

No. 702,558.

Patented June 17, 1902.

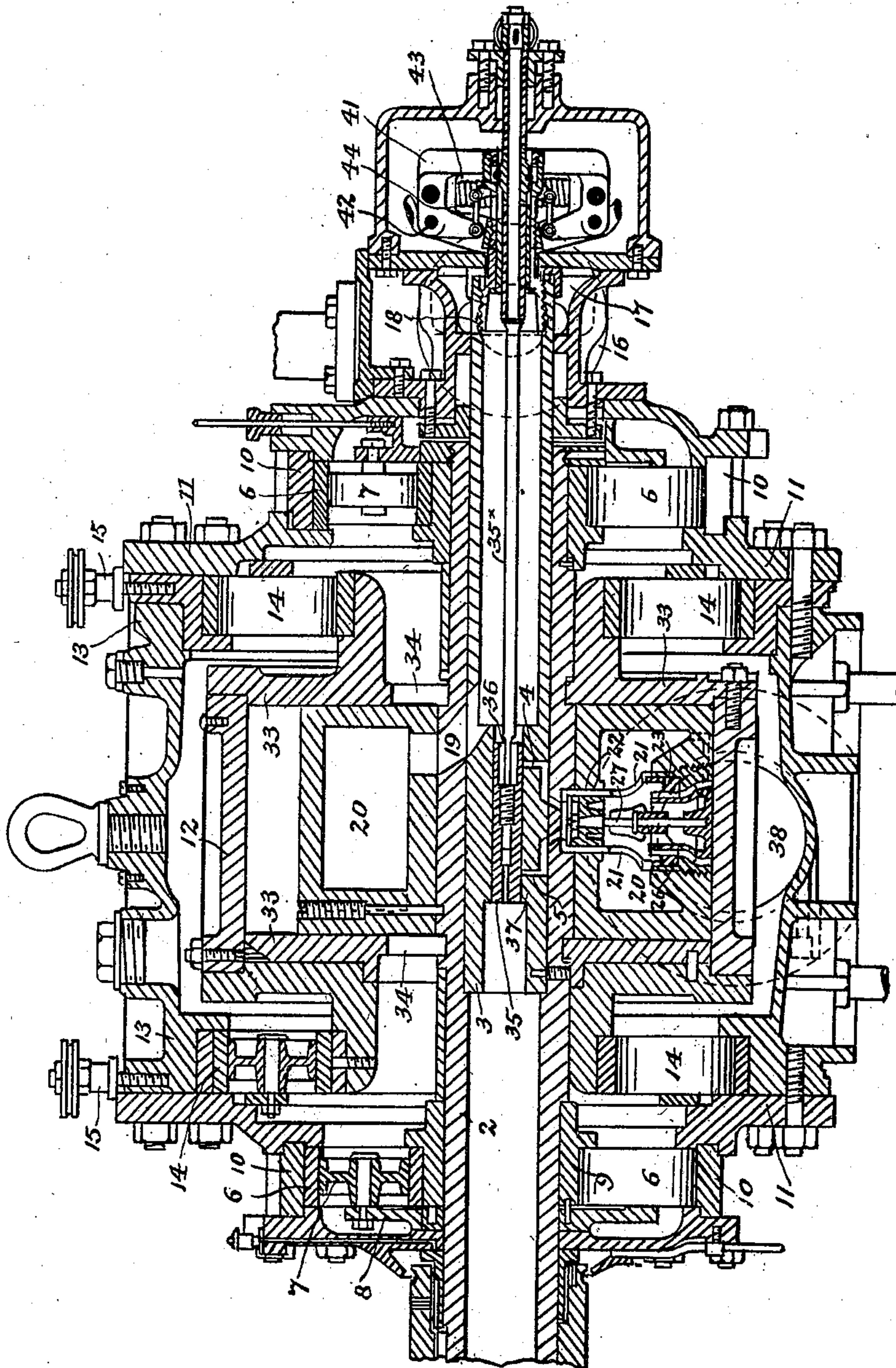
C. A. & O. W. HULT.  
ROTARY ENGINE.

