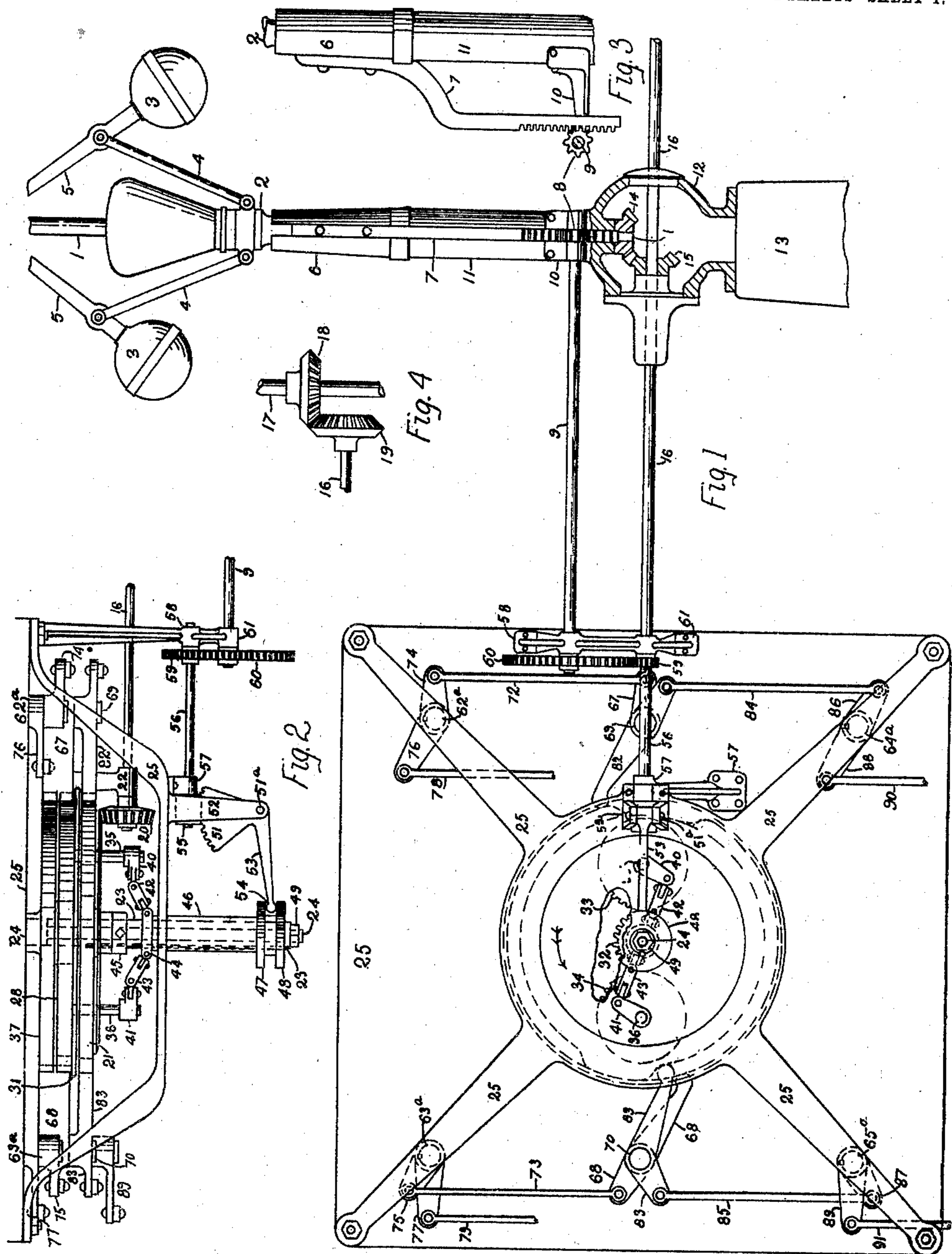


S. STROMMERSON.
VALVE REGULATOR IN CORLISS ENGINES.
APPLICATION FILED OCT. 20, 1909.

967,261.

Patented Aug. 16, 1910.

