(No Model.)

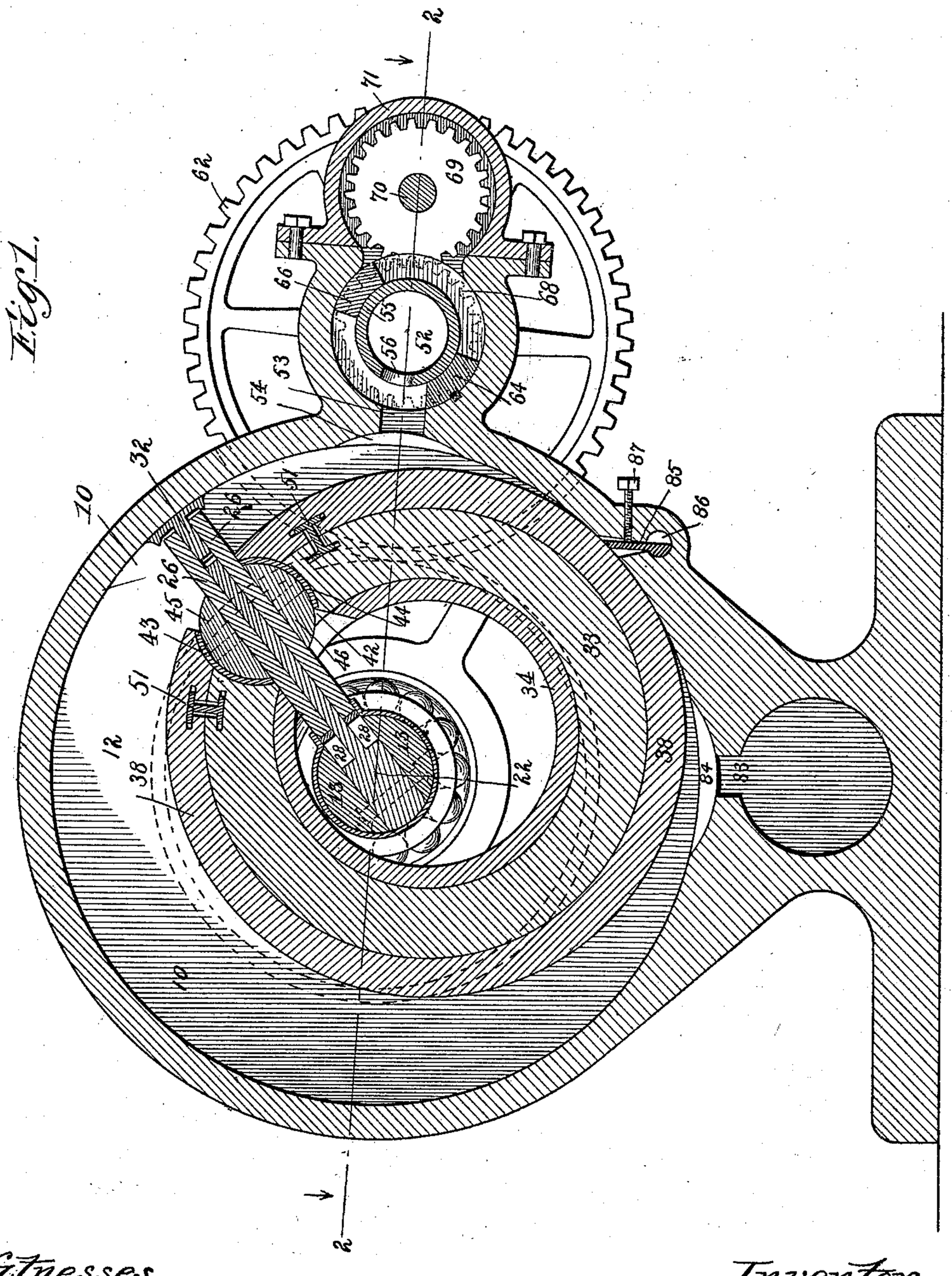
4 Sheets—Sheet 1.

C. A. FISHER.

ROTARY ENGINE.

No. 545,062. Patented Aug. 27, 1895.

Fig. 1.



Witnesses.
Wm. N. Rheem.
Wm. F. Fleming

Inventor.
Charles A. Fisher
By Bond, Adams & Pickard
Atty's

(No Model.)