(Application filed Mar. 17, 1902.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1-



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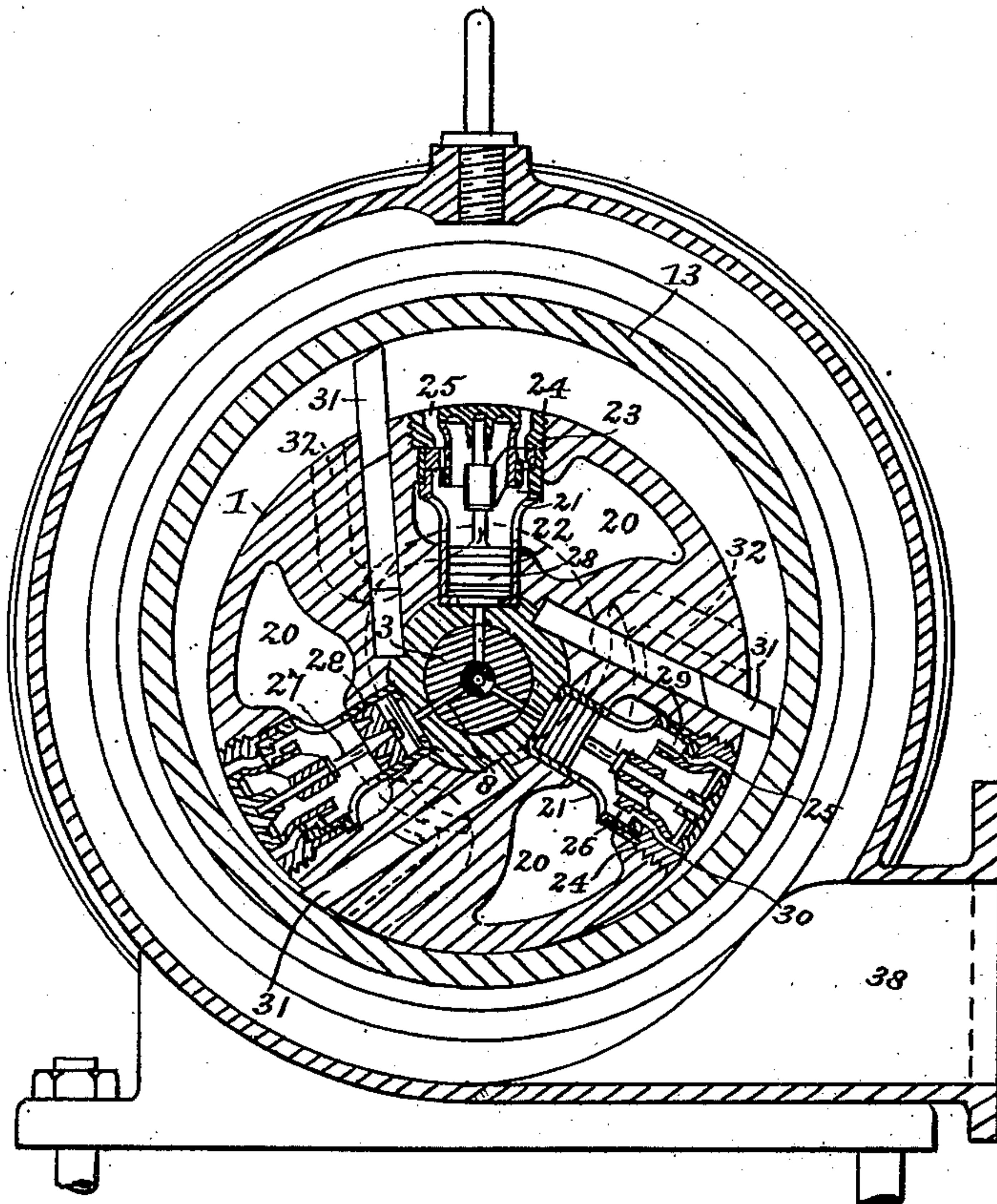
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Fig. 2.



