C. E. GODLOVE & J. L. VAN NORT.

MOTOR.

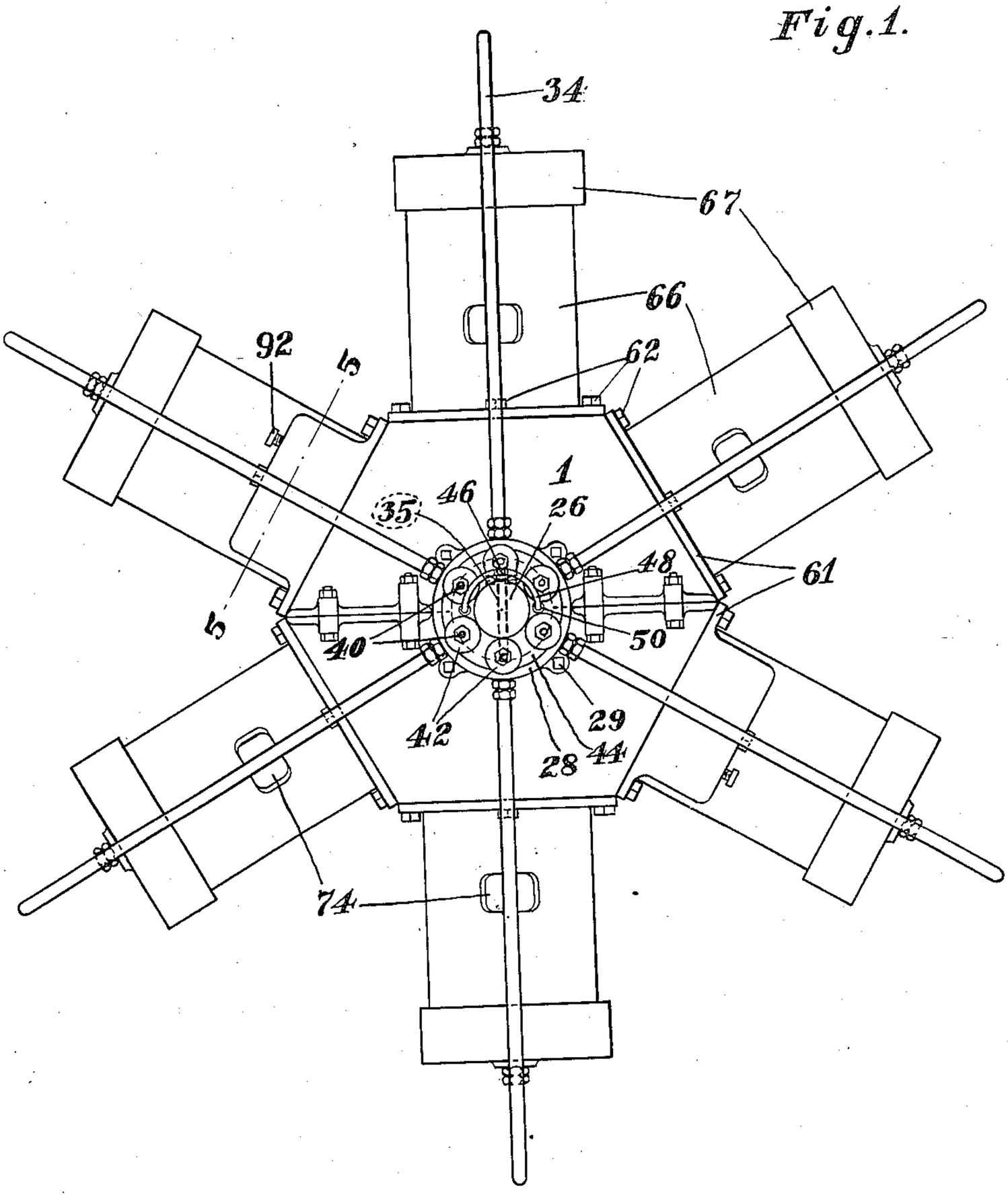
APPLICATION FILED APR. 15, 1909.

981,995.

Patented Jan. 17, 1911.

