinder, a piston having a diametral passage, a piston-head slidably mounted in said passage and having its ends in contact with the inner walls of the cylinder and portions of its side edges in contact with the cylinder-heads, the ends of the passage having packing constructed to wear faster than the wear of the piston-head against the cylinder-heads, the contacting portions of the piston-head being movable toward the surfaces with which they contact, and yielding means for maintaining a steam-tight contact.

2. A rotary engine comprising a cylinder, a piston therein having a diametral passage, a piston-head slidably mounted in the passage and including separable sections for contact with the inner wall and cylinder-heads, means

located within the piston-head for holding the sections thereof against the surfaces with which they are in contact, and packing means at the ends of the piston-passage for engagement with the sides of the piston-head, said packing means having a reduced surface area for contact with the piston-head.

3. The combination with a cylinder, of a piston, a piston-head carried by the piston and comprising a central rectangular member divided on the line of its longitudinal and transverse diameters, a member disposed against each face of the central member and divided into two parts adjacent to diametrically opposite corners and having flanges at their ends extending at right angles to their faces, plates disposed upon the second member and between the flanges thereof, a block disposed within the inclosure of the first and second members and having recesses in which are disposed springs in contact with the parts of the first and second members to hold them yieldably extended, and plates disposed between the second-named members and between the flanges thereof.

4. The combination in a rotary engine, of a cylinder, a piston mounted eccentrically in the cylinder and provided with a diametral passage, a piston-head mounted slidably in said passage and comprising upper and lower members and intermediate sectional members for contact with the inner periphery and ends

of the cylinder, packers disposed in said passage transversely of the head and against the upper and lower members, and additional packers disposed longitudinally of and against the side edges of the top and bottom members, the last-named portions being formed for rapid wear to compensate for the wear of the packers against the heads of the cylinder.

5. A rotary engine comprising a cylinder having a piston mounted therein having a passage therethrough, a piston-head in the passage and including upper and lower members and intermediate sectional packers for contact with the inner periphery and the ends of the cylinder, packers in the passage disposed transversely of and against the upper and lower members, additional packers disposed longitudinally of and against the side edges of the upper and lower members, and means for holding the sectional portions of the packers of the head yieldably in contact, the ends of the passage in contact with the packers of the head being formed to wear to compensate for wear of the packers against the ends of the cylinder.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

DWIGHT J. BLISS.

Witnesses:

ROBT. T. STICKNEY,  
J. A. RILEY.