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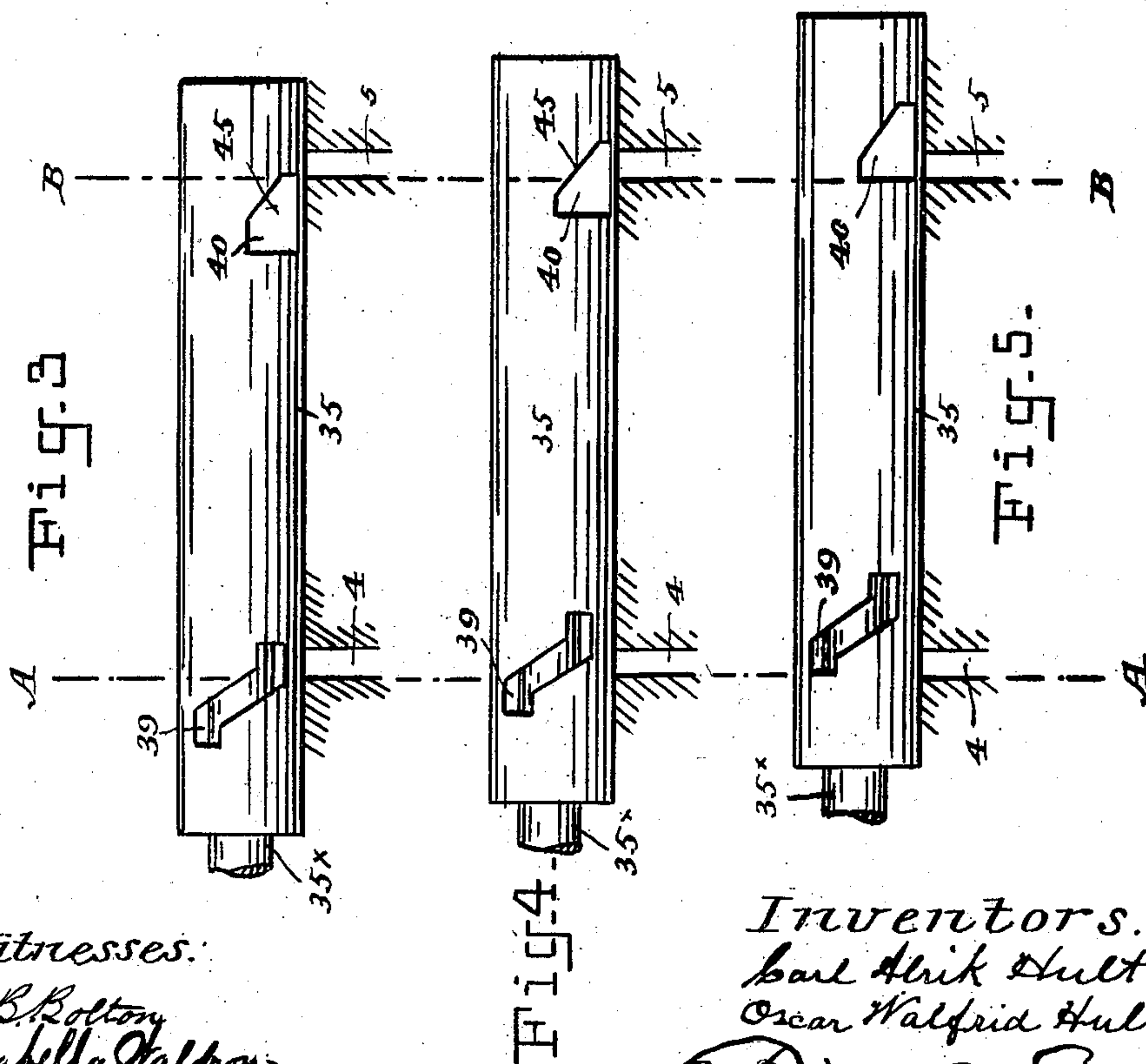
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4 Sheets—Sheet 4.