5 SHEETS—SHEET 1.

*Fig. 1.*

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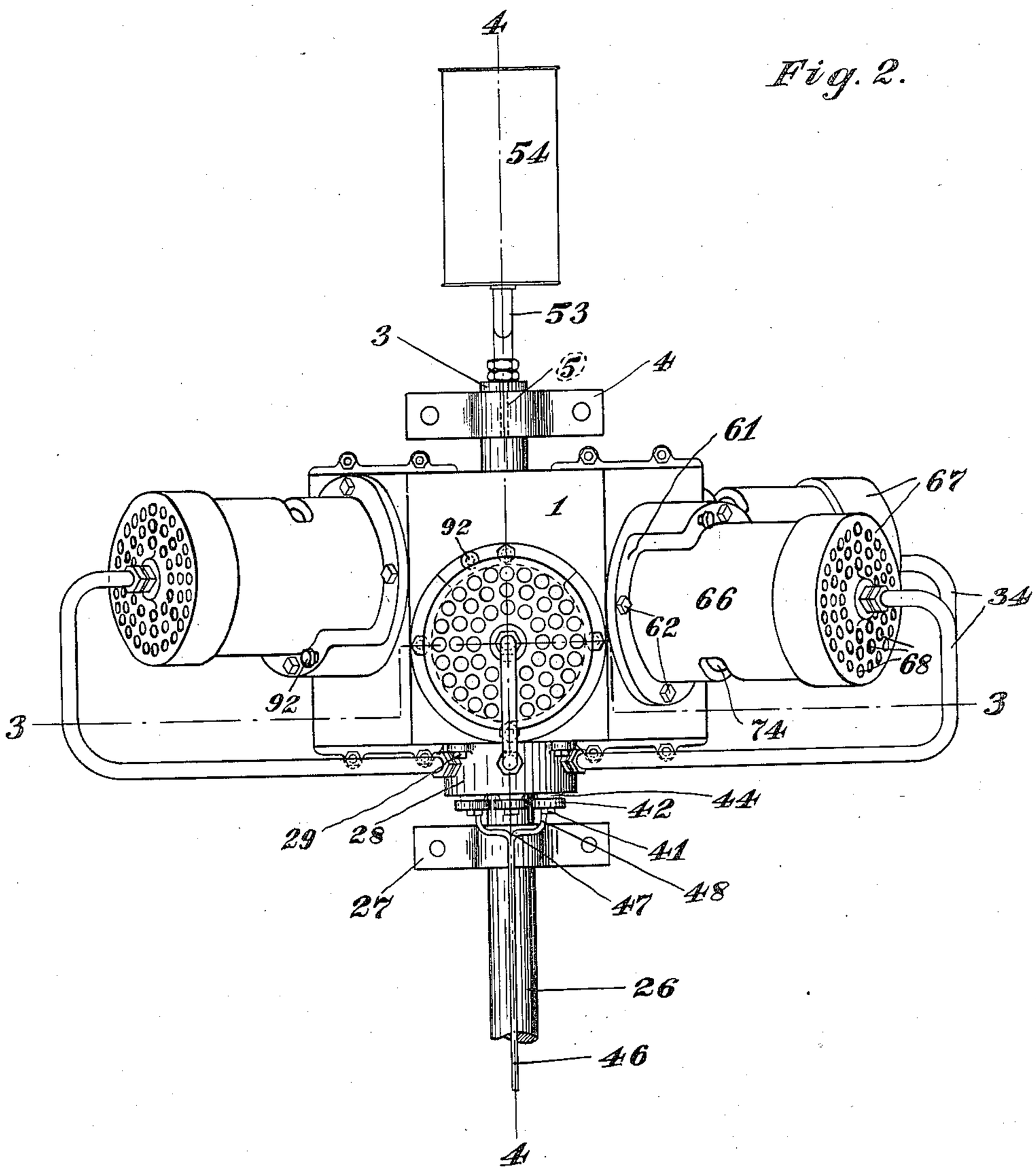
5 SHEETS—SHEET 2.

Fig. 2.

