No. 884,097.

PATENTED APR. 7, 1908.

J. N. LEACH.

STEAM ENGINE.

APPLICATION FILED SEPT. 6, 1907.

4 SHEETS—SHEET 1.

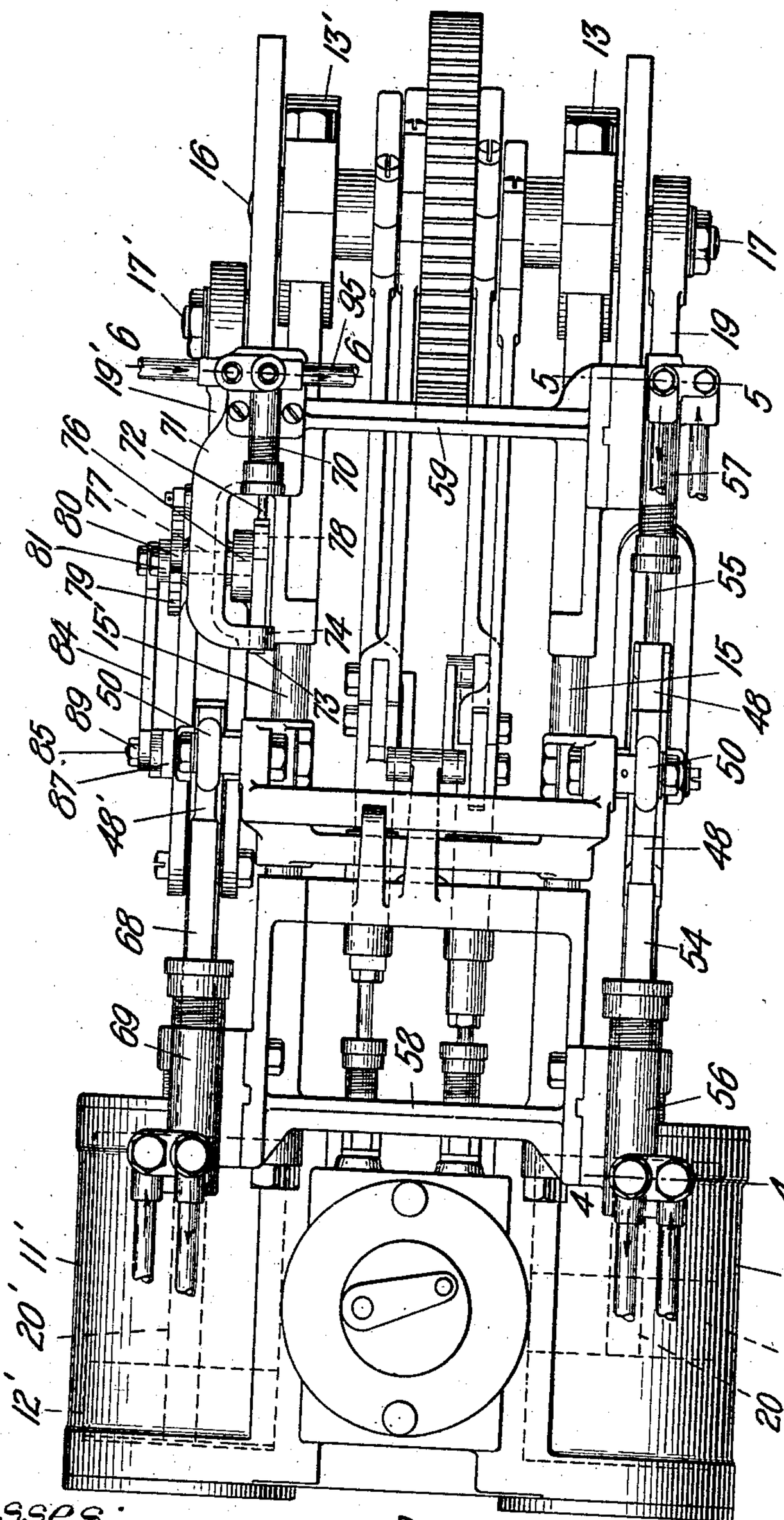

Fig. 1.

Witnesses:
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Francis H. Bishop.

Inventor:
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by his attorney, Charles V. Fooding.

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4 SHEETS—SHEET 2.