Fig. 12.

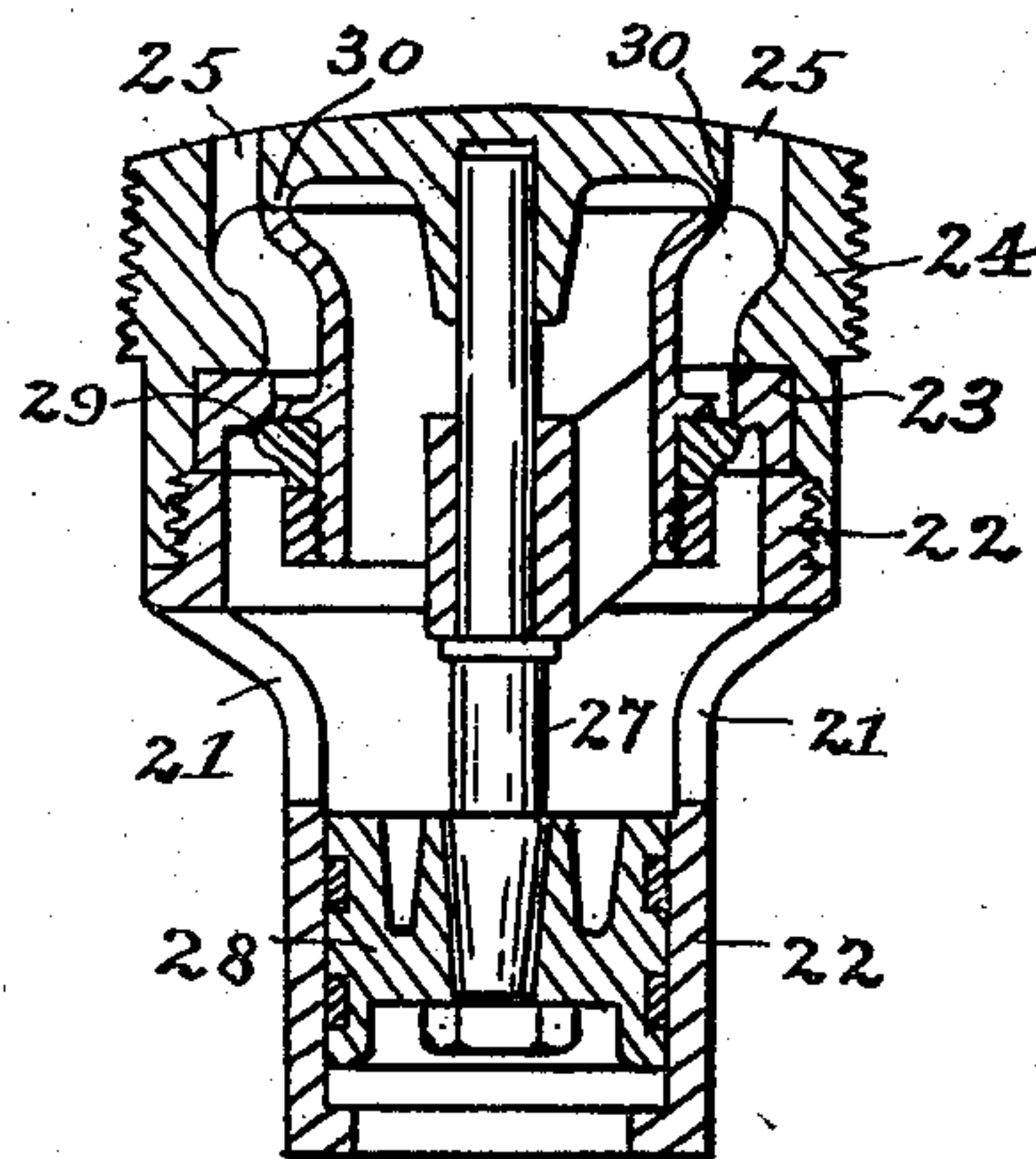