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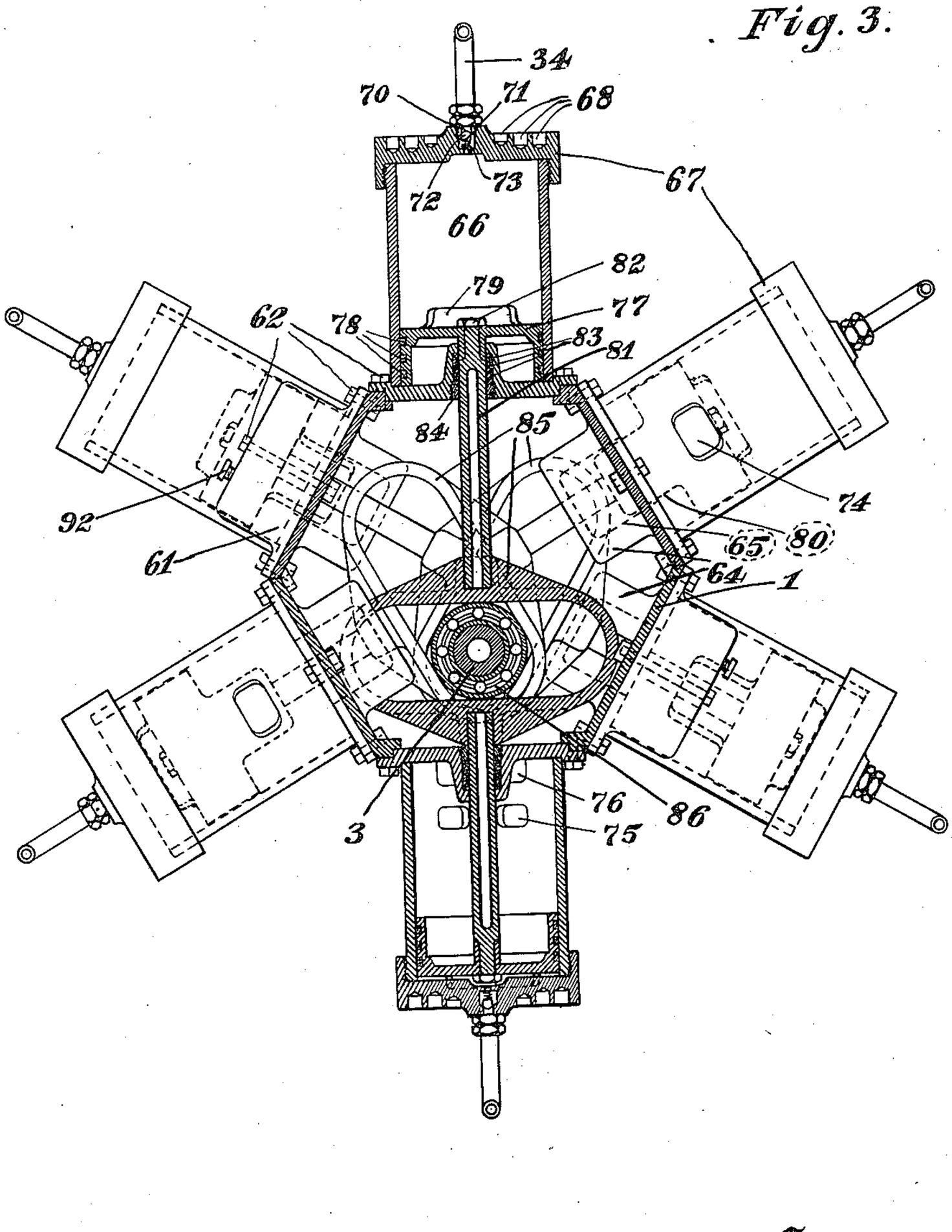
5 SHEETS—SHEET 3.

