G. I. LEONARD.

ENGINE.

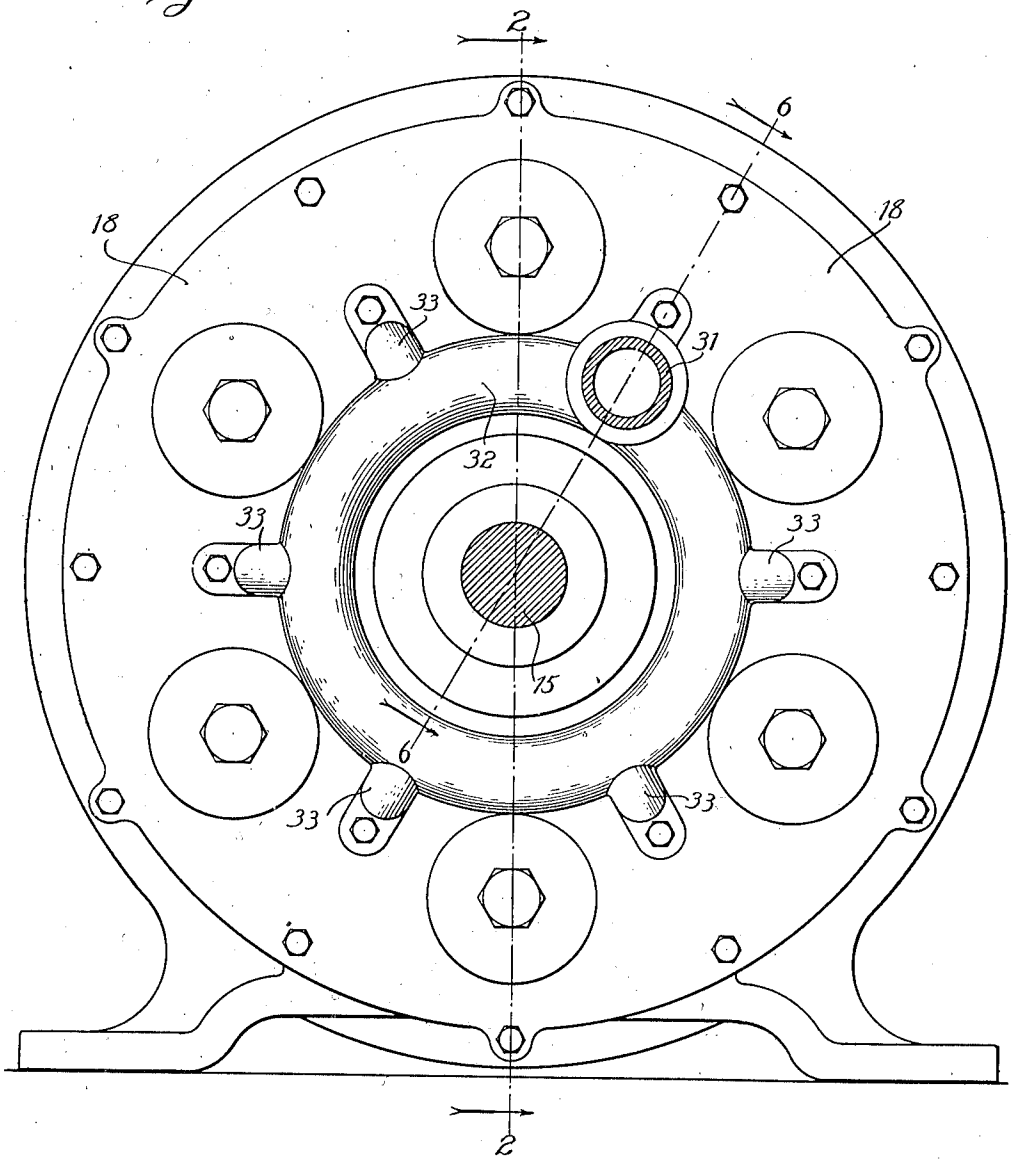
APPLICATION FILED SEPT. 6, 1917.

1,270,037.

Patented June 18, 1918.