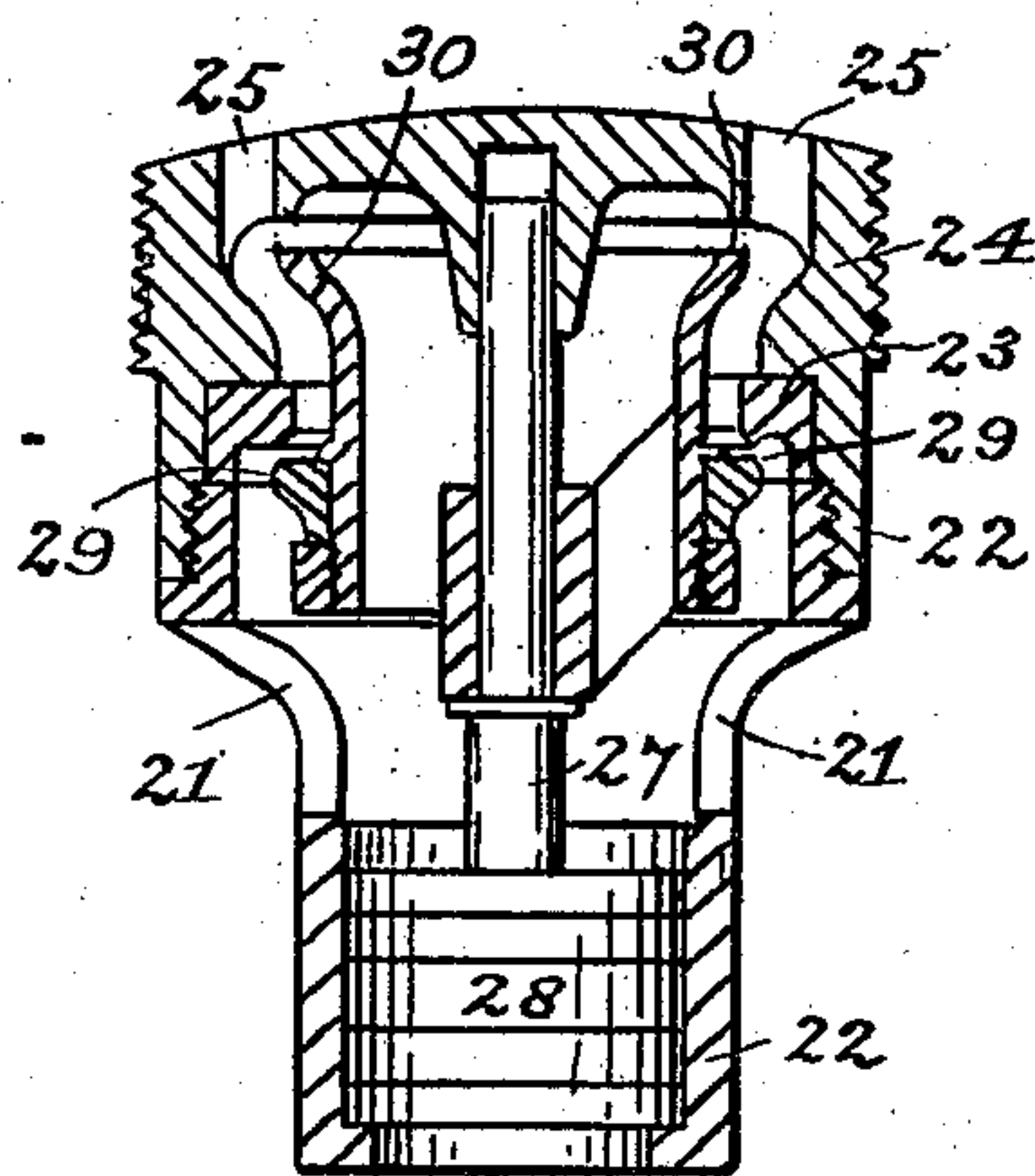