*Fig. 3.*

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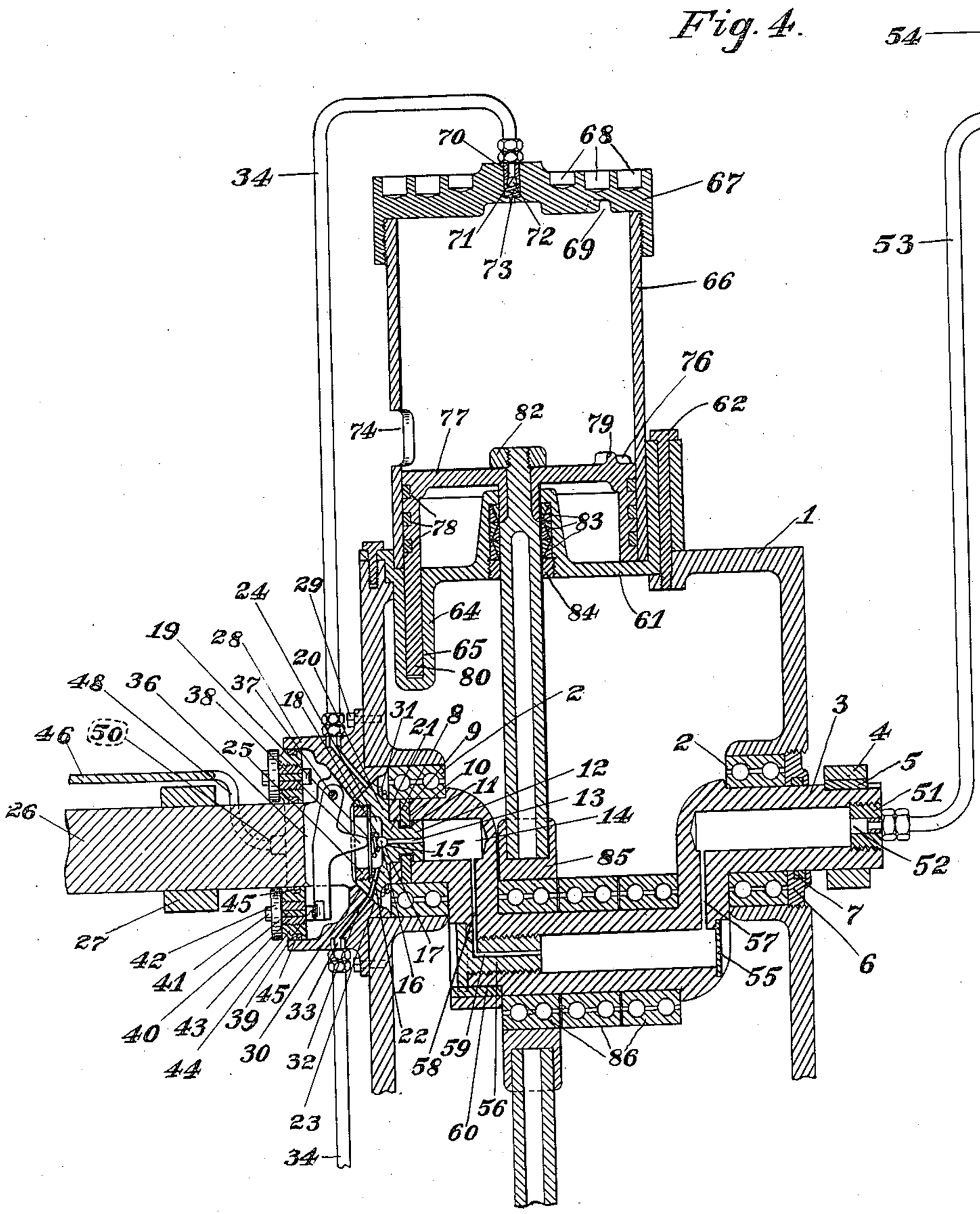
5 SHEETS—SHEET 4.

*Fig. 4.*

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5 SHEETS—SHEET 5.