2 SHEETS—SHEET 1.



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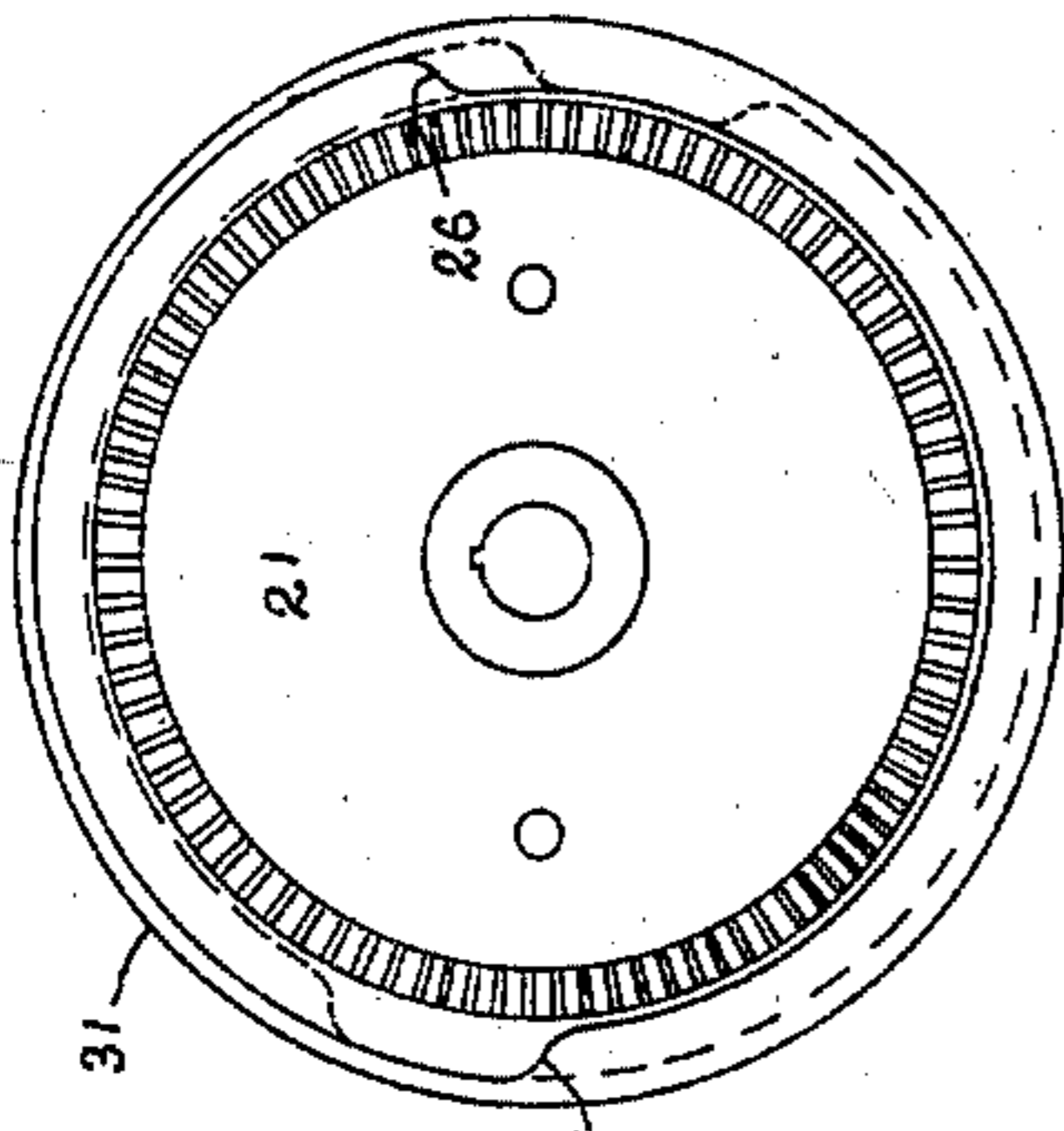