Fig. 13.



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# UNITED STATES PATENT OFFICE.

CARL ALRIK HULT AND OSCAR WALFRID HULT, OF STOCKHOLM, SWEDEN.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 702,558, dated June 17, 1902.

Application filed March 17, 1902. Serial No. 98,705. (No model.)

*To all whom it may concern:*

Be it known that we, CARL ALRIK HULT, of Flemmingatan 48, and OSCAR WALFRID HULT, of Handtverkaregatan 30, Stockholm, in the Kingdom of Sweden, managing directors, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an improved rotary engine with automatic inlet valve or valves for the driving fluid. By this arrangement the advantages are gained that the noxious space is diminished and that the driving fluid is quickly shut off from the working chamber as soon as the piston takes up a determined position, varying according to the amount of power required at any moment. For this purpose the valve or valves are combined with a controlling-cylinder actuated by a regulator, said cylinder serving as a distributing-valve for the driving fluid, hereinafter supposed to be steam or aqueous vapors. The inlet-valves are located in the rotary working piston of the engine, each connected to and actuated by a small controlling-piston, so that they are opened and closed under the influence of the steam-pressure at opposite sides of the controlling-piston.

The accompanying drawings illustrate a rotary engine constructed according to this invention.

Figure 1 is a vertical longitudinal section of the engine. Fig. 2 is a section at right angles to the former through the middle of the working piston, the latter being rotated a small angle from the position shown in Fig. 1. Figs. 3 to 5 are views showing the distributing cylinder or valve in different positions with relation to the ports of the steam-passages in the working piston. Figs. 6 and 7 are transverse sections of the distributing-cylinder on the lines A A and B B, respectively, of Fig. 3. Figs. 8 and 9 are transverse sections of the distributing-cylinder on the lines A A and B B, respectively, of Fig. 4; and Figs. 10 and 11 are transverse sections on the lines A A and B B, respectively, of Fig. 5. Figs. 12 and 13 are sections, at an enlarged scale, of the inlet-valve in respectively closed and opened position.

In the arrangement for carrying out our invention illustrated in the drawings the working piston 1, Figs. 1 and 2, is secured to a hollow shaft 2, journaled in the frame of the engine. Fastened within the shaft 2 is a case or lining 3, provided with a number of steam-passages 4 5, leading in pairs through the said lining and communicating with passages through the piston-shaft leading to the inlet-valves in the working piston. The piston-shaft 1 is journaled in the end walls of the frame, preferably by means of yielding rings 6, placed upon rollers 7, the said rollers being pivoted to a ring or disk 8, loosely surrounding the piston-shaft. The yielding rings 6 roll upon a steel ring 9, fastened to the piston-shaft, and within a steel ring 10, fastened to the end wall 11 of the frame in a position concentric to the piston-shaft. In order to further reduce the friction, the case 12, inclosing the working piston, is journaled with its end walls in the cylindrical portion 13 of the frame by means of yielding rings 14, arranged in the same manner as the yielding rings 6, before mentioned. As shown in Figs. 1 and 2, the working piston is located eccentrically in the case 12, so that it contacts with the inner side of the case along a generating-line. In order to assure an intimate contact between the piston and the case, adjusting-screws 15 are provided in the frame, by which screws the end walls of the frame can be lowered when required.

The high-pressure steam enters the hollow piston-shaft, communicating through passages 19 with cavities 20 in the working piston. Arranged within the working piston are valve-boxes, each of which communicates through openings 21 with one of the cavities 20 in the working piston. In the form of construction shown in the drawings the valve-boxes consist of an inner casing 22, a ring or collar 23, serving as a valve-seat, and a cap 24, screwed together with the casing 22 and screwed into the outer part of the piston, the bottom of the cap being provided with openings 25 and constructed to serve as the second valve-seat for the double-seat valve 26, arranged within the valve-box. The valve 26 is connected by arms with a socket or hub fastened to the rod 27 of a small controlling-piston 28, movable in the inner portion of the valve-box.



The tightening-surfaces 29 30 of the valve are so located with relation to each other that the valve cannot be opened by the steam-pressure in the working chamber of the engine.