*Fig. 5.*

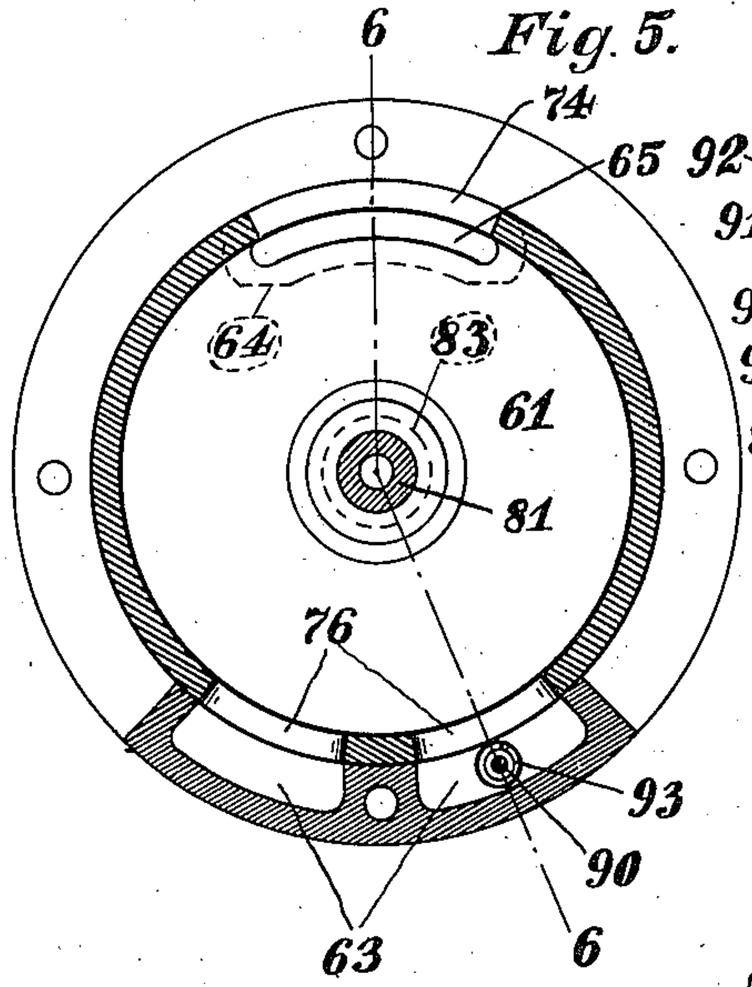



*Fig. 6.*

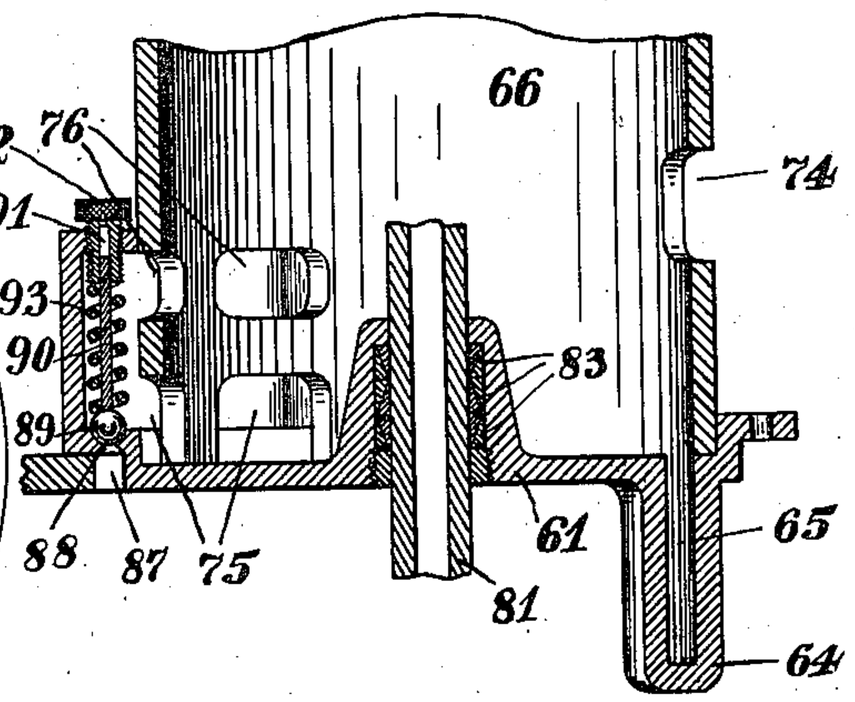



*Fig. 7.*