Fig. 8

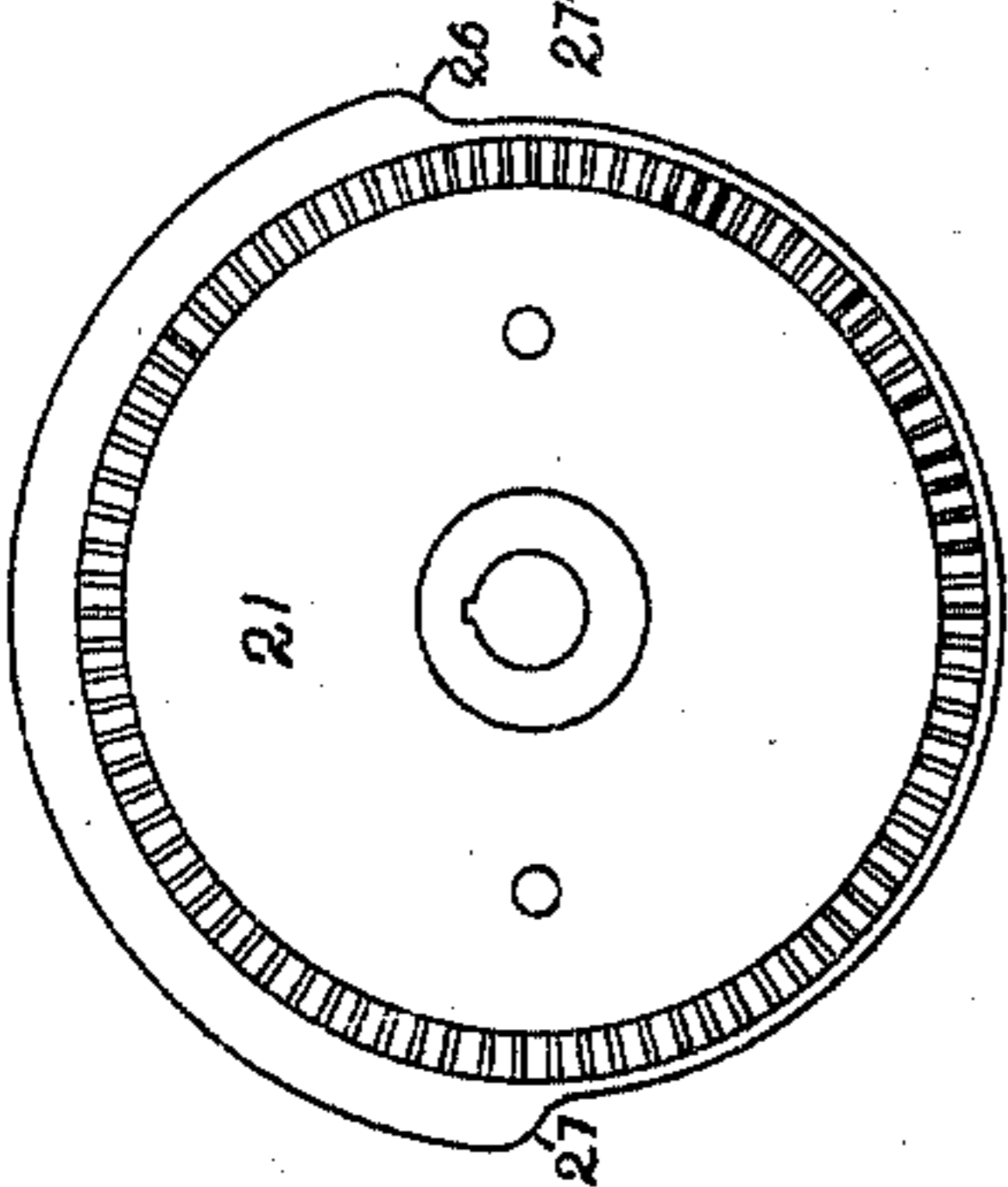


Fig. 5

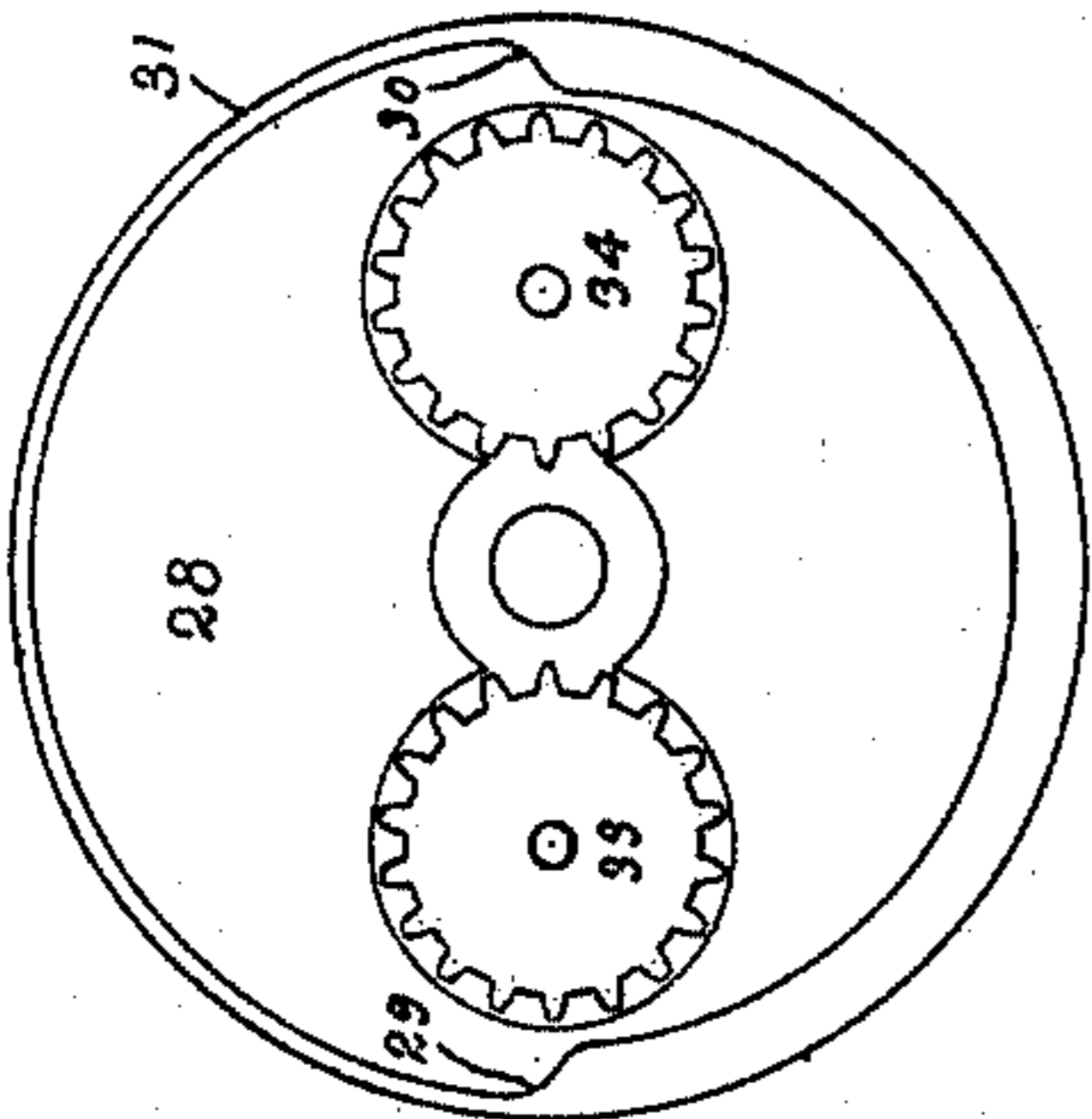