7 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

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Inventor:

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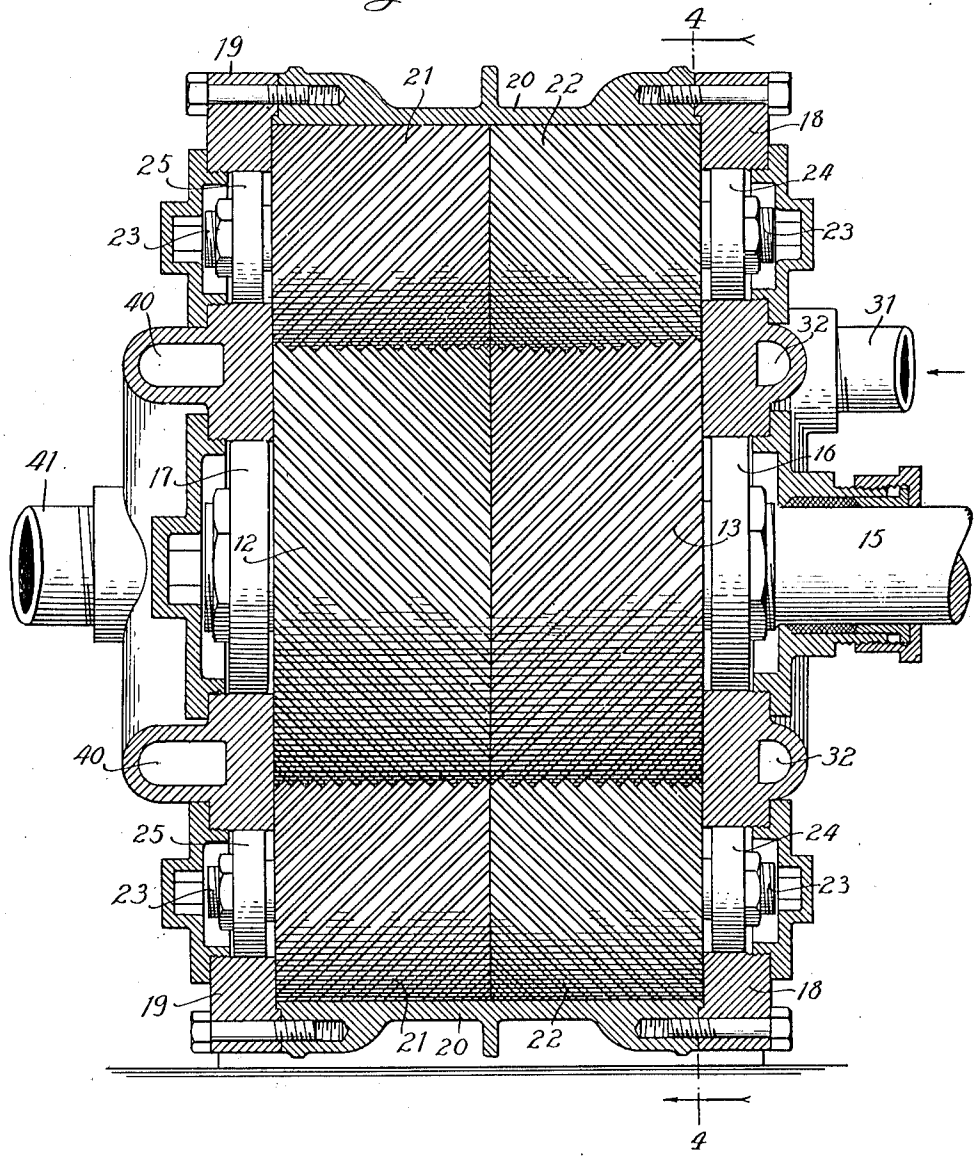
APPLICATION FILED SEPT. 6, 1917.

1,270,037.

Patented June 18, 1918.