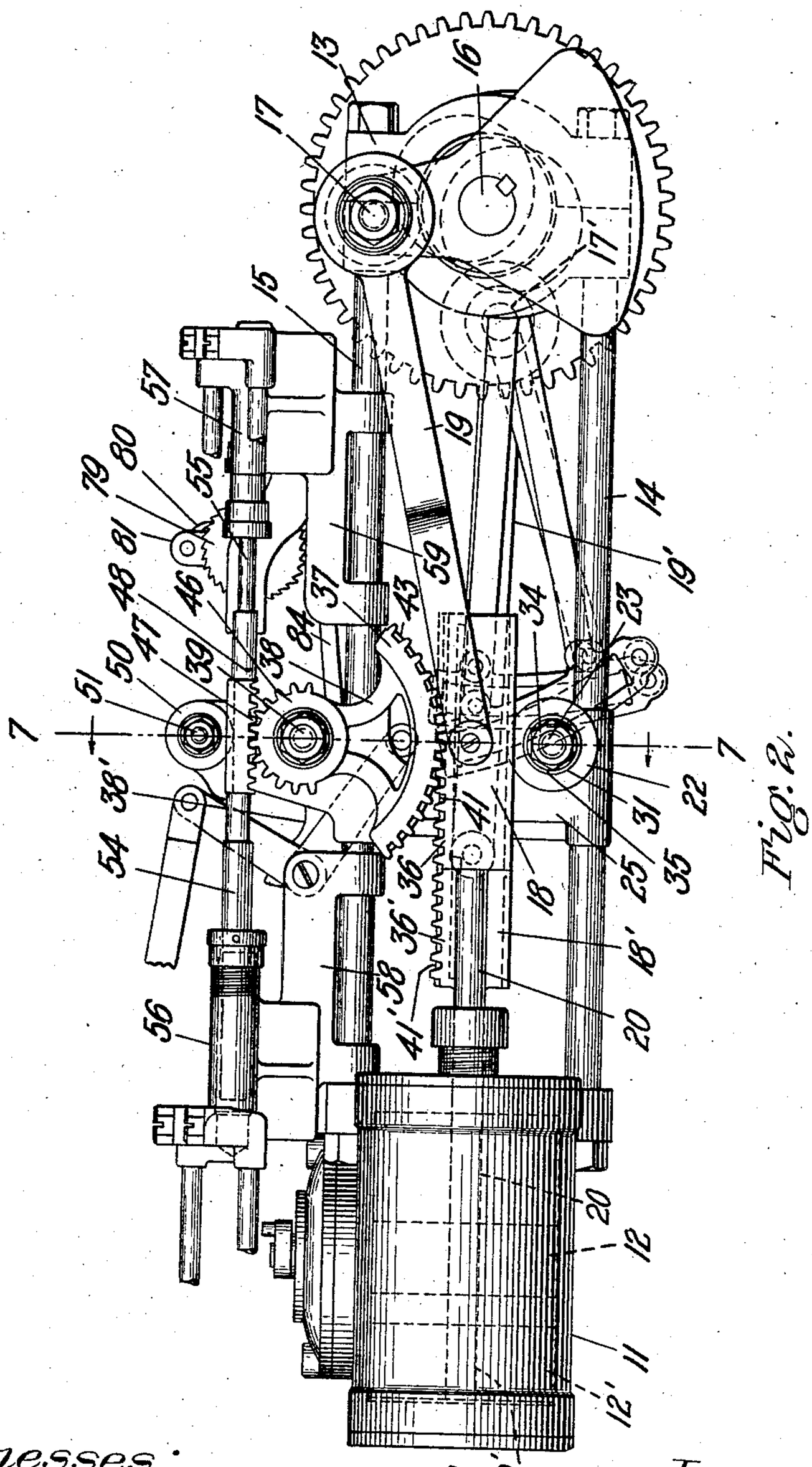

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