Fig. 6

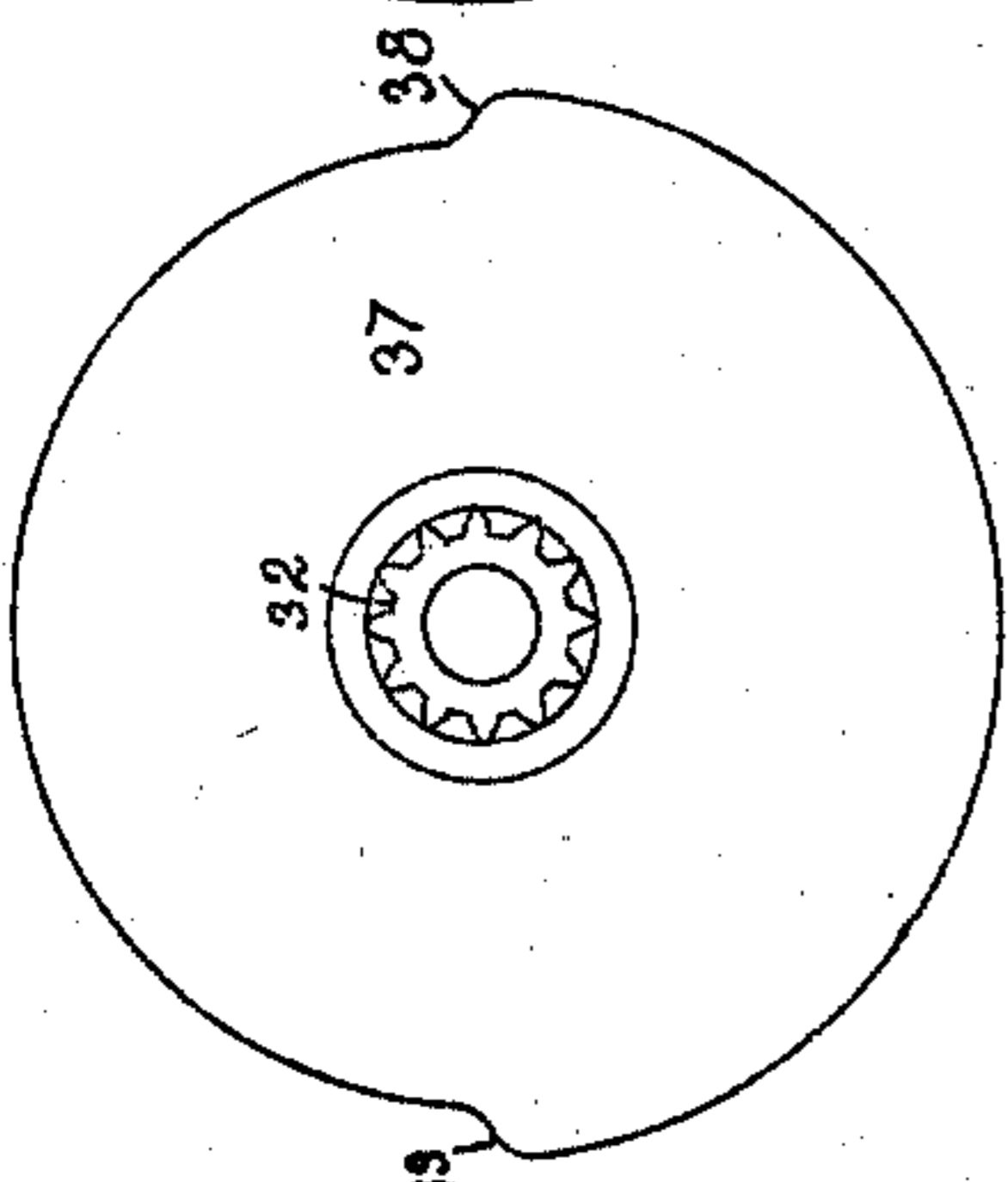


Fig. 7