7 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
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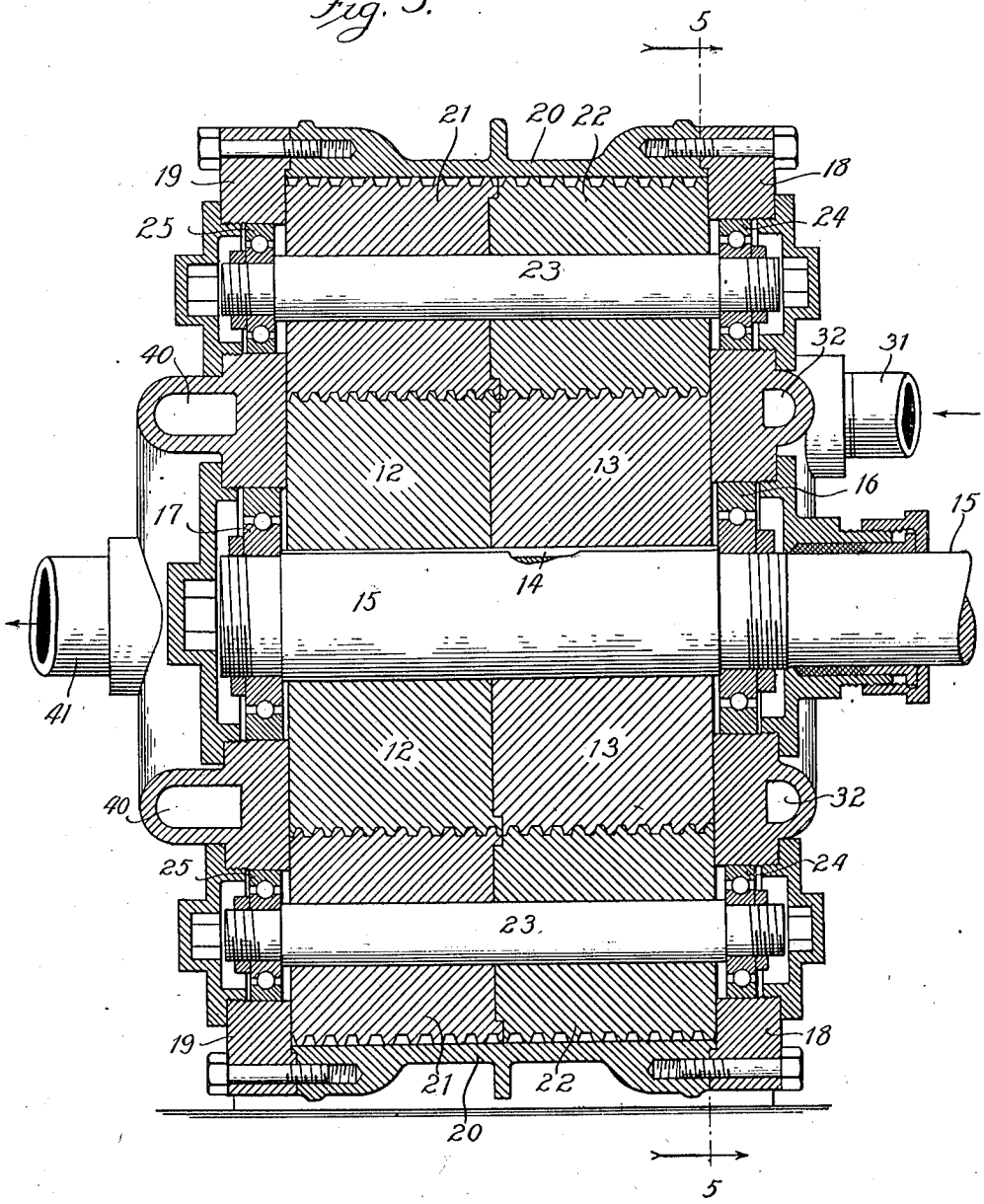
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7 SHEETS—SHEET 3.

Fig. 3.