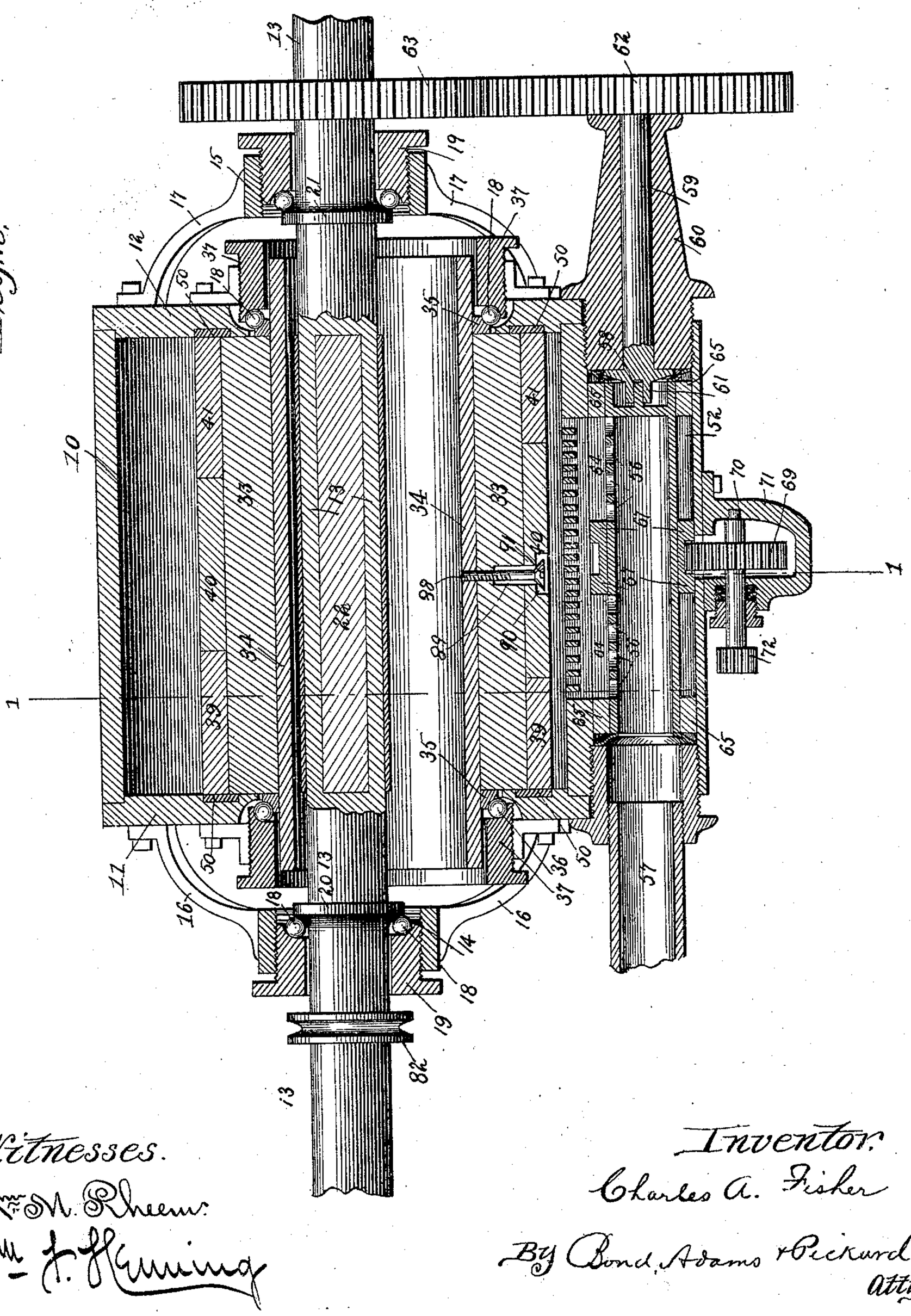
4 Sheets—Sheet 2.

C. A. FISHER.

ROTARY ENGINE.

No. 545,062. Patented Aug. 27, 1895.

Fig. 2.



Witnesses.

Wm. N. Rheem.

Wm. F. Fleming

Inventor.

Charles A. Fisher

By Bond, Adams & Pickard.

Atty's.

(No Model.) 4 Sheets—Sheet 3.

C. A. FISHER.

ROTARY ENGINE.

No. 545,062. Patented Aug. 27, 1895.

Fig. 4.