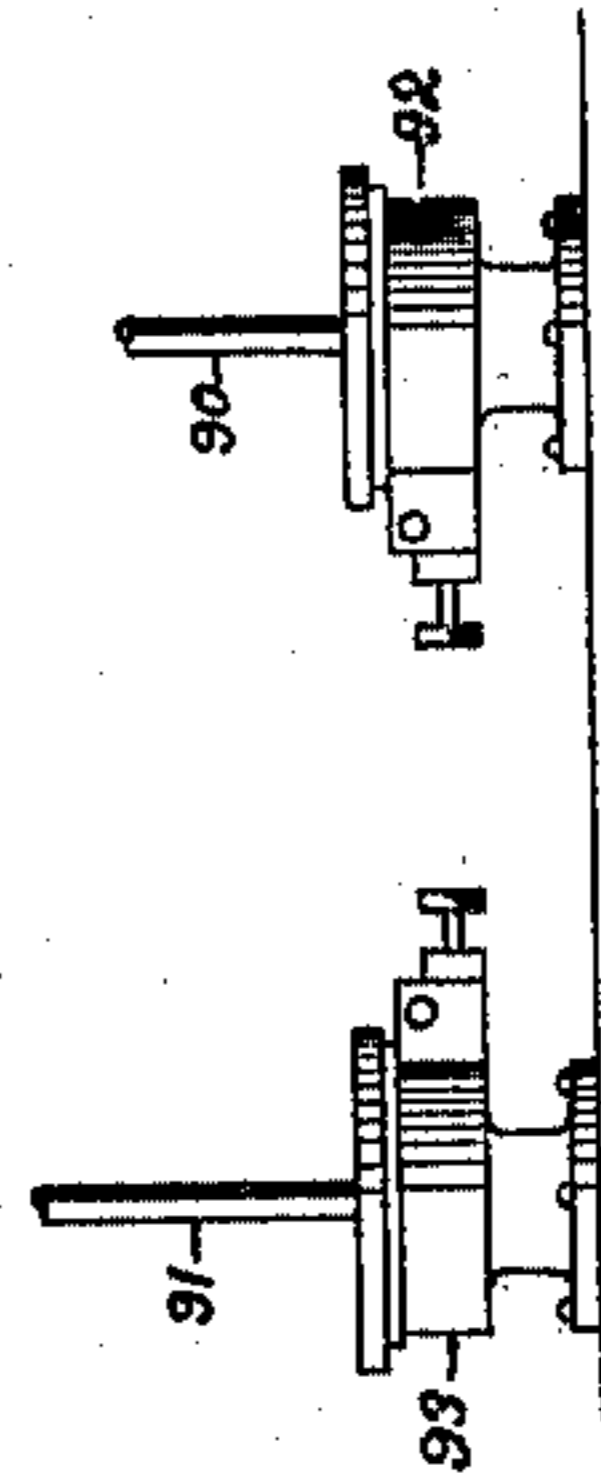
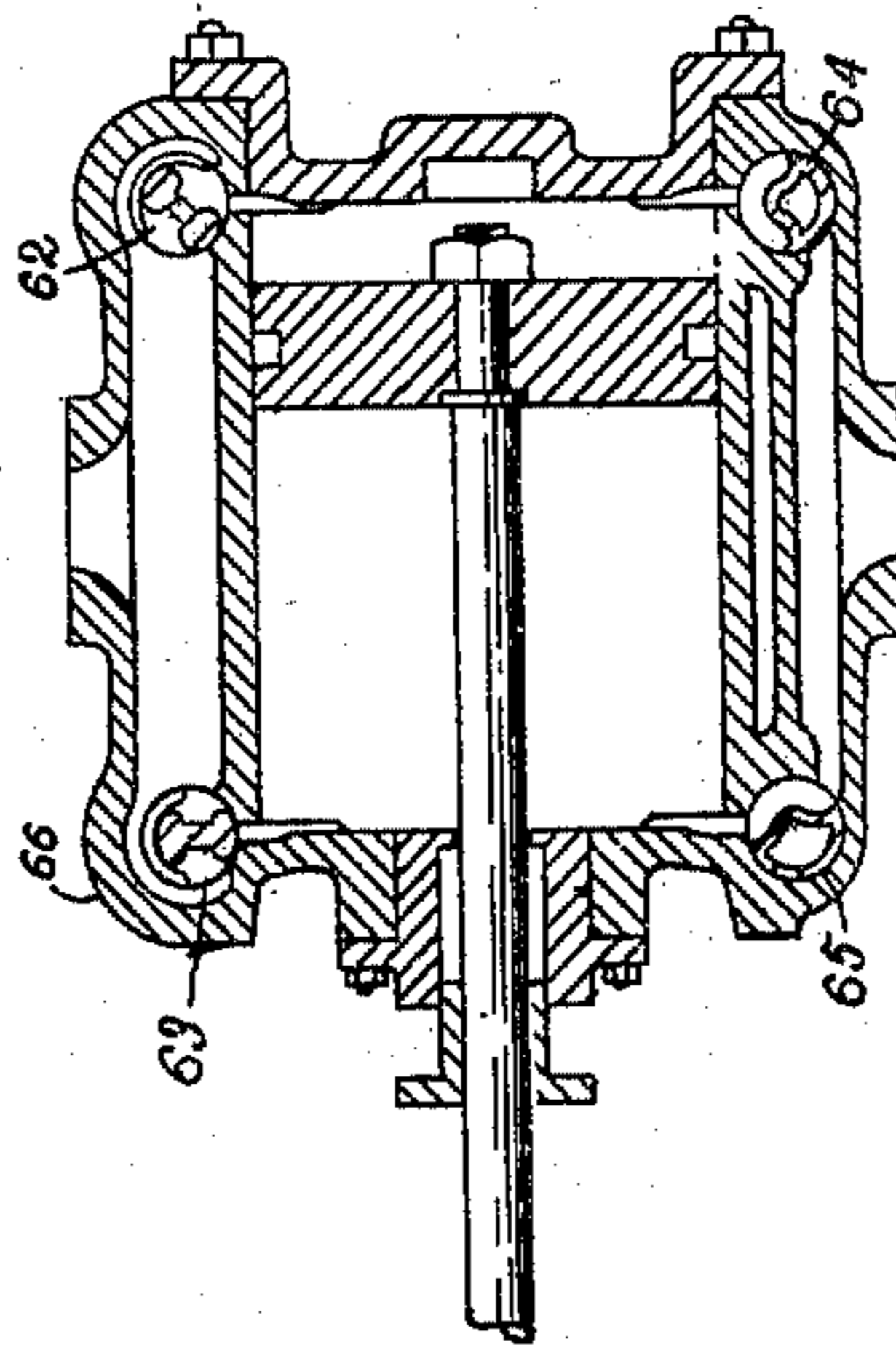