5 The vanes 31, actuated by the pressure of the steam, are movable in the working piston and combined with suitable means (not shown) pressing their outer edges against the inner side of the case 12. The discharge of  
10 the driving fluid is suitably effected in such a manner that the ports in the ends of the working piston of the exhaust-passages 32 are alternately covered by the side pieces 33 of the case and uncovered by circular apertures  
15 34, arranged in the latter concentrically to the said case and surrounding the piston-shaft.

Arranged to slide within the lining 3 of the piston-shaft is a distributing-valve 35, not  
20 partaking in the revolution of the working piston, said valve being connected by means of a rod 35<sup>x</sup> to a regulator or speed-controlling device situated at one end of the engine. At the ends of the distributing-valve 35 are bor-  
25 ings or holes 36 37, one of which, 36, communicates with the steam-inlet, while the other, 37, communicates through an opening (not shown) in the piston-shaft with the chamber between the frame and the case 12 and through  
30 said chamber with the exhaust 38. Openings or ports 39 40, located near the ends of the distributing-valve 35, lead from the borings or holes 36 37 in the valve to the outer side of the distributing-valve 35. (See Figs. 3 to  
35 11.) During the revolution of the piston each of the ports of the passages 4 and 5 will be alternately covered by the wall of the distributing-valve and uncovered by the corresponding opening 39 or 40. The form and  
40 position of these openings are such that for any position of the distributing-valve 35 the passage 4 will be brought into communication with the steam-inlet immediately after the passage 5 has been shut off from the exhaust,  
45 as shown in Figs. 3 to 11, inclusive. By this means loss of steam is prevented, as steam can never pass directly from the inlet through the passages 4 and 5 to the exhaust.

In the arrangement for carrying out our  
50 invention illustrated in the drawings the regulator connected to the distributing-valve consists of weights 41, mounted to turn upon pivot-pins 42 and held in position by springs 43. The weights 41 are connected by links  
5 44 to a socket fixed to the rod 35<sup>x</sup>, so that when the weights are caused to turn under the influence of the centrifugal force the rod 35<sup>x</sup> is moved to the right in Fig. 1. On account of the oblique direction of the one edge  
10 45 of the exhaust-port 40 of the distributing-valve (see Figs. 3 to 5) the time during which the passage 5 is in communication with the said port will be diminished the more the valve 35 is moved to the left in Figs. 3 to 5  
15 or to the right in Fig. 1. The opening 39 has the same width throughout; but the shape of the said opening is determined, as before in-

12 indicated, by the condition that the passage 4 must be put into communication with the steam-inlet immediately after the passage 5  
70 has been shut off from the exhaust.

The engine operates in the following way: The high-pressure steam enters through the pipe 16, the steam-chamber 17, and the open-  
75 ings 18 in the case or lining 3, from which it passes through the passages 19 to the cavities 20 in the working piston and from said cavities through the openings 21 into the valve-boxes. The steam is, however, prevented by  
80 the inlet-valve 26 from entering the working chamber until the valve opens. As before stated, the inlet-valves 26 are equilibrated and normally kept closed by the centrifugal force. When, however, the port of any of  
85 the passages 5 passes the opening 40 in the distributing-cylinder 35, which occurs just before the inlet-valve communicating with the said passage is in its lowermost position, the chamber above the controlling-piston 28,  
90 connected to the corresponding inlet-valve, is connected through the passage 5, the opening 40 in the distributing-cylinder, the bore 37 in the said cylinder, the piston-shaft 2, and the chamber between the frame and the case to the exhaust-pipe 38. The steam-pres-  
95 sure in the valve-box acting upon the opposite side of the controlling-piston 28 then opens the inlet-valve 26, so as to allow steam to flow between the ring 23 and the tightening-surface 29 into the working chamber of  
100 the case. (See the right-hand one of the two lower inlet-valves in Fig. 2.) When the piston has made such a part of a revolution that the port of the passage 5 has passed the opening 40 in the distributing-cylinder, the pas-  
105 sage 4 is put through the opening 39 in the distributing-cylinder in communication with the steam-inlet. The steam-pressures at the two sides of the controlling-piston 28 will then be equal, and the inlet-valve 26 is closed  
110 under the influence of the centrifugal force, the supply of steam to the working chamber being then shut off. The steam confined in the working chamber then expands until it can escape through the exhaust-passage 32,  
115 (in the present instance through the lowermost one of those shown in Fig. 2.) The process described is repeated every time the port of the passage 5 to an inlet-valve passes the opening 40 in the distributing-valve. It  
120 will be easily understood that if the speed of the engine should exceed a certain limit the time during which the inlet-valves are kept opened will be diminished, so that the degree of admission decreases and the speed of  
125 the engine is reduced to the normal. Fig. 5 shows the position of the distributing-valve at the greatest degree of admission. Fig. 4 shows the position of said valve at a smaller degree of admission, and Fig. 3 shows the po-  
130 sition of said valve at full turn of the regulator, (admission equals 0.) One of the edges of the opening 40 being parallel to the axis of the piston, while the opposite edge 45 has