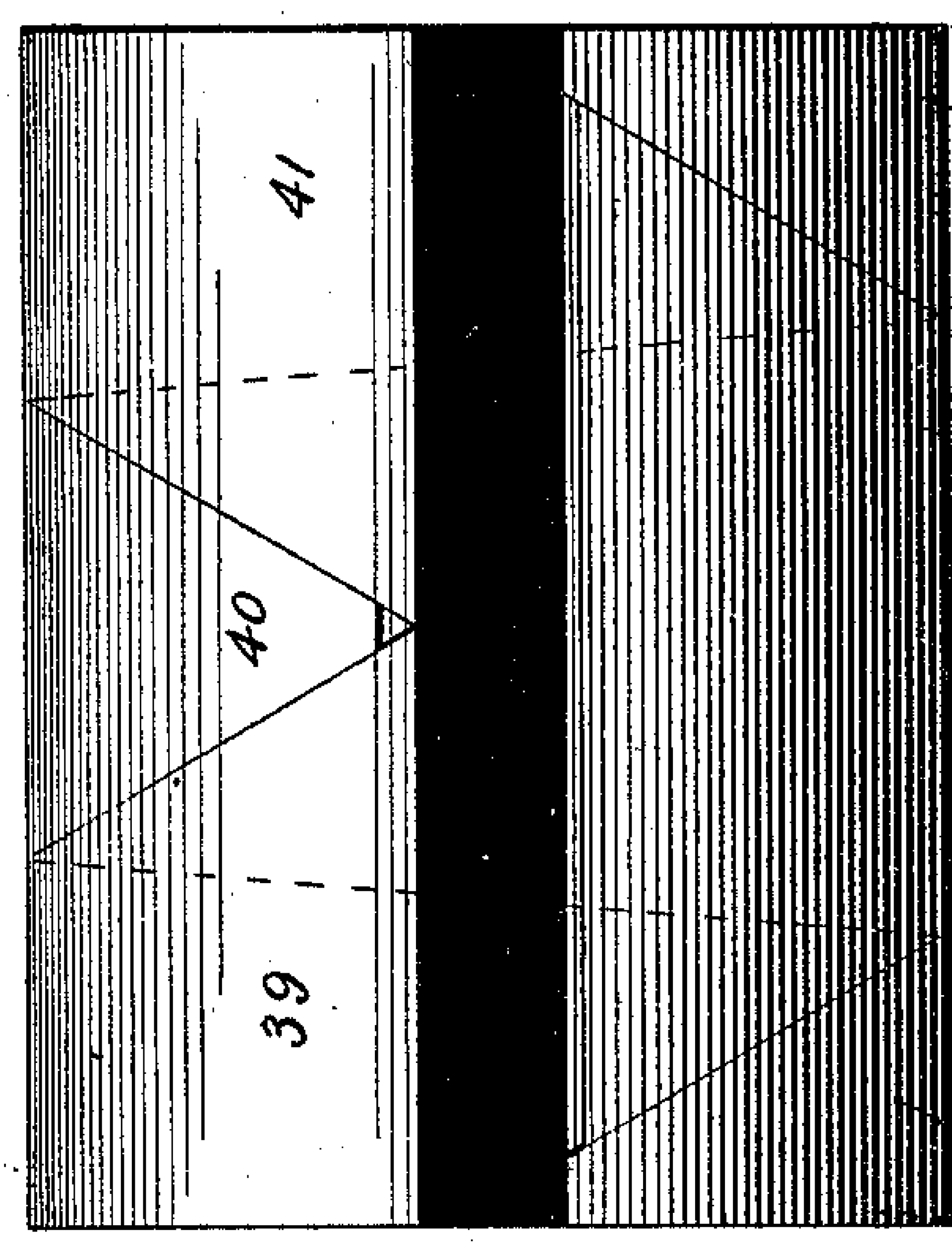


Fig. 5.