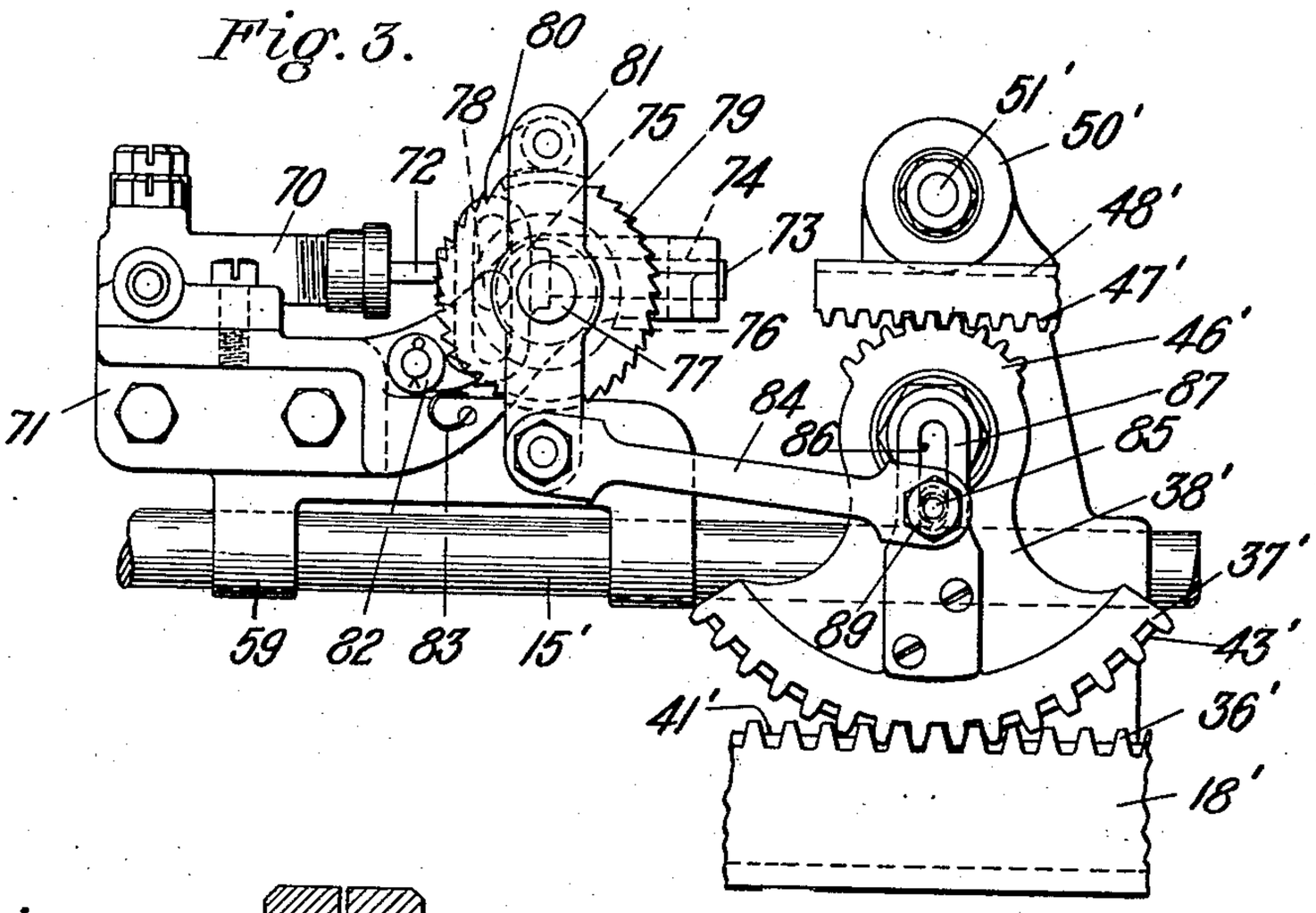
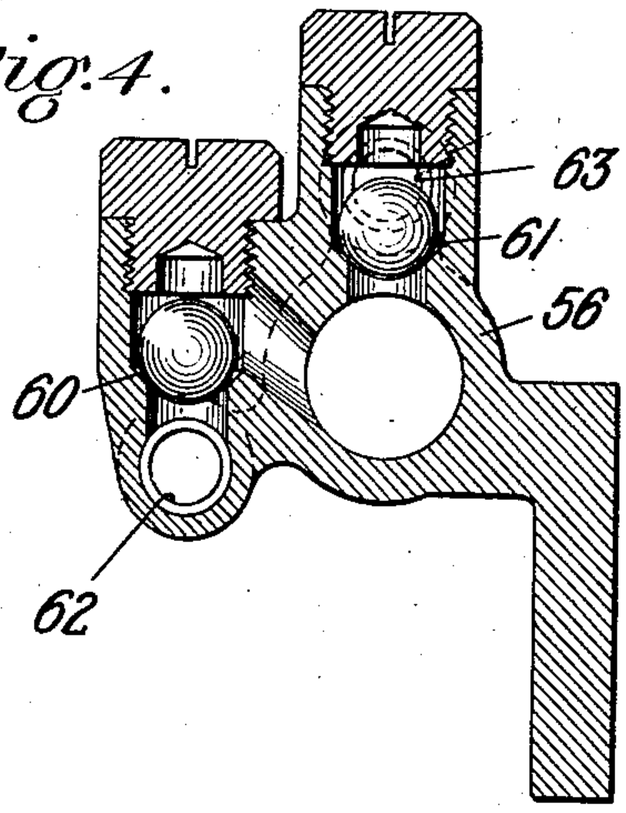


Fig. 4.