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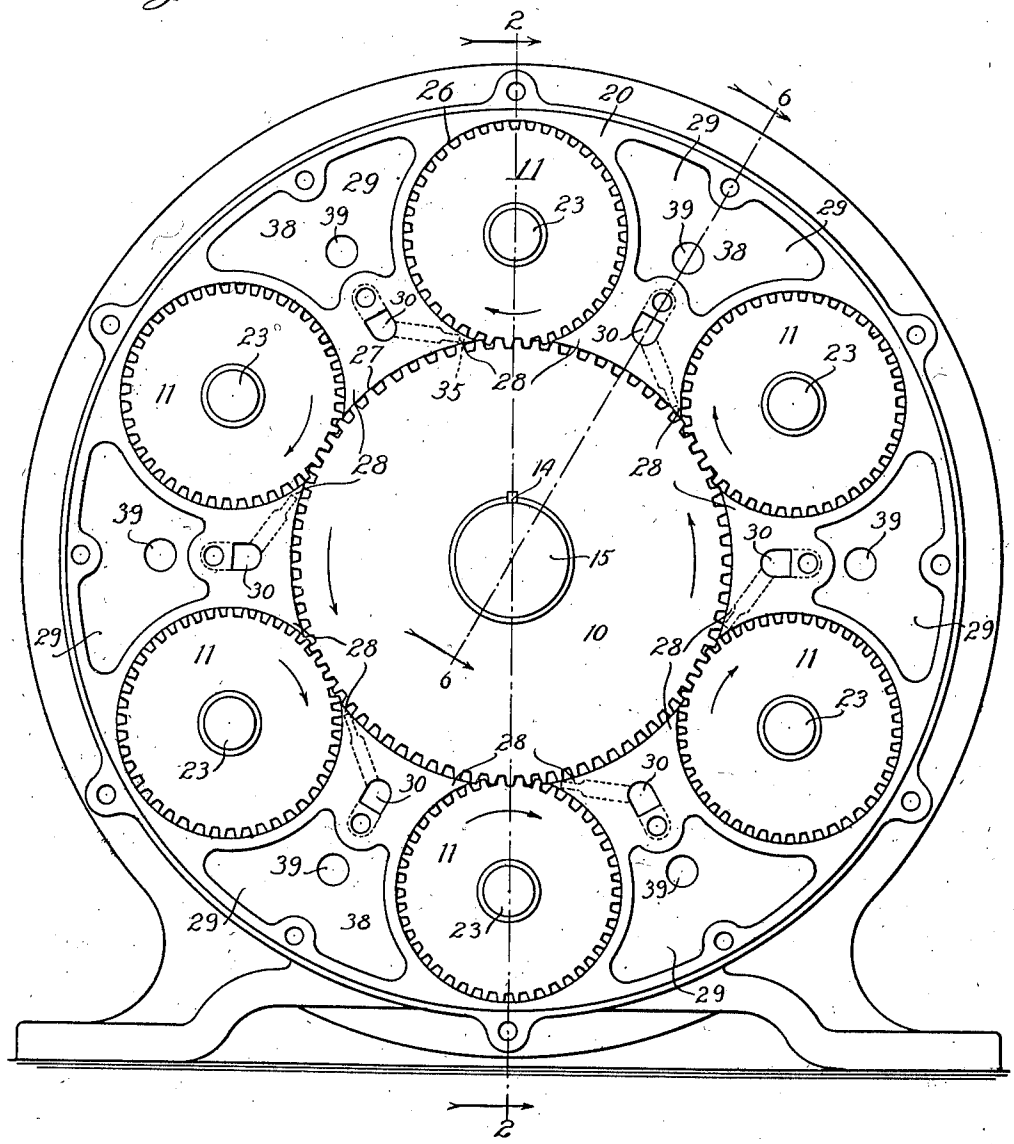
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7 SHEETS—SHEET 4.

Fig. 4.



Witnesses:
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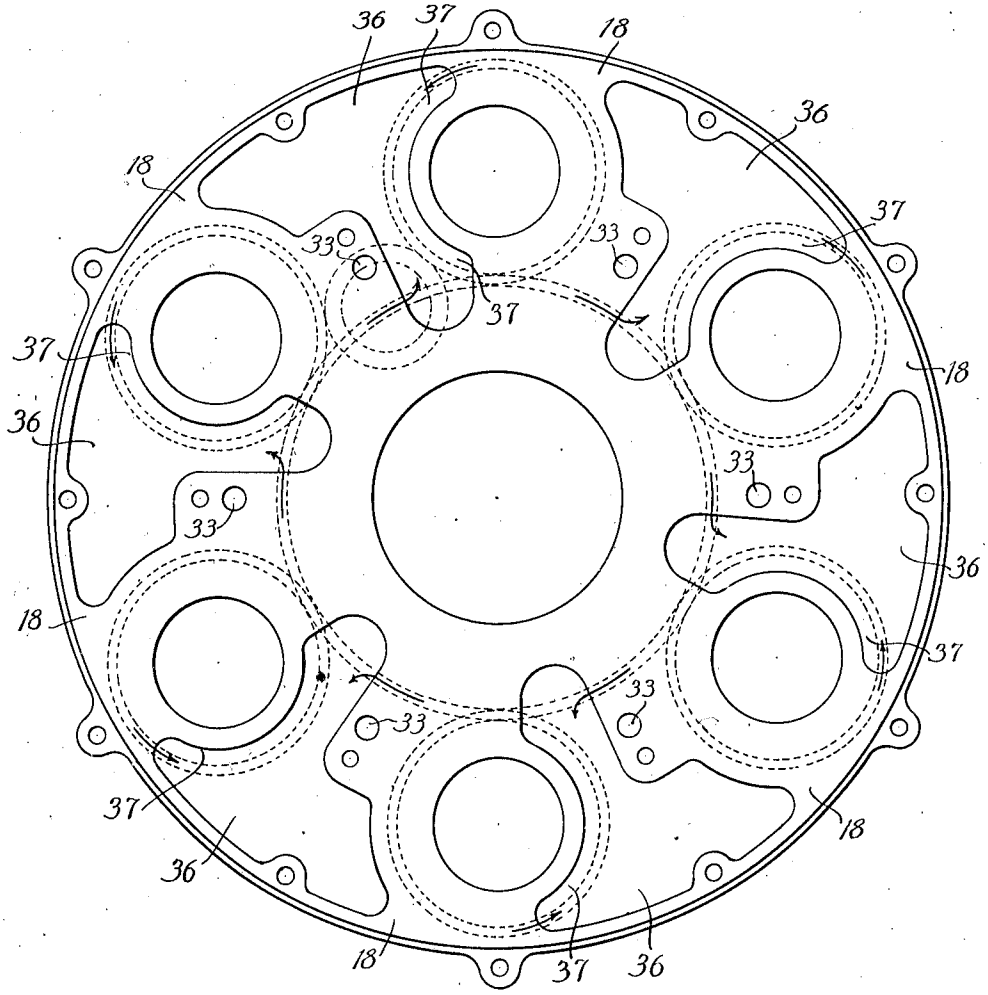
APPLICATION FILED SEPT. 6, 1917.