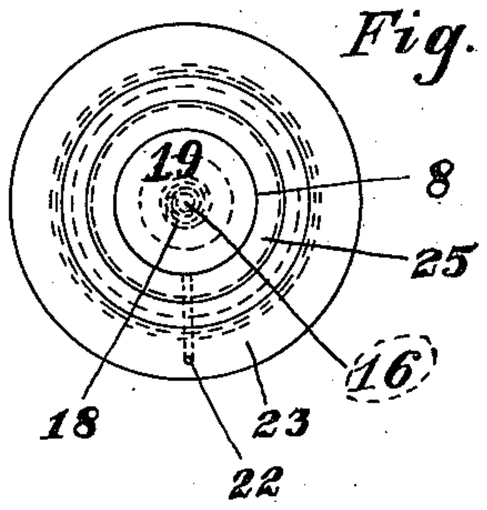



*Fig. 8.*

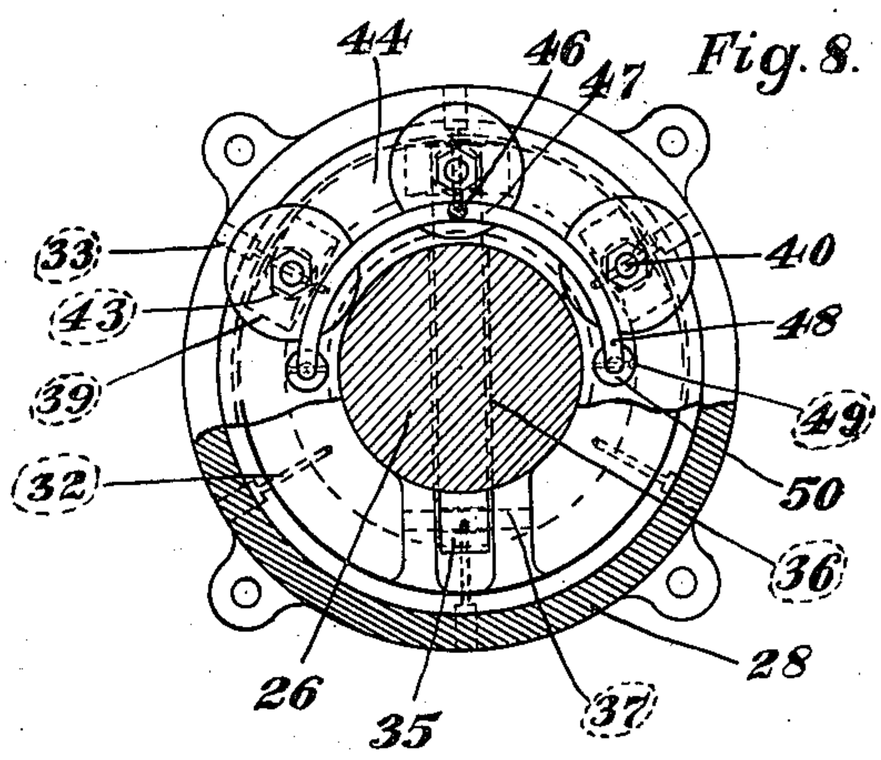
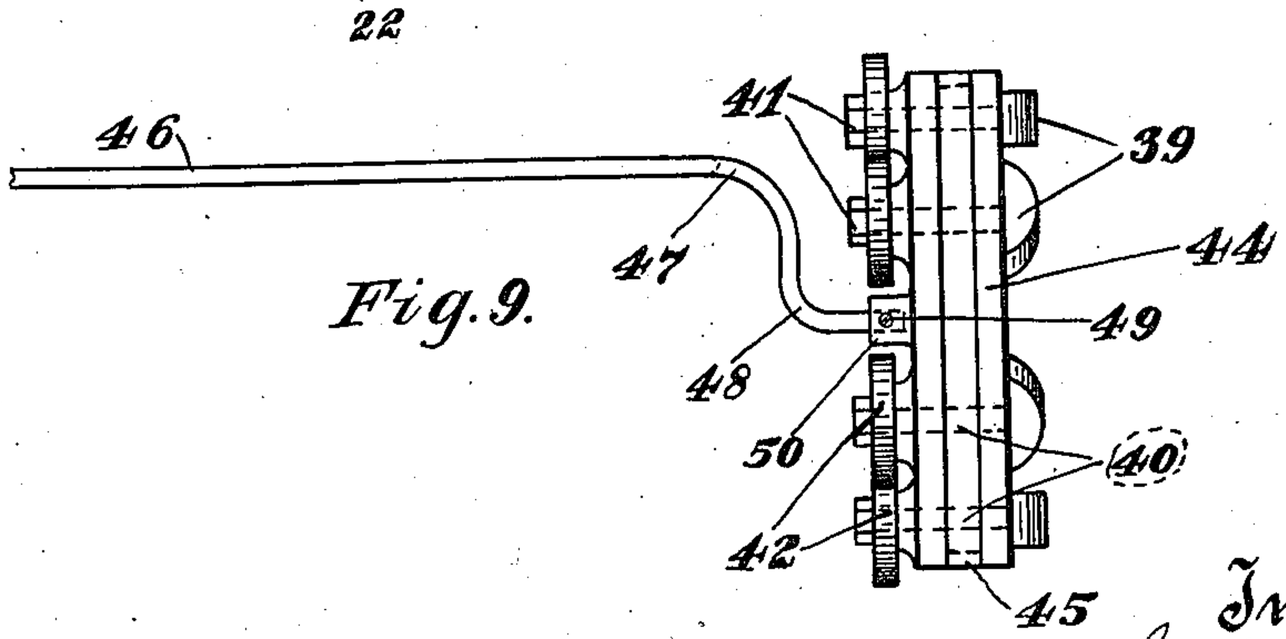