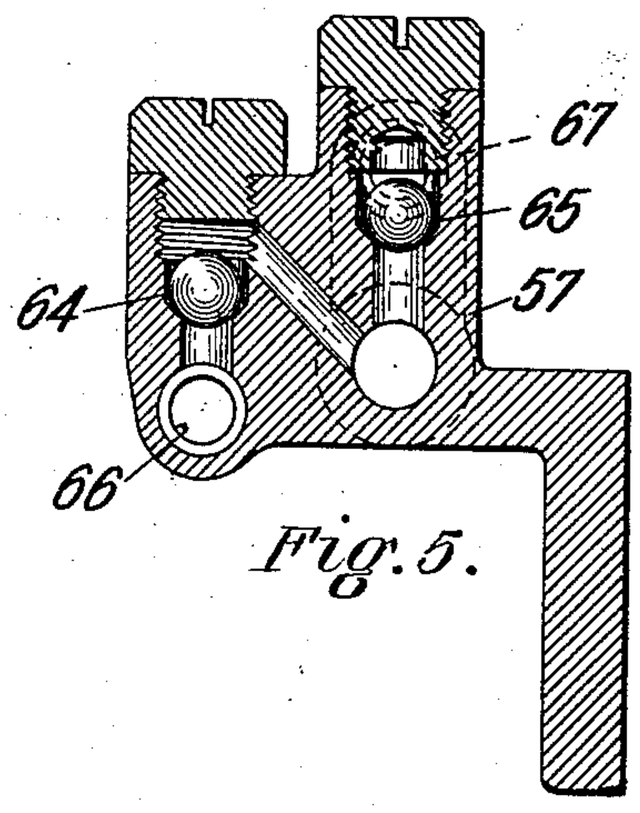


Fig. 5.

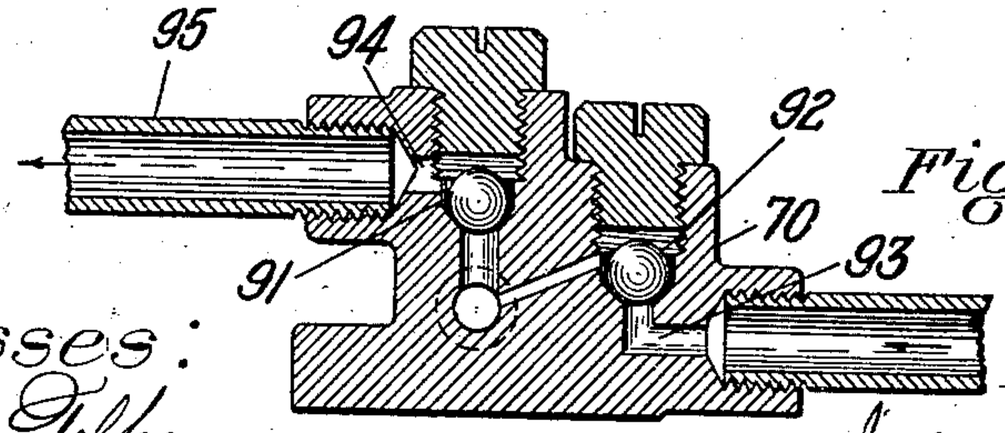


Fig. 6.

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4 SHEETS—SHEET 4.