1,270,037.

Patented June 18, 1918.

7 SHEETS—SHEET 5.

Fig. 5.



Witnesses:
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APPLICATION FILED SEPT. 6, 1917.

1,270,037.

Patented June 18, 1918.

7 SHEETS—SHEET 6.

Fig. 6.

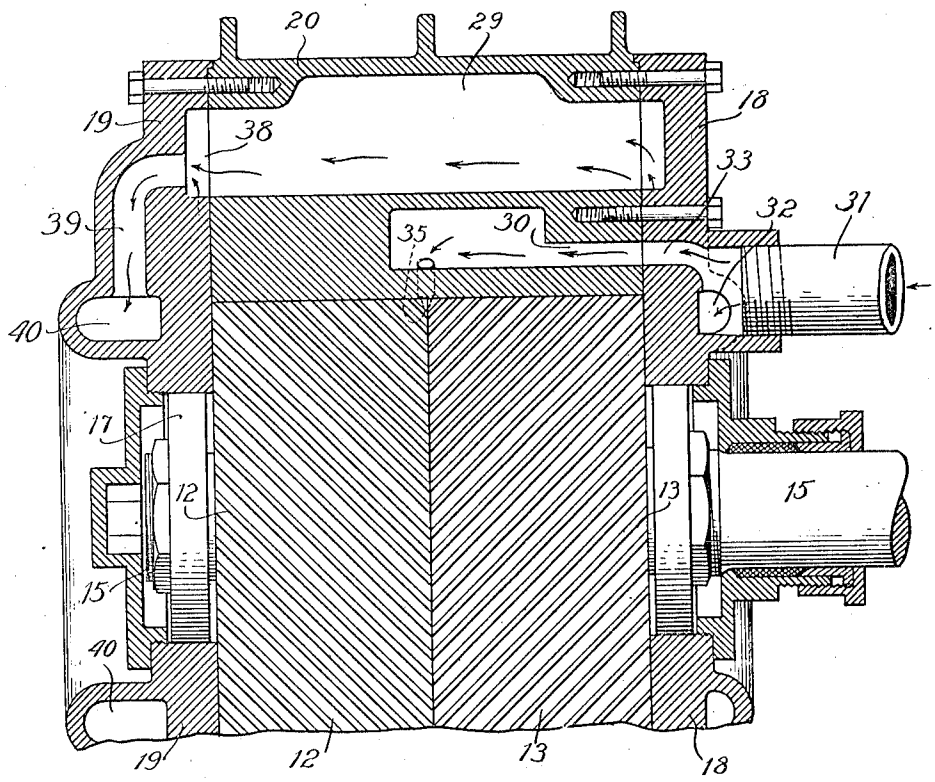
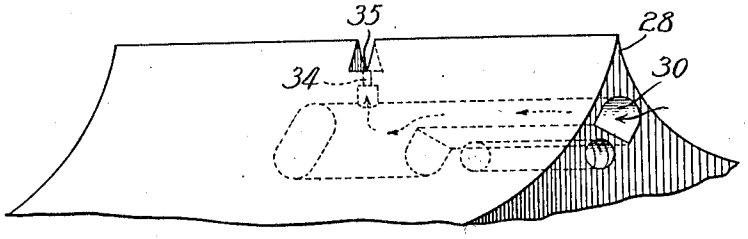


Fig. 7.



Witnesses:
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APPLICATION FILED SEPT. 6, 1917.

1,270,037.

Patented June 18, 1918.

7 SHEETS—SHEET 7.

Fig. 8.