*Fig. 9.*

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# UNITED STATES PATENT OFFICE.

CHARLES E. GODLOVE AND JAMES L. VAN NORT, OF ST. LOUIS, MISSOURI; SAID VAN NORT ASSIGNOR, BY MESNE ASSIGNMENTS, TO SAID CHARLES E. GODLOVE, OF ST. LOUIS, MISSOURI.

## MOTOR.

981,995. Specification of Letters Patent. **Patented Jan. 17, 1911.**

Application filed April 15, 1909. Serial No. 490,192.

*To all whom it may concern:*

Be it known that we, CHARLES E. GODLOVE and JAMES L. VAN NORT, citizens of the United States, residing at the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Motors, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention consists in improvements in motors of the hydrocarbon variety, the main features of the invention residing in the fact that, in lieu of the ordinary rotation of the crank shaft, the cylinders revolve around a stationary crank shaft, and the means for producing such revolution. These and other features of invention will be pointed out in the claims.

In the drawings, like numbers of reference denote like parts wherever they occur, and Figure 1 is an end elevation; Fig. 2 is a top plan view; Fig. 3 is a sectional view on the line 3—3, Fig. 2; Fig. 4 is a sectional view on the line 4—4, Fig. 2; Fig. 5 is a transverse sectional view on line 5—5, Fig. 1; Fig. 6 is a sectional view on line 6—6, Fig. 5; Fig. 7 is a face view of the diaphragm pump; Fig. 8 is a face view of the cam casing with a portion broken away; and Fig. 9 is a side view of the cams.

The casing 1 is rotatably mounted on ball-bearing collars 2 on the stationary hollow crank-shaft 3. One end of said crank-shaft is supported in a sleeve or bracket 4 and held stationary therein by a key 5, or other suitable means. The lock-nut 6, provided with packing ring 7, fits closely around said crank-shaft, and, in threaded engagement with casing 1, holds ball-bearing collar 2 in place. At the other end of said crank-shaft, the diaphragm pump 8 is fastened thereto by pins 9, which are inserted into the perforations 10 of the crank-shaft 3, and extend into notches 11 in the neck portion 12 of said diaphragm pump, and prevents same from turning with casing 1. Said neck portion 12 of diaphragm pump 8 is provided with aperture 13, one end of which terminates in the hollow compartment 14 of the crank-shaft 3, and the other end of said aperture is adapted to form a seat 15 which receives the ball 16, and forms therewith check-valve 17. Said ball 16 is normally held off said seat 15 by the pressure of the fuel fluid in the hollow crank-shaft, and is seated under the influence of spring 18 when diaphragm 19 is depressed.

The body portion 20 of the diaphragm pump 8 is provided with shoulder 21, which fits closely against the end of crank-shaft 3 adjacent thereto. The outlet passage 22 in diaphragm pump 8 extends from the circularly beveled face 23, and terminates in the diaphragm chamber 24 underneath diaphragm 19, which is held in place by the hollow lock-nut 25.