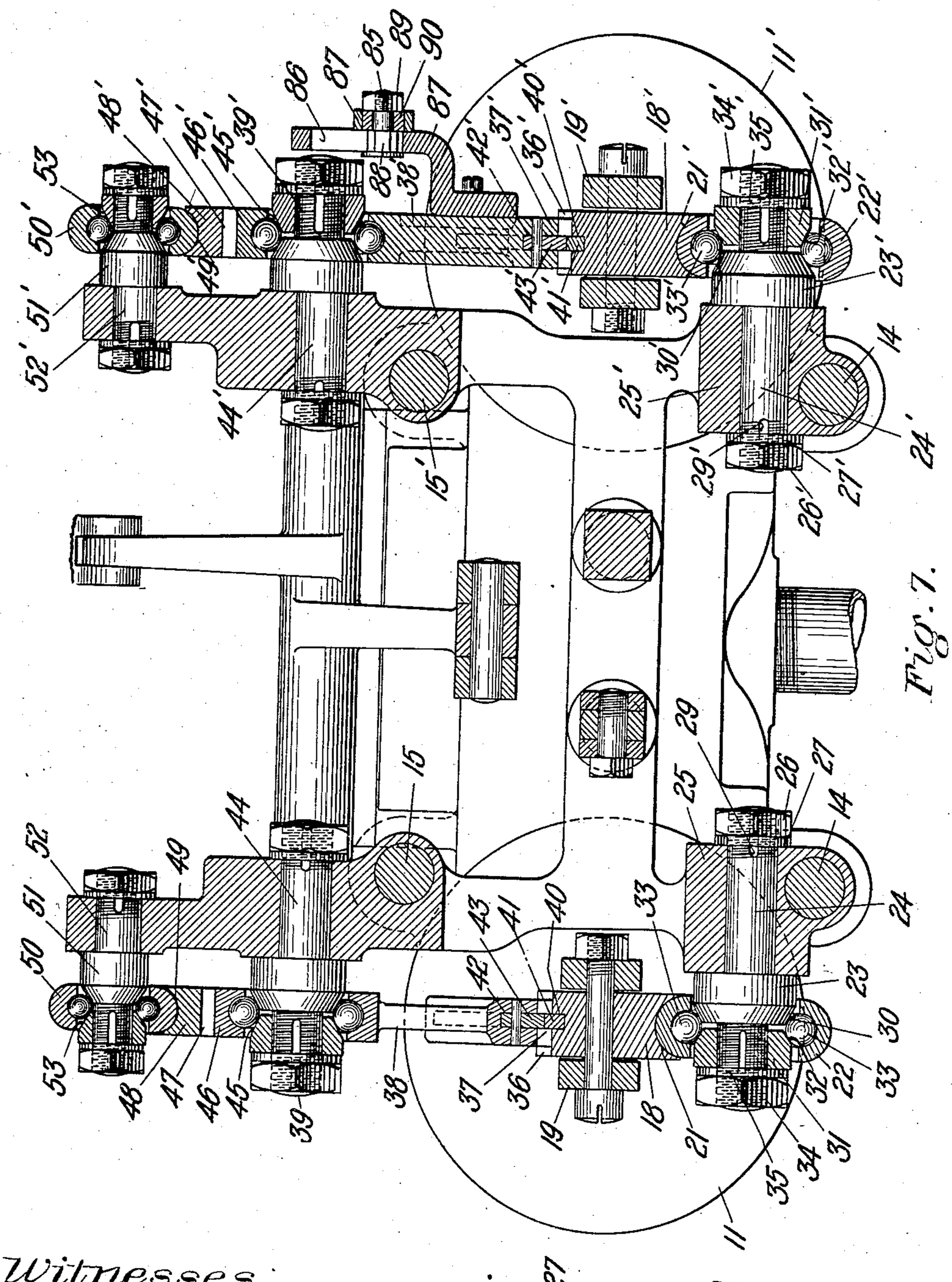

Fig. 7.

Fig. 8.

Fig. 9.

Witnesses:

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UNITED STATES PATENT OFFICE.

JOHN N. LEACH, OF MELROSE, MASSACHUSETTS, ASSIGNOR TO JUDSON L. THOMSON M'F'G COMPANY, A CORPORATION OF MAINE.

STEAM-ENGINE.

No. 884,097. Specification of Letters Patent. Patented April 7, 1908.

Application filed September 6, 1907. Serial No. 391,547.

To all whom it may concern:

Be it known that I, JOHN N. LEACH, a citizen of the United States, residing at Melrose, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Steam-Engines, of which the following is a specification.

This invention relates to improvements in steam engines of a type particularly adapted for use in automobiles, and the object is to provide a simple, compact and accessible engine having the water, fuel and oil pumps mounted thereon and being so arranged as to minimize friction and weight.

The invention consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the appended claims.

Referring to the drawings: Figure 1 is a plan of my improved steam engine. Fig. 2 is a side elevation of the same. Fig. 3 is an enlarged side elevation of the oil pump and its operating mechanism as viewed from the side of the engine opposite to that shown in Fig. 2. Fig. 4 is an enlarged detail sectional elevation of the water pump taken on line 4—4 of Fig. 1, looking toward the left in said figure. Fig. 5 is an enlarged detail sectional elevation of the fuel pump taken on line 5—5 of Fig. 1, looking toward the left in said figure. Fig. 6 is an enlarged detail sectional elevation of the oil pump taken on line 6—6 of Fig. 1. Fig. 7 is an enlarged sectional elevation taken on line 7—7 of Fig. 2. Figs. 8 and 9 are detail elevations of two washers used on bearing studs.

Like numerals refer to like parts throughout the several views of the drawings.