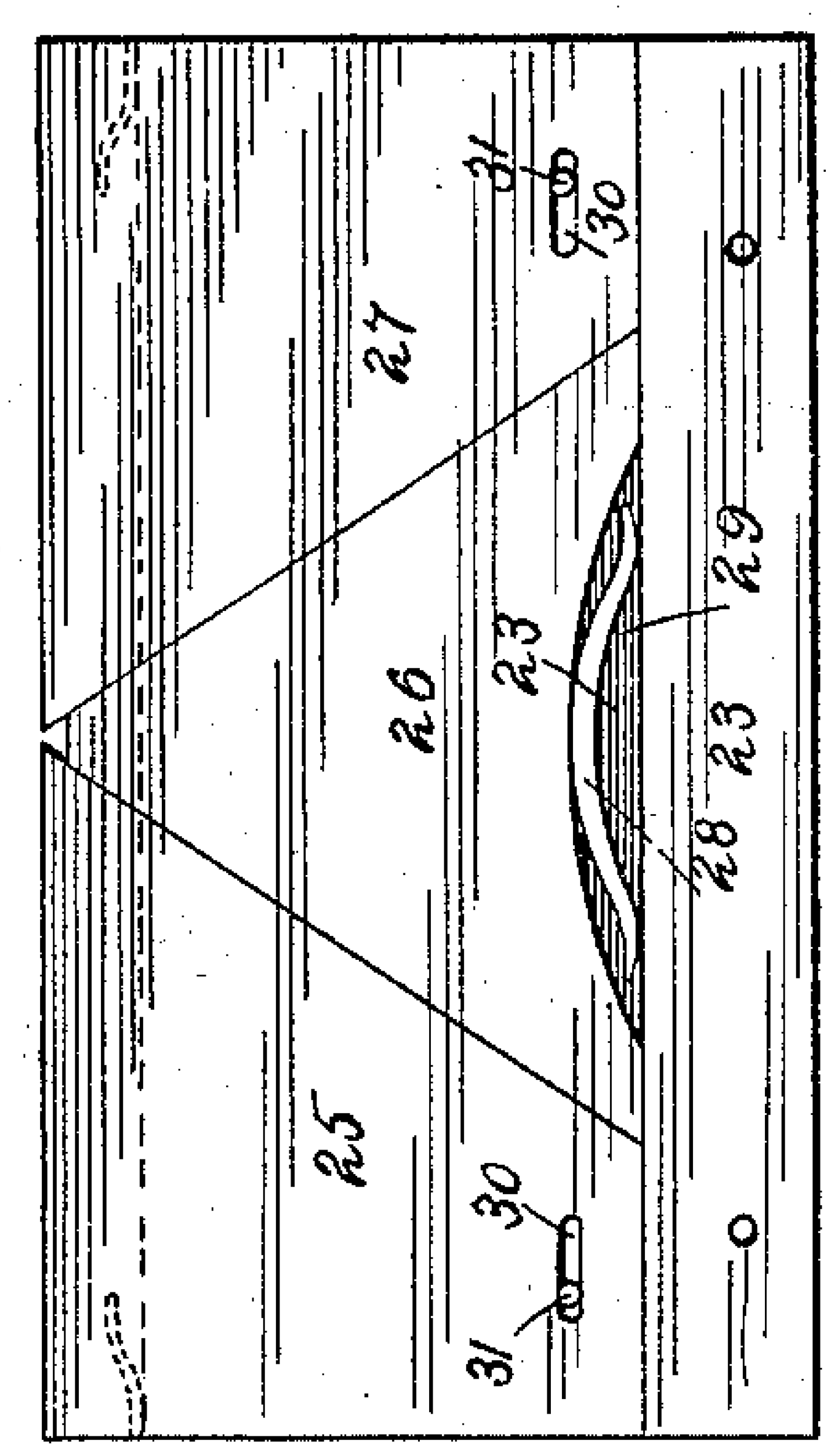
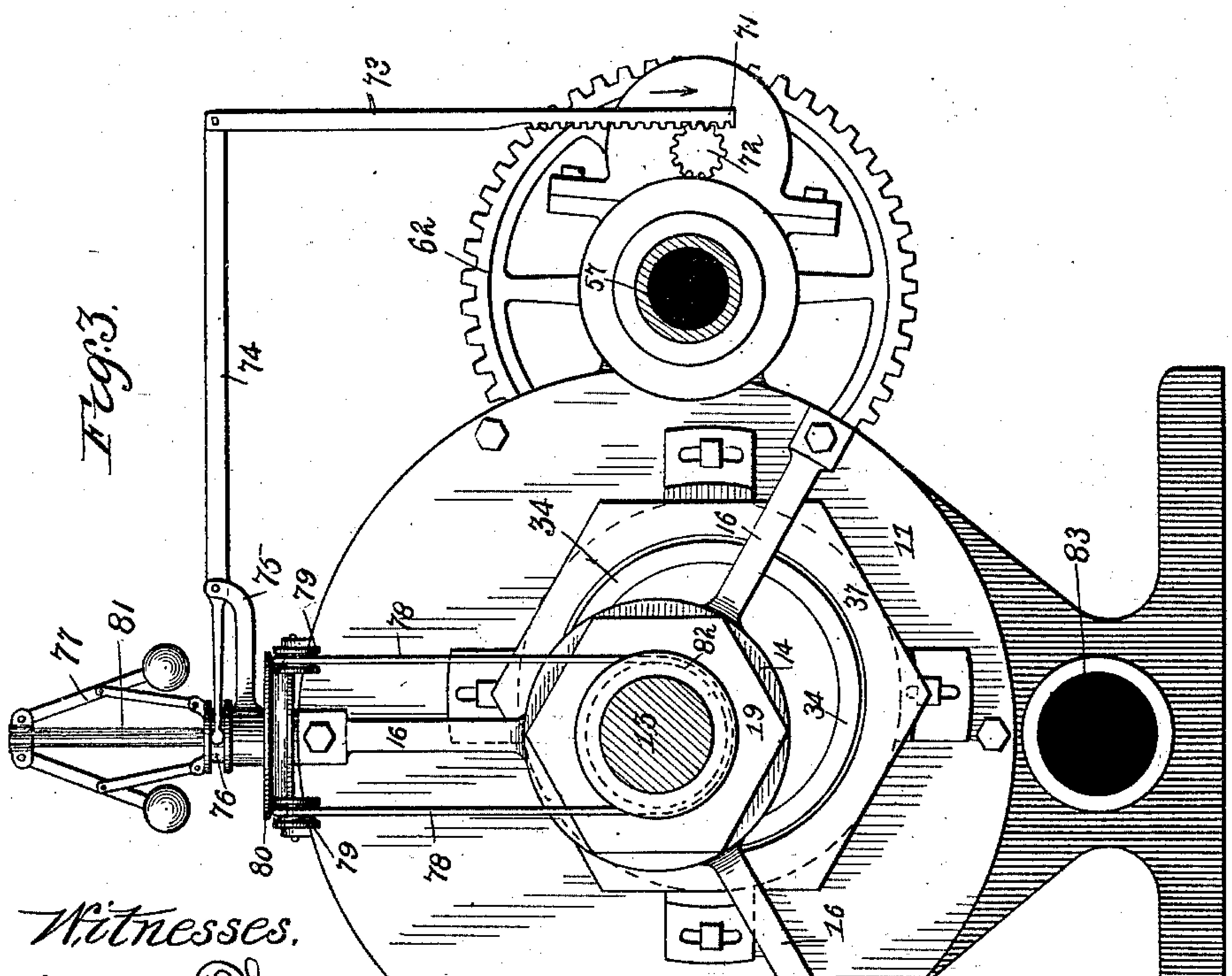


Fig. 3.



Witnesses.
Wm. M. Rheem.
Wm. F. Henning

Inventor
Charles A. Fisher
By Bond, Adams & Pickard
Attys.

(No Model.)

4 Sheets—Sheet 4.

C. A. FISHER.

ROTARY ENGINE.

No. 545,062. Patented Aug. 27, 1895.

Fig. 6.