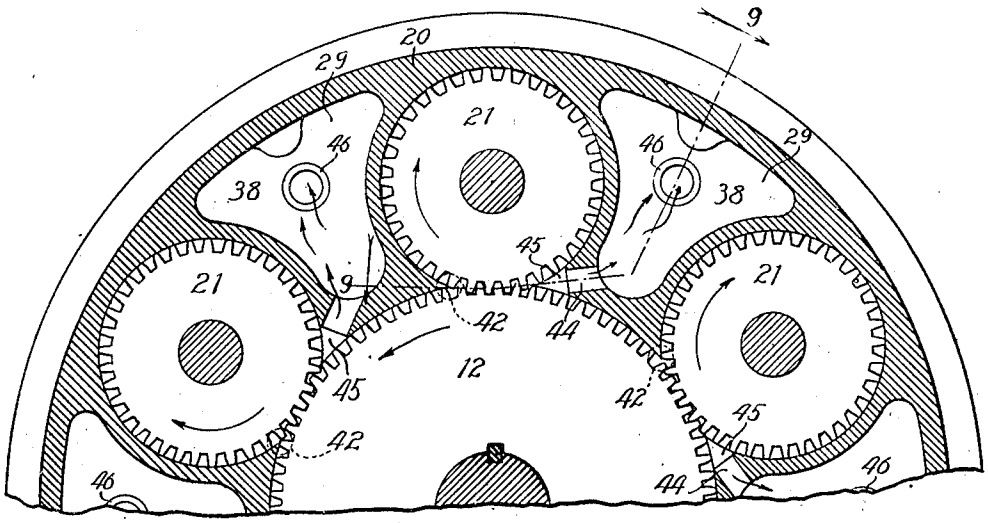
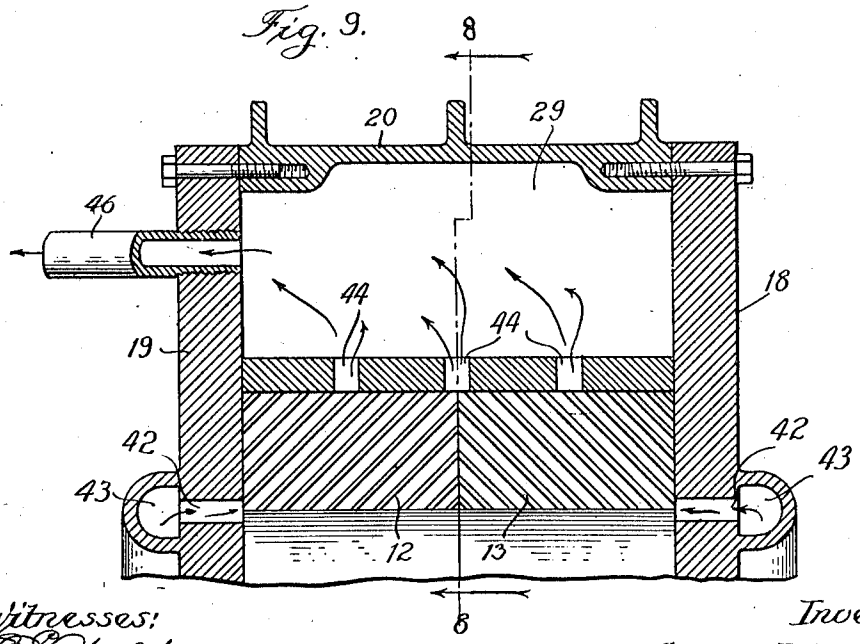


Fig. 9.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

GEORGE I. LEONARD, OF CHICAGO, ILLINOIS, ASSIGNOR TO LEONARD VALVELESS ENGINE COMPANY, A CORPORATION OF MAINE.

ENGINE.

1,270,037. Specification of Letters Patent. Patented June 18, 1918.

Application filed September 6, 1917. Serial No. 189,958.

To all whom it may concern:

Be it known that I, GEORGE I. LEONARD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Engines, of which the following is a specification.

My invention relates more particularly to engines of the type employing intermeshing gears, driven by the introduction of a fluid, such as steam, into the intermeshing portions of the gears; and my object, generally stated, is to provide improvements in engines of this general type to the end that greater power may be obtained from the engine, the wear of parts reduced to the minimum, and smoother running obtained.