In the drawings, 10 is a cylinder casting comprising cylinders 11 and 11′ in which pistons 12 and 12′ are arranged to reciprocate respectively. Two crank-shaft bearings 13 and 13′ are connected to the cylinder casting 10 by rods 14 and 14′, respectively, and rods 15 and 15′, respectively, said rods constituting a portion of the frame of the engine. A crank-shaft 16, journaled in the bearings 13 and 13′, is provided with crank-pins 17 and 17′, said crank-pins being connected, respectively, to crossheads 18 and 18′ by connecting rods 19 and 19′. The crosshead 18 is connected to the piston 12 by a piston-rod 20, while the crosshead 18′ is connected to the piston 12′ by a piston-rod 20′. The crossheads 18 and 18′ are provided, respectively, with grooves 21 and 21′ which are preferably semi-circular in cross section, there being two rolls 22 and 22′ on which the crossheads 18 and 18′ rest, respectively. The rolls 22 and 22′ are mounted on studs 23 and 23′, respectively, and said studs and appertaining parts being identical in construction a description of the stud 23 will suffice for both.

The stud 23 is provided with a stem 24 which is eccentric to the main portion of said stud and to the roll 22, said stud extending through a frame 25 mounted on the rods 14, 14′ and 15, 15′. The stud 23, with its eccentric stem, constitutes an eccentric whereby the roll 22 may be adjusted toward and away from the crosshead 18. A nut 26, having screw-threaded engagement with the stem 24, bears against a washer 27, shown in detail in Fig. 9, said washer being provided with a tooth 28 which engages a groove 29 formed in the stem 24, said washer being preferably corrugated on its face which bears against the frame 25, so that when the nut 26 is screwed up the stud 23 is held against rotation.

The stud 23 is provided with a substantially conical ball race 30 and a collar 31 having a substantially conical ball race 32 has screw-threaded engagement with the stud 23, there being a series of balls 33 interposed between said ball races and the inner periphery of the roll 22, said periphery also constituting a ball race. A nut 34, having screw-threaded engagement with the stud 23, bears against a washer 35, identical in form with the washer 27. By rotating the collar 31 in the proper direction the ball race 32 is moved toward the ball race 30 to compensate for wear and the collar 31 is locked against rotation by the nut 34 and toothed washer 35 the corrugated face of which bears against said collar.

The crossheads 18 and 18′ are provided, respectively, with racks 36, 36′ which mesh, respectively, with gear segments 37 and 37′, said gear segments being formed on rocking members 38 and 38′, respectively, said rocking members being mounted, respectively, on studs 39 and 39′. The crossheads 18 and 18′ are provided, respectively, with grooves 40 and 40′ in which are located metal strips 41 and 41′, respectively, the upper faces of

said strips being coincident with the pitch line of the racks 36 and 36′. The rocking members 38 and 38′ are provided, respectively, with grooves 42 and 42′, respectively, in which are located metal strips 43 and 43′, said strips having their lower faces formed on an arc of a circle with the axes of the studs 39 and 39′ as centers, said faces being coincident with the pitch circles of their respective gear segments 37 and 37′. Thus it will be seen that the members 38 and 38′, with the strips 43 and 43′, constitute rollers arranged in rolling contact with the metal strips 41 and 41′ which constitute a part of the crossheads 18 and 18′.

The crossheads 18 and 18′ are thus rigidly and accurately guided between the rocking members 38 and 38′ and the rolls 22 and 22′ and are prevented from moving laterally by the grooves formed in the upper and lower sides of said racks.

The studs 39 and 39′ are provided with stems 44 and 44′, respectively, said stems being formed eccentric to the main portions of said studs and being held in the frame 25 in the same manner as the studs 23 and 23′ are held.

Ball bearings 45 and 45′, similar to those of the studs 23 and 23′, are provided for the members 38 and 38′ to rock on. The parts of said bearings being similar in form to the parts of the bearings of the studs 23 and 23′ a detailed description of them will be unnecessary. The rocking members 38 and 38′ are provided, respectively, with gear segments 46 and 46′ which mesh into racks 47 and 47′ formed on rods 48 and 48′, respectively, said rods being provided with grooves 49 and 49′, respectively, said grooves being preferably semi-circular in cross section. Two rolls 50 and 50′ arranged to roll in the grooves 49 and 49′, respectively, are mounted on studs 51 and 51′, respectively, said studs being provided with stems 52 and 52′ which are formed eccentric to the main portions of said studs, respectively, and are secured to the frame 25 in the same manner in which the studs 23 and 23′ are secured. The rolls 50 and 50′ are mounted on ball bearings 53 and 53′, respectively, said ball bearings being identical in form with the ball bearings of the studs 23 and 23′ and a detailed description of them will be unnecessary. The rolls 50 and 50′ being located in the grooves 49 and 49′, respectively, prevent the rods 48 and 48′ from moving transversely.