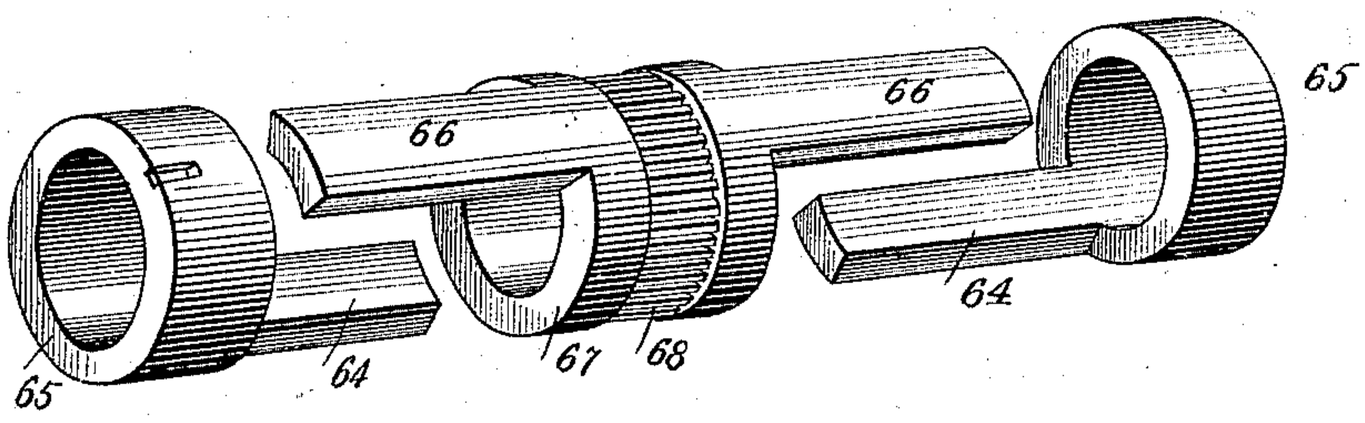


Fig. 7.

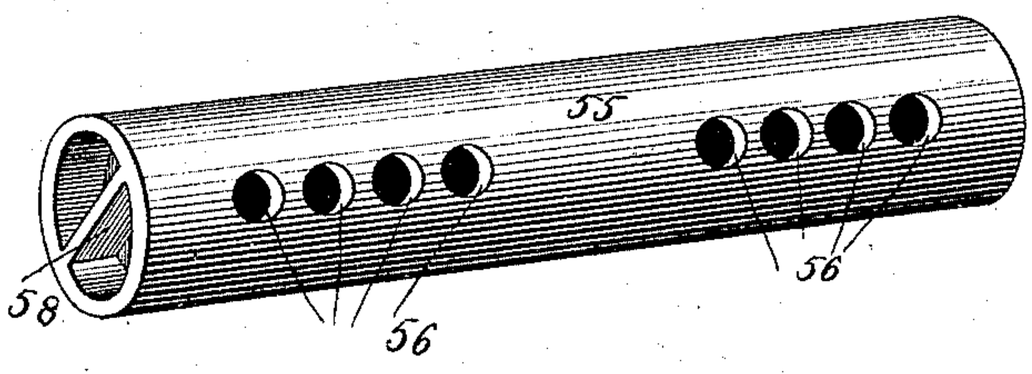


Fig. 8.