Fig. 9

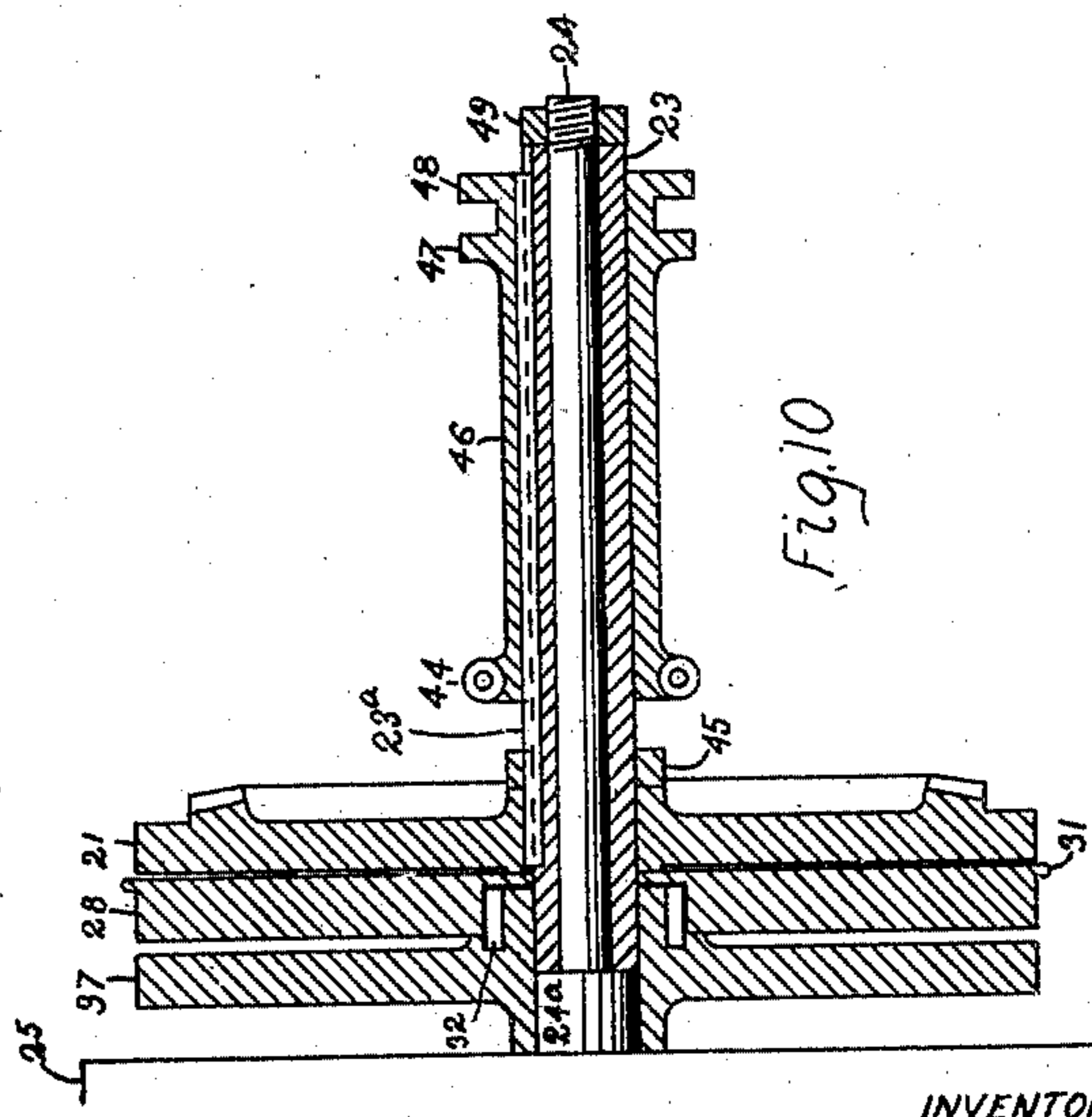


Fig. 10

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UNITED STATES PATENT OFFICE.

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VALVE-REGULATOR IN CORLISS ENGINES.

967,261.

Specification of Letters Patent.

Patented Aug. 16, 1910.

Application filed October 20, 1909. Serial No. 523,636.

To all whom it may concern:

Be it known that I, SOFFUS STROMMERSON, a citizen of the United States, and a resident of Sioux City, in the county of Woodbury and State of Iowa, have invented new and useful Improvements in Valve-Regulators in Corliss Engines, of which the following is a specification.

My invention relates to Corliss engines and the object of the invention is the provision of means for controlling in new and improved fashion the steam valves of the cylinder and regulating the supply and exhaust of steam.

The invention consists of a governor and a series of cam wheels connected therewith, the cam wheels controlling the valves by means of pawls and levers.