Referring to the accompanying drawings—

Figure 1 is a view in end elevation, showing the inlet pipe in section, of an engine constructed in accordance with my invention. Fig. 2 is a section taken at the line 2—2 on Figs. 1 and 4, and viewed in the direction of the arrows, the gears through which the section is taken being shown in elevation. Fig. 3 is a section taken at the line 2—2 on Figs. 1 and 4, but showing the gears in section. Fig. 4 is a section taken at the line 4—4 on Fig. 2, and viewed in the direction of the arrow. Fig. 5 is a section taken at the line 5—5 on Fig. 3 and viewed in the direction of the arrows. Fig. 6 is a section taken at the line 6—6 on Figs. 1 and 4, and viewed in the direction of the arrows, certain portions of the structure being broken away; Fig. 7 is a perspective view of a portion of the casing inclosing the gears, located adjacent the intersection thereof and illustrating the manner of supplying the driving-fluid to the gears; Fig. 8 is a section taken at the irregular line 8—8 on Fig. 9 and viewed in the direction of the arrows, showing a modification of the construction of the preceding figures; and Fig. 9, a section taken at the irregular line 9—9 on Fig. 8 and viewed in the direction of the arrows.

According to the illustrated, preferred embodiment of my invention, as shown in Figs. 1 to 7, inclusive, I employ a central gear 10 and a plurality of intermeshing gears 11, of relatively small diameter, grouped about the periphery of the gear 10, preferably at equal intervals, and provide for the introduction of the driving fluid, such as steam, into the intermeshing portions of all of the gears. The gear 10, which is preferably formed of two sections and 12 and 13, forming a gear of the herringbone variety, as shown in Fig. 2, is rigidly secured, as by a key 14 to a shaft 15, constituting the drive-shaft of the engine and journaled at its opposite ends in ball-bearings 16 and 17, located in openings in plates 18 and 19, respectively, disposed at opposite sides of the gear 10 and rigidly secured in flatwise condition against the ends of a circular member 20, which forms with the plates 18 and 19, a casing for the gears. The gears 11 are also provided in sections represented at 21 and 22, these sections being so constructed and arranged, as shown, as to present gears of the herringbone type intermeshing with the teeth of the gear 10. The gears 11 are secured to shafts 23, journaled in ball-bearings 24 and 25, in the plates 18 and 19, respectively. The ring-shaped member 20 contains a circumferential series of circular openings 26 in which the gears 11 have journal fit, and an opening 27 in which the gear 10 has journal fit, the portions of the ring-member 20, which extend adjacent to the points of intermesh of the gears 11, with the gear 10 being represented at 28, and of the shape shown in Figs. 4 and 7. The member 20 also contains a series of openings 29 extending transversely thereof and alternating with the openings 26, these openings extending entirely through the member 20, as represented more particularly in Fig. 6; and radially inward of each of the openings 29 the member 20 is recessed, as indicated at 30, to provide conduits for the driving fluid employed, which is supplied to these conduits through a supply-pipe 31, communicating with an annular chamber 32 in the plate 18 and in communication with these conduits through short passages 33 in this plate, each one of these conduits 30 opening into a passage 34 extending radially of the engine and discharging into a recess 35 in the portion 28 of the member 20, thereby forming what may be termed a fluid-jet, which is located closely adjacent the intermeshing portions of the gears and at the apexes of the teeth on the gears, as represented in Fig. 6, it

being understood that one of these fluid-jets is provided adjacent each gear 11, as more particularly shown in Fig. 4.

The end-plate 18, the inner face of which is represented in Fig. 5, with the intermeshing gears shown by dotted representation to illustrate the relative positions of the gears and certain other parts, contains recesses 36, arranged in a circular series and registering with the recesses 29 in the member 20, each of these recesses at one side being cut away, as indicated generally at 37, at portions thereof opposing the adjacent ends of the gears 10 and 11. In other words, in the rotation of the gears 10 and 11, the ends of the grooves between the teeth of the gears will be brought successively into registration with the respective recesses 36 with which they coöperate and thus permit of the effecting of the exhausting of the spent fluid-pressure from the gears, as hereinafter more fully explained. The plate 19 at the opposite side of the engine is recessed, as explained of the plate 18 at 36 and 37, so that the gears 11 will exhaust at their opposite ends simultaneously, these recesses in the case of the plate 19 being represented at 38. The exhausting of the spent fluid from the casing takes place through the plate 19, and to this end the recesses 38 communicate, as through the medium of branch passages 39, with an annular passage 40 formed in this plate and communicating with the exhaust-pipe 41.

The operation of the engine is as follows: The driving fluid enters the intake 31 and is distributed to the various fluid-jets 35, through the ring 32 and passages 33 and 40, from whence it discharges into the intermeshing portions of the gears 11 and 10, with the result of rotating the gears 11 and the gear 10 in the direction of the respective arrows.