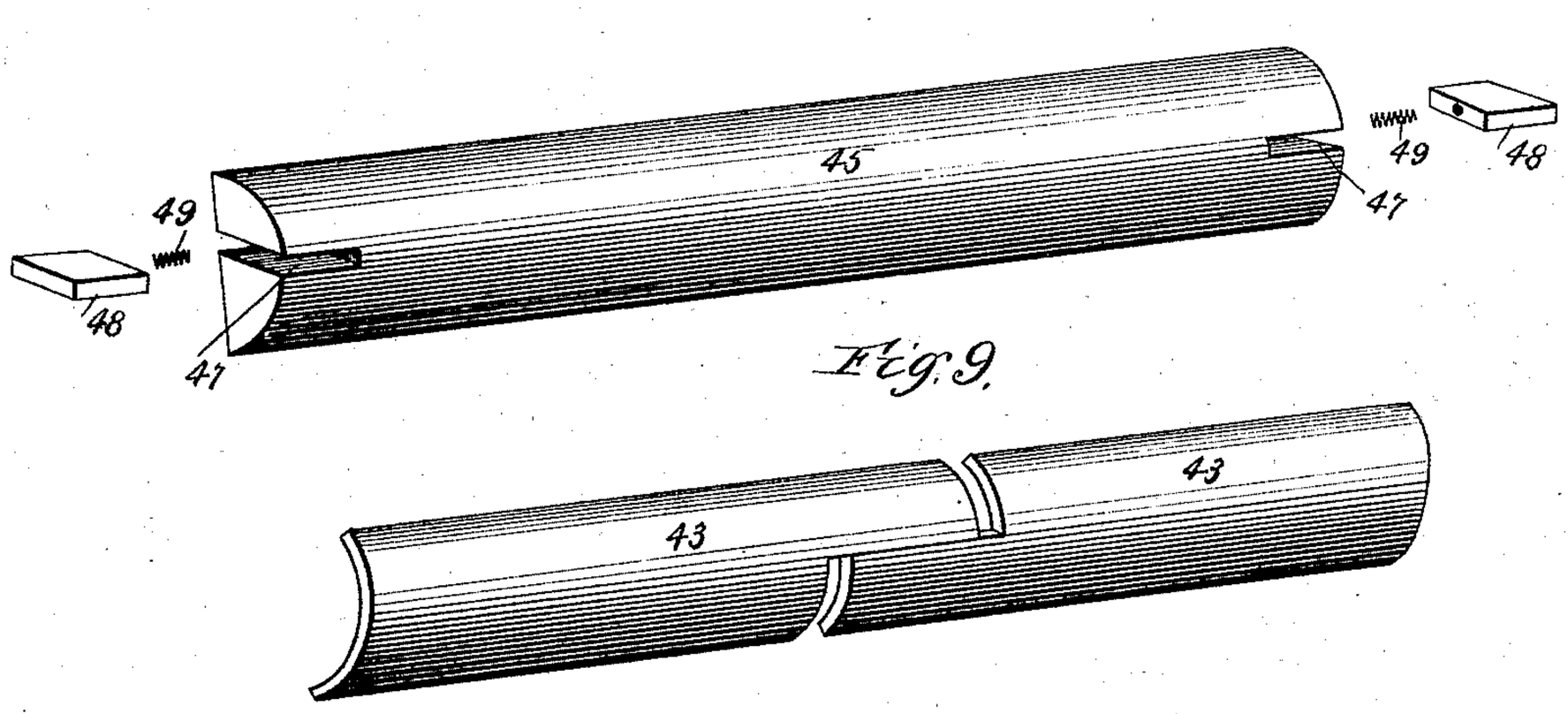


Fig. 9.

Witnesses.
Wm. N. Rheems
Wm. F. Fleming

Inventor.
Charles A. Fisher
By Bond, Adams & Pickard
Atty's

UNITED STATES PATENT OFFICE.

CHARLES A. FISHER, OF PETERSBURG, ILLINOIS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 545,062, dated August 27, 1895.

Application filed September 8, 1892. Serial No. 445,365. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. FISHER, a citizen of the United States, residing at Petersburg, in the county of Menard and State of Illinois, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical cross-section on line 1 1 of Fig. 2. Fig. 2 is a horizontal section on line 2 2 of Fig. 1. Fig. 3 is an end elevation. Fig. 4 is a detail, being a front elevation of the piston-wheel, showing the arrangement of its outer covering. Fig. 5 is a detail, being a side elevation of the piston. Fig. 6 is a perspective view showing the cut-off blocks. Fig. 7 is a perspective view of the induction-valve. Fig. 8 is a perspective view of one of the piston-blocks, and Fig. 9 is a perspective view of one section of the face-plates which form a bearing for the piston-blocks.

My invention relates to rotary steam-engines, and has for its object to improve the construction and operation of engines of this class, which object I accomplish as hereinafter specified and as illustrated in the drawings. That which I regard as new will be set forth in the claims.

In the drawings, 10 indicates the engine-cylinder, of which 11 and 12 are the heads.

13 indicates a shaft which extends centrally through the cylinder 10 and is mounted in suitable bearings 14 and 15, carried by brackets 16 and 17, respectively, supported by the cylinder-heads, as best shown in Fig. 2. The bearings 14 and 15 are ball-bearings, the balls 18 being held in place by adjustable caps 19, as shown in Fig. 2. By screwing the caps 19 in their sockets the balls may be adjusted. Flanges 20 and 21 are provided on the shaft 13, against which the balls bear, as shown.

22 indicates the piston of the engine, which is mounted in the shaft 13 and is secured tightly in place. The length of the piston 22 is slightly less than that of the interior length of the cylinder 10, and its width is such that its outer edge terminates near the interior circumference of the cylinder. The piston 22 consists of a fixed section 23, which is rigidly secured to the shaft 13, and a movable section 24, carried by the fixed section 23. The outer portion of the fixed section 23 is narrowed to form a web, upon each side of which are mounted plates 25, 26, and 27. The inner plates 26 are substantially triangular in shape, and the adjacent edges of the plates 25 and 27 are inclined to fit snugly against the edges of the plates 26. The apices of the triangular pieces 26 are squared, so as to permit of the pieces 27 moving slightly outward.

28 indicates springs, one of which is mounted in a recess 29 at the base of each triangular piece 26 and between the base of such triangular piece and that part of the fixed section 23 of the piston 22, which supports it. The sections 25 and 27 are provided with slots 30, which extend parallel with the shaft 13, as best shown in Fig. 5.

31 indicates pins carried by the web of the fixed section 23, which pins are adapted to fit into and move in the slots 30. By this construction, when the shaft 13 is rotating, centrifugal force will cause the plates 26 to move outward, thereby forcing the plates 25 and 27 away from each other and toward the end of the cylinder 10. Lubricating material is provided to prevent friction between the ends of the cylinder 10 and the adjacent portions of the plates 25 and 27.

32 indicates a T-shaped shoe, the outer portion of which is adapted to bear against the inner surface of the cylinder 10, and the stem of which is adapted to fit into the space between the plates 25 and 27 and the end of the fixed section 23 of the piston, as shown in Fig. 1. The shoe 32 is of the same length as the piston 22. As the piston is operated the shoe 32 will be thrown outward by centrifugal force, and will move upon the inner surface of the cylinder 10.