The details of the invention are fully illustrated in the accompanying drawings in which—

Figure 1 is a view of the invention in side elevation, a part being shown in section. Fig. 2 is a partial plan view and Fig. 3 is a detail view showing in side elevation a part of the governor. Fig. 4 is a detail view showing the connection of the device with the main shaft of the engine. Fig. 5 is a detail view of the front cam wheel in front elevation. Fig. 6 is a detail view of the central cam wheel in rear elevation. Fig. 7 is a detail view of the rear cam wheel in front elevation and Fig. 8 is a view in front elevation of all the cam wheels together. Fig. 9 is cross-section of cylinder of Corliss engine, showing also the dash pots in full lines. Fig. 10 is a cross-section of cam wheels and sleeves inclosing the stud on which the wheels operate, the stud being shown in full lines.

Referring to the illustration, 1 is the shaft of a governor having a sleeve 2 pivotally supporting the balls 3 by levers 4 and 5. Secured to the lower part of the sleeve is a sliding jacket 6 to which is secured a rack or curved bar 7, ratched or toothed at its lower end and engaging a pinion 8. The latter is secured to the end of a shaft 9 pivotally supported by a bracket 10 which is secured to a fixed jacket 11. The latter is integral with the frame 12 supporting the governor on a base 13. To the lower end of the governor shaft is secured a bevel gear 14 which meshes with a similar gear 15 fixed on the shaft 16, which is connected

with and operated by the main shaft of the engine, 17, by gears 18 and 19. The governor shaft is operated by the shaft 16 and connecting gears, while the shaft 9 is operated by the rack 7 as the latter is raised and lowered by the action of the balls in the usual manner. To the opposite end of the shaft 16 is secured a bevel gear 20 which meshes with and operates a cam wheel 21 having bevel teeth on the face thereof. The end of the shaft is pivotally supported by a bracket 22 secured to the frame 25. The cam wheel 21 is locked to a sleeve 23, by a feather 23^a, which incloses a stud 24, secured to the spider frame 25. The cam wheel has two steps 26 and 27 which engage pawls presently described. A similar cam wheel 28 having steps 29 and 30 revolves with the wheel 21 and has an outer rim or flange 31 to confine the pawls. The wheel 28 is centrally recessed and incloses a cog wheel 32 integral with a cam wheel 37 which revolves on the sleeve 23. The cog wheel meshes on each side with larger cog wheels 33 and 34 which are also inclosed within recesses in the cam wheel 28. Secured to the centers respectively of the wheels 33 and 34 are shafts 35 and 36 which project through corresponding openings in the cam wheel 21 and insure both cam wheels turning together on their axis. The third cam wheel 37 is of the reverse shape as the others, the steps 38 and 39 opening oppositely from those of the other wheels, and revolves with the cog wheel 32 on the sleeve 23 and an enlarged part, 24^a, of the stud 24.

Secured to the outer ends of the shafts 35 and 36 respectively are arms 40 and 41 which are connected by toggle joints to toggles 42 and 43, the opposite ends of the latter being similarly connected to a collar 44 on the sleeve 23. The collar is integral with an outer sleeve 46 which fits freely over the sleeve 23, having a lateral motion and adapted to slide over the latter sleeve, being limited by a fixed collar 45, adjacent to the hub of the wheel 21, on one side and the nut 49 on the end of the stud. Rings 47 and 48 on the outer end of the sleeve 46 form a groove around the sleeve.

A segment of a worm wheel 51 is supported pivotally at the point 51^a by a bracket 52, secured to the frame 25, the segment having an arm 53 whose head 54 is held in the groove between the rings and moves the

sleeve as presently described. The segment engages and is operated by a worm 55, secured to the end of a shaft 56 which is pivotally supported between brackets 57 and 58 on the frame. Near the opposite end of the shaft is secured a gear wheel 59 which engages a larger gear wheel 60 on the end of the shaft 9, supported on an extension 61 of the bracket 58.

It was seen that the cam wheel 21 is revolved by the shaft 16 through the gear 20, and that the cam wheel 28 is carried with it by the connection of the two cam wheels through the shafts 35 and 36. It will also be seen that the cam wheel 37 turns with the other cam wheels and also is operated by the governor through the action of the worm gear. As indicated in Fig. 2, the engine is at or near its lowest speed, but as the speed increases and the balls are raised, the segment 51 is carried to the opposite corner, moving the arm inwardly which pushes the sleeve 46 toward the cam wheels. The movement causes the toggles and connected arms to assume more nearly a straight line and in so doing they turn the wheels 33 and 34, which gives the wheel 32 a new motion and moves with it the cam wheel 37. As the speed of the engine lessens the process is reversed, and the cam wheel will be moved in the opposite direction by the worm gear. The connection between the cam wheels 21 and 28 and the cog wheels 34, 35 and 32 causes all the cam wheels to move together in the same direction, but at the same time the wheel 37 is moved in both directions with reference to the other wheels by the action of the governor as above described.