an oblique position, it will be seen that the admission always commences at a determined position of the working piston, but ceases at the position of the said piston corresponding to the amount of power instantaneously required.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

10 1. In rotary engines, in combination, equilibrated inlet-valves 26 for controlling the supply of driving fluid, each valve arranged in the rotary working piston 1 of the engine and connected to a controlling-piston 28 movable  
15 in the said rotary working piston, passages 19, 20, 21 communicating with the inlet and leading through the working piston 1 to one side of each of the controlling-pistons 28 for the inlet-valves, and passages 4, 5 leading to  
20 the opposite sides of the controlling-pistons 28, one of said passages 5 communicating periodically with the exhaust, the other passage 4 being put in communication with the inlet after the former passage 5 is shut off  
25 from the exhaust, substantially as specified.

2. In a rotary engine, the combination of equilibrated inlet-valves 26 placed in the rotary working piston 1 of the engine for controlling the supply of driving fluid, each valve  
30 being connected to a controlling-piston 28 movable in the said rotary working piston, passages 19, 20, 21 communicating with the inlet and leading through the working piston 1 to one side of each of the controlling-pis-  
35 tons 28 for the inlet-valves, a distributing-valve 35 located in the hollow shaft 2 of the rotary working piston and provided at its ends with bores or holes 36, 37 one of which 36 communicates with the inlet and the other  
40 37 with the exhaust, openings 39, 40 in the wall of the distributing-valve 35 leading from

each of the bores or holes 36, 37 in the distributing-valve to the outside of said valve, and passages 4, 5 leading from the outer side of the distributing-valve to the side of the  
45 controlling-pistons 28 opposite to that permanently communicating with the inlet, the ports of said passages periodically passing the openings 39, 40 in the wall of the distributing-valve, substantially as specified. 50

3. In a rotary engine, the combination of equilibrated inlet-valves 26 placed in the rotary working piston 1 of the engine for controlling the supply of driving fluid, each valve being connected to a controlling-piston 28  
55 movable in the said rotary working piston, passages 19, 20, 21 communicating with the inlet and leading through the working piston 1 to one side of each of the controlling-pistons 28 for the inlet-valves, a distributing-  
60 valve 35 located in the hollow shaft 2 of the rotary working piston and provided at its ends with bores or holes 36, 37, one of which 36 communicates with the inlet and the other 37 with the exhaust, openings 39, 40 in the  
65 wall of the distributing-valve 35 leading from each of the bores or holes 36, 37 in the distributing-valve to the outside of said valve, passages 4, 5 leading from the outer side of the distributing-valve to the side of the con-  
70 trolling-pistons 28 opposite to the side permanently communicating with the inlet, and a regulator connected to the distributing-valve for controlling the position of same, substantially as specified. 75

In witness whereof we have hereunto set our hands in presence of two witnesses.

CARL ALRIK HULT.

OSCAR WALFRID HULT.

Witnesses:

ERNST SVANQVIST,

AUG. SÖRENSEN.