33 indicates a tubular wheel, which is mounted upon a sleeve 34 which extends eccentrically through the cylinder 10. The sleeve 34 is provided with bushings 35, which bear upon balls 36 supported by adjustable bearings 37 carried by the cylinder casing, as best shown in Fig. 2. The bearings of the sleeve 34 are eccentric as regards the cylinder 10. The shaft 13, however, passes through the sleeve 34, as shown. The wheel 33 is of the same length as the interior of the cylinder 10, and is provided with an exterior casing 38. The casing 38 of the wheel 33 con-

sists of three sections 39 40 41. The lateral edges of the middle section 40 are equally inclined, so that if the section 40 were to be flattened it would be substantially of a triangular shape. The sections 39 and 41 have inclined inner edges adapted to fit snugly against the edges of the section 40, their outer edges being parallel to fit snugly against the ends of the cylinder 10. The apex of the inner section 40 is squared, so that it may be moved slightly to cause the sections 39 and 41 to be separated. The casing 38 is slit longitudinally, as shown in Fig. 4, to register with a circular recess 42 formed in the wheel 33. The sleeve 34 is also divided to register with the recess 42.

43 44 indicate segmental lining-plates, which line the inner surface of the recess 42. The plates 43 are each preferably made up of two sections fitted together, as best shown in Fig. 9. The piston 22 passes through the recess 42, as shown in Fig. 1.

45 46 indicate segmental blocks, one of which is placed in the recess 42 at each side of the piston 22, as shown in Fig. 1. The blocks 45 and 46 serve as bearings for the piston, and they are adapted to move radially thereupon. Each block 45 and 46 is provided at each end with a recess 47 adapted to receive a block 48 and spring 49. The spring 49 is placed between the block 48 and the inner end of the recess 47, and serves to exert an outward pressure upon the block 48, holding it in contact with the adjacent end of the cylinder 10.

50 indicates annular antifriction-plates, fitted into the ends of the cylinder 10 and adapted to act as bearings for the adjacent portions of the casing 38 of the wheel 33, as shown in Fig. 2.

51 indicates tie-bars, which bind the ends of outer sections of the casing 38 to the wheel 33 at points near the recess 42, as shown in Fig. 1.

52 indicates a cylindrical valve-chamber, the casing of which is preferably formed integral with the casing of the cylinder 10. The valve-chamber 52 extends longitudinally of the cylinder 10 and at one side thereof.

53 indicates an induction-port opening from the chamber 52 to the interior of the cylinder 10. A number of cross-bars 54 are provided in the cylinder 10 opposite the port 53, which are flush with the interior of the cylinder and serve to prevent the piston-shoe 32 from dropping into the port as it passes it.

55 indicates an induction-valve, which is cylindrical in shape, and is provided with steam apertures 56 of any suitable description.

57 indicates a steam-supply pipe, which is adapted to conduct steam into the valve 55, as shown in Fig. 2. At the end of the valve 55 opposite to that at which the steam is supplied, is provided a web 58, as best shown in Figs. 2 and 7.

59 indicates a shaft which extends through a suitable bearing 60, and is provided with a fork 61 adapted to receive the web 58, as shown in Fig. 2. By rotating the shaft 59 the valve may be rotated.

62 indicates a gear-wheel mounted upon the shaft 59.

63 indicates a gear meshing with the gear 62, and mounted upon the shaft 13. By this construction, as the shaft 13 is rotated the valve 55 will also be rotated.

64 indicates fixed cut-off blocks, which are rigidly secured in the valve-chamber 52 adjacent to the port 53. The blocks 64 are carried by sleeves 65 fitted into the valve-chamber at opposite ends in such manner that the blocks 64 project from opposite ends into the chamber 52, and are substantially in line with each other.

66 indicates adjustable cut-off blocks, which are carried by a sleeve 67 mounted centrally in the valve-chamber 52 around the valve 55. When the parts are in place the inner ends of the blocks 64 bear upon the ends of the sleeve 67, and the outer ends of the blocks 66 bear upon the inner ends of the sleeve 65, as shown in Fig. 2, forming steam-tight connections. The sleeve 67 is provided with peripheral teeth 68, in which mesh the teeth of a pinion 69 mounted upon a shaft 70 journaled in a suitably-arranged bracket 71. By rotating the sleeve 67 the position of the blocks 66 may be adjusted as desired, thereby admitting a greater or less amount of steam into the cylinder 10.

72 indicates a pinion mounted upon the shaft 70, as best shown in Figs. 2 and 3.

73 indicates a rack-bar vertically arranged and intermeshing with the teeth of the pinion 72.

74 indicates a pivoted lever mounted upon a suitable support 75, and having its outer end connected to the bar 73. The inner end of the lever 74 is fitted into a slot in a collar 76, connected to a governor 77 in such manner that as the arms of the governor swing outward the sleeve 76 will be lifted, thereby raising the inner end of the lever 74 and depressing its outer end. When the outer end of the lever 74 is depressed the pinion 74 will be rotated in the direction indicated by the arrow in Fig. 3, thereby rotating the pinion 69 in the same direction and throwing the cut-off blocks 66 toward the port 53, and diminishing the supply of steam supplied to the cylinder 10. As the arms of the governor 77 fall an opposite action takes place. The governor 77 is operated by means of a belt 78 passing over pulleys 79 and around a horizontal pulley 80 mounted upon the governor-shaft 81. The lower portion of the belt 78 passes over a pulley 82 mounted upon the shaft 13. By this arrangement the speed of rotation of the shaft 13 determines the amount of steam admitted to the cylinder 10.

83 indicates an exhaust-port, which is located about ninety degrees, more or less, from the induction-port 53, and is provided with depressions 84, similar to the depressions 54.