Formed on the rod 48 are two pump plungers 54 and 55 which are arranged to reciprocate within pump cylinders or casings 56 and 57, said cylinders being mounted on brackets 58 and 59, respectively. The brackets 58 and 59 are mounted on the rods 15 and 15′.

Referring to Fig. 4, it will be seen that within the pump casing 56 are two check valves 60 and 61 of the ball type, said valves being adapted to control the flow of the fluid from an inlet passage 62 to an outlet passage 63 as the plunger 54 is reciprocated.

The pump, consisting of a plunger 54 and cylinder or casing 56, is adapted for use as a water pump which may be used to pump water to a boiler. The casing 57, shown in section in Fig. 5, is provided with check valves 64 and 65 of the ball type, said check valves being adapted to control the flow of fluid from an inlet passage 66 to an outlet passage 67 as the plunger 55 is reciprocated. The pump consisting of the plunger 55 and casing 57 is adapted for use as a fuel pump— that is, for a hydrocarbon such as gasolene or kerosene.

The rod 48′ has formed thereon a pump plunger 68 arranged to reciprocate in a pump cylinder or casing 69 fast to the bracket 58 having valves identical with those of the pump casing 56. The pump plunger 68 and the casing 69 constitute a pump adapted for use as a water pump in connection with the other water pump hereinbefore described.

A pump cylinder or casing 70 is fast to a bracket 71 and said bracket, in turn, is fast to the bracket 59. (Fig. 3). A plunger 72, arranged to reciprocate in the cylinder 70, is provided with a stem 73 arranged to slide in a bearing 74, said plunger being also provided with a slot 75 extending transversely thereof. A crank 76 fast to a crank-shaft 77 journaled in the bracket 71 is provided with a crank-pin 78 located in the slot 75. A ratchet 79 fast to the shaft 77 is engaged by a pawl 80 pivotally mounted on a pawl-carrier 81, said pawl-carrier being arranged to oscillate on the shaft 77. A stop-pawl 82, held in engagement with the ratchet 79 by means of a spring 83, prevents said ratchet from rotating clockwise (Fig. 3). The pawl-carrier 81 is pivotally connected to a link 84, said link being also connected to a stud 85 located in a slot 86 formed in **an** arm 87 fast to the rocking member 38′. The stud 85 is provided with a flatted portion 88 which engages the sides of the slot 86 so that said stud is prevented from rotating in said slot. A nut 89 having screw-threaded engagement with the stud 85 bears against a sleeve 90 surrounding said stud and so arranged that said nut is adapted to clamp said stud rigidly with relation to the arm 87 without binding the link 84. The stud 85 may be adjusted toward and away from the axis of the member 38′ to vary the throw of the pawl-carrier 81 and the consequent movement of the pump plunger 72.

Within the pump casing 70 are two check valves 91 and 92 which are adapted to control the movement of fluid from an inlet passage 93 to an outlet passage 94, said valves being of the ball type. The pump just described is adapted for use as a lubri-

cating oil pump and may be connected by a pipe 95 to the steam chest of the cylinder casting 10.

The operation of the oil pump just described is as follows: As the crosshead 18′ imparts a rocking movement to the member 38′ said rocking movement is communicated by the link 84 to the pawl-carrier 81 and the pawl 80, therefore, imparts an intermittent rotary movement to the ratchet 79 and crank 76. The crank-pin 78, therefore, imparts to the plunger 72 an intermittent reciprocatory movement and oil is drawn in through the inlet passage 93 and forced out through the outlet passage 94.

It will be seen that by reason of the arrangement of the eccentric studs 51 and 51′ and the eccentric studs 44′ and 44′ the rolls 50 and 50′ may be adjusted toward and away from the rods 48 and 48′, respectively. The rocking members 38 and 38′ may be adjusted toward and away from the crossheads 18 and 18′, thereby insuring a perfect rolling contact without any looseness.

The engine hereinbefore described may be provided with any suitable type of valve gear.

Having thus described my invention, what I claim and desire by Letters Patent to secure is:

1. In an engine, a steam cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said crosshead to said piston, a crank, a connecting rod connecting said crosshead to said crank, a rack on said crosshead, a rocking member, a gear segment on said member meshing into said rack, two pump cylinders, a rod comprising two plungers located in said pump cylinders, respectively, a rack on said rod, and a gear segment on said rocking member meshing into said last named rack.

2. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said piston to said crosshead, a frame, a roll arranged in rolling contact with said crosshead, and a stud on which said roll is mounted, said stud constituting an eccentric rotatably mounted on said frame, whereby said roll may be adjusted toward and away from said crosshead.

3. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said piston to said crosshead, a frame, a roll arranged in rolling contact with said crosshead, a stud on which said roll is mounted, said stud constituting an eccentric rotatably mounted on said frame, whereby said roll may be adjusted toward and away from said crosshead, and a series of balls interposed between said stud and said roll.

4. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said piston to said crosshead, a frame, a roll arranged in rolling contact with said crosshead, a stud on which said roll is mounted, said stud having a stem eccentric with said roll, said stem being rotatably mounted on said frame, whereby said roll may be adjusted toward and away from said crosshead, and a nut having screw-threaded engagement with said stem, whereby said stud may be held against rotation.

5. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said piston to said crosshead, a frame, a roll arranged in rolling contact with said crosshead, a stud mounted on said frame, said stud being provided with a ball race, a collar having screw-threaded engagement with said stud, said collar having a ball race, a series of balls arranged in rolling contact with said races and with the interior periphery of said roll, and means to lock said collar against rotation on said stud.

6. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead provided with a concave groove extending longitudinally thereof, a piston rod connecting said piston to said crosshead, a roll having a convex periphery located in said groove, and a stud on which said roll is mounted.

7. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead provided with a groove extending longitudinally thereof, a piston rod connecting said piston to said crosshead, a roll located in said groove, and a stud on which said roll is mounted.

8. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead provided with two grooves located in opposite faces thereof, respectively, and extending longitudinally thereof, a piston rod connecting said piston to said crosshead, and two rocking members arranged with their peripheries in rolling contact with said faces, respectively.

9. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead provided with two grooves located in opposite faces thereof, respectively, and extending longitudinally thereof, a piston rod connecting said piston to said crosshead, two rocking members arranged with their peripheries in rolling contact with said faces, respectively, and two ball bearings on which said rocking members are mounted, respectively.

10. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said piston to said crosshead, a frame, two rocking members arranged with their peripheries in

rolling contact with opposite sides, respectively, of said crosshead, and two studs on which said rocking members are pivoted, respectively, said studs constituting eccentrics rotatably mounted on said frame, whereby said members may be adjusted toward and away from each other.

11. In an engine, a cylinder, a piston arranged to reciprocate within said cylinder, a crosshead provided with two grooves in opposite faces thereof and extending longitudinally thereof, a piston rod connecting said piston to said crosshead, a frame, two rocking members arranged with their peripheries in rolling contact with said faces, respectively, and two studs on which said rocking members are pivoted, respectively, said studs constituting eccentrics rotatably mounted on said frame, whereby said members may be adjusted toward and away from each other.

12. In an engine, a steam cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said crosshead to said piston, a rack on said crosshead, a rocking member, a gear segment on said member meshing into said rack, a pump cylinder, a plunger located in said pump cylinder, a rack on one side of said plunger, a gear segment on said member meshing into said second named rack, and a roll arranged with its periphery in rolling contact with the other side of said plunger.

13. In an engine, a steam cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said crosshead to said piston, a rack on said crosshead, a rocking member, a gear segment on said member meshing into said rack, a pump cylinder, a plunger located in said pump cylinder, a rack on one side of said plunger, a gear segment on said member meshing into said second named rack, a roll arranged with its periphery in rolling contact with the other side of said plunger, a frame, and a stud on which said roll is mounted, said stud constituting an eccentric mounted on said frame, whereby said roll may be adjusted toward and away from said second named rack.

14. In an engine, a steam cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said crosshead to said piston, a rack on said crosshead, a rocking member, a gear segment on said member meshing into said rack, a pump cylinder, a plunger located in said pump cylinder, said plunger provided with a longitudinal groove in one side thereof, a rack on the other side of said plunger, a gear segment on said member meshing into said second named rack, a roll located in said groove and arranged in rolling contact with said plunger, and a frame on which said roll is supported.

15. In an engine, a steam cylinder, a piston arranged to reciprocate within said cylinder, a crosshead, a piston rod connecting said crosshead to said piston, a rack on said crosshead, a rocking member, a gear segment on said member meshing into said rack, a pump cylinder, a plunger located in said pump cylinder, said plunger provided with a longitudinal groove in one side thereof, a rack on the other side of said plunger, a gear segment on said member meshing into said second named rack, a roll located in said groove and arranged in rolling contact with said plunger, a frame on which said roll is supported, and a ball bearing on which said roll is mounted.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN N. LEACH.

Witnesses:
CHARLES S. GOODING,
SADIE V. MCCARTHY.