The valves of the cylinder are controlled by levers operated by pawls engaging the cam wheels. The ports 62 and 63 are for the inlet of steam to the cylinder 66, and the ports 64 and 65 are for the exhaust steam. The inlet valves are controlled by the cam wheels 28 and 37, the latter being a governor of the steam supply while the former controls the valves for the operation of the piston. The exhaust valves are controlled by the cam wheel 21. The wheels 28 and 37 are engaged by pawls 67 and 68, pivoted to the respective studs 69 and 70. The outer ends of the respective pawls are pivoted to connecting rods 72 and 73 which in turn are pivoted to the respective valve arms 74 and 75. Said arms are keyed to the valve stems 62^a and 63^a and are keyed with similar arms 76 and 77 which are respectively pivoted to dash pot rods 78 and 79, operated by dash pots similar to those presently described.

We will suppose the engine to be at a standstill, with the ports 62 and 65 open and the ports 63 and 64 closed as shown in the drawing. The cam wheel 28 traveling in the direction indicated by the arrow will

bring the part below the step 29 in contact with the pawl 67, permitting the contact end of the pawl to drop, raising the opposite end, while the dash pot pulls down the valve arm 76 and closes the valve 62. At the same time the step 30 on the opposite side of the wheel presses down the contact end of the pawl 68, raising the opposite end, and, by means of the connecting rod and valve arm, opening the valve 63. When the cam wheel has traveled one half a revolution the process will be reversed, and so on, the two valves being alternately opened and closed. As the speed of the engine increases the cam wheel 37 will be operated as described. The pawl 68 will be released from the step 39 permitting the dash pot rod 79 to close the valve 63. The action of the governor insures the closing of the valves as required for the proper regulation of the speed. As the valve 62 is closed the exhaust valve 64 must be opened, and as the valve 63 is opened the exhaust valve 65 must be closed. The exhaust valves are both controlled by the cam wheel 21, operated by the gear 20 as previously described. The wheel 21 is engaged on each side by the pawls 82 and 83, pivoted to the respective studs 69 and 70. To the outer ends of said pawls are pivoted the respective connecting rods 84 and 85 which are respectively pivoted to valve arms 86 and 87. Said arms are keyed to the valve stems 64^a and 65^a of the exhaust valves and are also keyed with similar arms 88 and 89, respectively pivoted to dash pot rods 90 and 91, operated by dash pots 92 and 93. As the cam wheel 21 travels as indicated the pawl 82 will drop off the step 26, permitting the dash pot to turn the valve stem 64^a and open the valve 64. At the same time the opposite pawl 83 will be forced down by the step 27, raising the opposite end and lifting the valve arm 87 and opening the valve 65. The exhaust valves will be thus alternately opened and closed in reverse of the inlet valves.

The object of my invention is attained in the more accurate regulation of the valves; as the full stroke of the piston is realized, the valves are opened and closed quicker and at the exact places desired.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is,—

1. In a valve regulator, the combination with the cylinder and the main shaft of the engine and governor connected therewith, the valves and valve stems of the cylinder of the engine, of cam wheels operated by the main shaft of the engine and controlled by the governor, and pawls engaging the cam wheels and pivoted to the valve stems of the cylinder whereby the valves are opened and closed by the action of the cam wheels and pawls, substantially as described.

2. In a valve regulator, the combination with the cylinder and main shaft of an engine, the valves and valve stems of the cylinder, of a cam wheel operated by the main shaft of the engine, pawls engaging the cam wheel and pivoted to the stems of the exhaust valves of the cylinder for the control of said valves, a second cam wheel secured to the first cam wheel and adapted to travel therewith, a third cam wheel connected with and normally traveling with the other two, a governor controlling the third cam wheel whereby the same is moved back and forth with reference to the other cam wheels as the speed of the engine increases or decreases, pawls engaging said cam wheels and pivoted to the stems of the inlet valves of the cylinder whereby said valves are opened and closed by the action of the second and third cam wheels and engaging pawls, substantially as described.

3. In a valve regulator, the combination with the cylinder and main shaft of an engine, the valves and valve stems of the cylinder, of a cam wheel operated by the main shaft of the engine, pawls engaging the cam wheel and pivoted to the stems of the exhaust valves of the cylinder for the control of said valves, a cam wheel connected with the first cam wheel and adapted to travel therewith, a third cam wheel connected with and normally traveling with the other two, gear wheels and a worm gear controlling said cam wheel, a governor operating said worm gear whereby the cam wheel is moved

back and forth with reference to the other cam wheels as the speed of the engine increases or decreases, pawls engaging said last cam wheel and pivotally connected to the stems of the inlet valves of the cylinder whereby said valves are opened and closed by the action of the cam wheels and pawls and the speed of the engine regulated, substantially as described.

4. In a valve regulator, the combination with the cylinder and main shaft of the engine and governor connected therewith, the valves and valve stems of the cylinder, of a cam wheel operated by the main shaft, pawls engaging the cam wheel and pivotally connected to the stems of the exhaust valves of the cylinder, cam wheels connected with and normally traveling with the cam wheel aforesaid, one of said wheels being controlled by the governor, means connecting the governor with said wheels for the control of the same as the speed increases or decreases, pawls engaging said cam wheels and pivotally connected to the stems of the inlet valves of the engine whereby said valves are opened and closed by the action of the cam wheels and pawls and the speed of the engine regulated, substantially as described.

In testimony whereof I have hereunto affixed my name in the presence of two subscribing witnesses.

SOFFUS STROMMERSON.

Witnesses:

E. BEAUMONT,
H. C. GARDINER.