85 indicates a bearing-plate, which is piv-

otally mounted in a recess 86 in the casing of the cylinder 10, as best shown in Fig. 1. The inner portion of the plate 85 is adapted to bear upon the outer surface of the casing 38, to form a steam-tight joint and prevent the passage of steam between said casing and the walls of the cylinder 10.

87 indicates an adjusting-screw, by means of which the position of the plate 85 may be adjusted.

The valve 55 being in the position shown in Fig. 1, steam will pass through the port 53 into the cylinder 10, and its pressure will cause the piston 22 to rotate. As the piston rotates a larger surface will become exposed to the action of the expanding steam, until the point opposite the plate 85 is reached, after which the exposed surface of the piston will begin to diminish until the plate 85 is reached, at which point the piston will be entirely incased in the wheel 33. The blocks 45 and 46 will move upon the surface of the piston, giving a steady bearing. The wheel 33 and the parts connected therewith are also rotated. After the piston passes the exhaust-port 83 steam will begin to exhaust and will continue to be exhausted until the piston again reaches the exhaust-port 83. As the wheel 33 is in contact with the plate 85 between the induction and eduction or exhaust-ports steam cannot pass from in front of the piston back to the induction-port, nor can there be any pressure except upon the back of the piston, whereby all back-pressure is avoided. Tight connections at all points will be formed, owing to the expansibility of the parts, as hereinbefore described. The mounting of the rotary parts upon the ball-bearings serves to diminish friction and increases the efficiency of the engine.

By operating the induction-valve from the piston-supporting shaft steam will be admitted to the cylinder only when the piston arrives at the upper position. In Fig. 1 the relative positions of the piston and induction-port are shown, the induction-valve being so arranged as to admit steam to the cylinder shortly after the piston passes the induction-port. The relative positions of the pistons and induction-valve may be varied slightly, if desired.

In order to expand the exterior casing 38 of the piston-wheel 33 a spring-screw 88 is provided, the lower end of which is screwed into a socket in the sleeve 34, its outer end lying in a recess 89 in the wheel 33 and in a recess 90 in the central section 40 of the casing 38. The upper portion of the screw 88 is made of spring metal, and it is provided with a tapering head 91, as shown in Fig. 2. The head of the screw is adapted to bear against the adjacent portion of the section 40 on the side nearest the pointed end of said section. By screwing the screw 88 into or out of its socket the head will bear against the adjacent portion of the section 40, thereby moving said section in one direction or the other, depending on the direction of rotation of the screw, to cause the central section 40 to force the sections 39 and 41 apart, or to permit them to approach each other. By this arrangement the exterior sections of the casing 38 may be made to engage the surface of the rings 50 and form steam-tight connections. By making the screw 88 of spring-metal it will have a yielding action and the action of the piston-wheel will be smoother.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a cylinder having induction and eduction ports, a laterally expansible piston, an eccentrically mounted piston wheel, a bearing for said piston wheel intermediate the cylinder ports, segmental bearing blocks carried by the piston wheel in contact with opposite sides of the piston, and segmental lining plates intermediate said blocks and wheel, substantially as described.

2. The combination of a cylinder having induction and eduction ports, a laterally expansible piston, an eccentrically mounted piston wheel, a sleeve supporting said piston wheel, bearings for said sleeve, and a central shaft on which the piston is mounted, substantially as described.

3. The combination with a cylinder having induction and eduction ports, and a bearing plate 85 intermediate said ports, of an eccentrically mounted piston-wheel, having a laterally expansible casing 38, and a rotary piston composed of a fixed section 23 and a laterally expansible section carried by said fixed section and consisting of plates 25, 26, and 27, and the radially movable shoe 32, substantially as described.

4. The combination with a cylinder having induction and eduction ports, of a shaft extending centrally through the cylinder, a rotary piston consisting of a fixed section 23 rigidly secured to the said shaft and having its outer portion narrowed to form a web, laterally movable plates 25, 26, and 27, mounted upon each side of said web and the radially movable shoe 32, and an eccentrically mounted piston-wheel, substantially as described.

5. The combination with a cylinder having induction and eduction ports, a central shaft and a rotary piston mounted on said shaft, of a piston wheel eccentrically mounted in said cylinder around the central shaft and having an exterior expansible casing, substantially as described.

6. The combination of a cylinder having induction and eduction ports, a central shaft extended through the cylinder a rotary piston mounted on said shaft and an eccentrically mounted piston wheel inclosing the central shaft and having an exterior laterally expansible casing, substantially as described.

7. The combination of a cylinder having induction and eduction ports, a centrally mounted rotary piston, an eccentrically mounted piston wheel having an exterior laterally expansible casing, and a bearing for

said piston wheel intermediate the cylinder ports, substantially as described.

8. The combination with a cylinder, having induction and eduction ports, a rotary piston, and a tubular piston wheel 33 having a bearing between said ports, of a casing 38 for said wheel, said casing consisting of three sections, 39, 40, 41, the inner section having inclined lateral edges, substantially as described.

9. The combination with a cylinder, having induction and eduction ports, and a rotary piston, of a tubular piston wheel encircling said piston and having a bearing between said ports, casing 38 for said wheel, said casing consisting of three sections 39—40—41, the inner section having inclined lateral edges, and a screw 88, having a tapering head adapted to bear against the adjacent portion of the central section 40, substantially as described.

CHARLES A. FISHER.

Witnesses:
JOHN L. JACKSON,
A. H. ADAMS.