As the spaces at the ends of the gears 10 and 11 move into registration with the portions 37 of the recesses 36 in the plate 18 and the corresponding recesses in the plate 19, the spent fluid-pressure exhausts and passes from the engine through the exhaust 41, the way in which the exhaust from these gears takes place at one end of the engine being illustrated by the arrows in Fig. 5.

It is preferred that the form of the recesses 36 be such, as shown, that they extend relatively close to the points of fluid-inlet, and thus as the teeth of the gears 10 and 11 are carried into intermeshing relation, practically all of the spent fluid carried over between the teeth of these gears is free to be forced, by the action of the intermeshing gears, through the ends of the gears and into these exhaust passages, thus avoiding objectionable back-pressure.

The feature of providing a central gear about which the coöperating gears are grouped, preferably equi-distantly, with provision for the introduction of the operating fluid against the intermeshing portions of the gears, is very desirable, inasmuch as the pressure exerted in the operation of the engine is substantially uniformly distributed about a center and relatively great power is obtainable, with great economy of space.

According to the construction shown in Figs. 8 and 9, the inlet, instead of being through the face of the gears, is provided at opposite ends thereof; the exhaust, instead of being at the ends of the gears, is through the faces thereof; and the teeth of the gears are inclined reversely to the teeth of the gears of the preceding described construction, as shown in Fig. 9. In this arrangement the inlet passages are represented at 42, these passages communicating at opposite sides of the engine-casing, with annular channels 43, which would connect with any suitable source of fluid-pressure supply as a driving agent, these inlets 42 being located in the end-plates 18 and 19 of the casing and adjacent the intermeshing portions of the gears, as illustrated in Fig. 8. The exhaust passages, a plurality of which are preferably provided for each gear 11, are represented at 44, these passages being located in the portions of the member 20 which extend into the spaces provided between the adjacent gears, the forward tapering portions thereof, and which are represented at 28 in the preceding described structure, being cut away along the entire length of the gears, as represented, to provide a space 45 in communication with the exhaust passages 44, to insure exhausting without back-pressure, the exhaust-passages 44 opening into the recesses 38 provided in the member 30, and in communication with separate exhaust pipes 46, which, by preference, would communicate with an exhaust manifold (not shown). In this arrangement, because of the exhausting intermediate the ends of the gears, the plates 18 and 19 do not contain the recesses 36 and 37, as described of the construction illustrated in the preceding figures.

While I have illustrated and described certain constructions in which my invention may be embodied, I do not wish to be understood as intending to limit it thereto, as various modifications and alterations may be made therein without departing from the spirit of my invention, it being my intention to claim my invention as fully and completely as the prior state of the art will permit.

What I claim as new and desire to secure by Letters Patent is—

1. An engine comprising, in combination, intermeshing gears, a casing for said gears, inlet ports in said casing for admitting fluid under pressure into the intermeshing

portions of said gears, and exhaust-ports in the side walls of said casing opposite the ends of said gears and extending close to the line of mesh of the gears on the low-pressure side.

2. An engine comprising, in combination, intermeshing gears, a casing for said gears, inlet ports in said casing for admitting fluid under pressure into the intermeshing portions of said gears, and exhaust-ports in the side walls of said casing opposite the ends of said gears and extending close to the line of mesh of the gears on the low-pressure side, the vertex of the tooth angle of said gears extending in the direction of the incoming fluid.

3. An engine comprising, in combination, intermeshing herring-bone gears, a casing for said gears, inlet ports in said casing for admitting fluid under pressure into the intermeshing portions of said gears, and exhaust-ports in the side walls of said casing opposite the ends of said gears and extending close to the line of mesh of the gears on the low-pressure side.

4. An engine comprising, in combination, intermeshing herring-bone gears, a casing for said gears, inlet ports in said casing for admitting fluid under pressure into the intermeshing portions of said gears, and exhaust-ports in the side walls of said casing opposite the ends of said gears and extending close to the line of mesh of the gears on the low-pressure side, the vertex of the tooth angle of said gears extending in the direction of the incoming fluid.

5. An engine comprising, in combination, a central herring-bone gear, a plurality of herring-bone gears intermeshing with said central gear, a casing for said gears, said casing closely fitting about said gears except at the areas at which said gears intermesh, said casing being formed with side plates, a manifold on one of said side plates, inlet ports communicating with said manifold for admitting fluid under pressure into the intermeshing portions of said gears between the ends thereof at one side of the line of centers of said gears, and exhaust-ports in the end walls of said casing at the outer ends of the gears, on the opposite side of the line of their centers, the ports being so constructed and arranged that the vertices of the angles presented by the gears extend toward the incoming fluid.

GEORGE I. LEONARD.