The driving shaft 26 is journaled in a sleeve 27, or other suitable bearing, and is provided with the casing or housing 28, preferably integral therewith, which is fastened to casing 1 by bolts 29, and rotates therewith. Said housing 28 is provided internally with a circularly beveled side 30, which tightly encircles the beveled face 23 of diaphragm pump 8, and rotates thereon. Spring 31 holds the beveled face 23 closely against the beveled side 30, and prevents the leakage of the fuel liquid between the contacting surfaces 23 and 30. Said housing 28 is provided with passages 32 which terminate at one end in the beveled side 30 and register with the outlet 22 of the diaphragm pump 8 when said housing is revolved. The other end of each of said passages 32 terminates in an aperture 33, each of which receives a pipe 34. The lever 35 is pivoted at one end in the slotted compartment 36 of the driving shaft 26 by pin 37, and is provided with a projection 38. The other end of said lever 35 is preferably rounded and depressed during the rotation of the driving shaft by the stationary cams 39, which causes the depression of the diaphragm 19 by the projection 38 on said lever. Each of said cams 39 is preferably formed integrally on one end of a rod 40, which is threaded at the other end to receive a nut 41. Said rod 40 passes through a washer 42 and a sleeve 43, which is in threaded engagement with the disk 44. The sleeves 43 allow the separate adjustment of the cams 39. The cam disk 44, which is provided with packing rings 45, tightly encircles the driving shaft 26, and is closely encircled by the housing 28, but does not rotate therewith. Said cam disk 44 is held in position by a rod 46, one end of which runs to a suitable adjusting device (not shown in the drawings), and the other end terminates in a fork 47. Each of the prongs 48 of said fork is at-

tached to the cam disk 44 by set-screws 49 in the lugs 50 on said disk, or by other convenient means. Said rod 46 permits of the longitudinal adjustment of the cam disk 44 and, consequently, the adjustment of the cams 39 in unison therewith. The plug 51 in the exposed end of said crank-shaft is provided with an aperture 52, which receives the supply pipe 53. Said pipe 53 conveys the fuel liquid from any suitable reservoir 54, which is located above the crank-shaft, and forces the liquid by gravity into the hollow compartment 14 of the crank-shaft 3, and maintains a pressure on the liquid in said hollow compartment. As the passage through shaft 3 would be most conveniently formed by drilling, the hollow portion in the crank part is sealed at one end by a plate 55, which is preferably brazed therein, and the other end is tapped to receive the threaded plug 56. The hollow portion in the crank part of crank-shaft 3 is connected with the hollow portions in the straight parts of said crank-shaft by passages 57 and 58. Said plug 56 is provided with an angular passage 59, which registers with said passage 58 and is held firmly in position by a pin 60.

The stuffing boxes 61 are fastened to the casing 1 by bolts 62, and are provided with a by-pass chamber or chambers 63, which extend outwardly from said casing. Extending inwardly into the interior of said casing is a projection 64, which is provided with a recess 65. Each of said stuffing boxes 60 receives a cylinder 66 which is preferably welded thereto. Said cylinder is provided with a cap 67 which is in threaded engagement with said cylinder and formed with perforations 68 extending partly into the outer surface of said cap, and in the inner surface of said cap a recess 69 is formed. An aperture 70 extending through said cap 67 is adapted to receive said pipe 34 and a check valve 71. Said valve 71 is formed with a ball 72, which normally closes the end of pipe 34 in aperture 70 by the pressure of spring 73. Said cylinder 66 is provided with a port 74, which permits of the entrance of the fresh air and the exhaust of the burned gases. The openings 75 and 76 connect the interior of said cylinder with the by-pass chamber 63, and allow the entrance into, and exhaust from, said by-pass chamber of fresh air.

The piston 77 is provided with ordinary packing rings 78, and, on the upper surface of said piston, a deflector 79 is provided, which enters the recess 69 when the piston is at the end of the outward stroke. A lip 80 extends downwardly on the periphery of piston 77, and enters the recess 65 during the downward stroke of said piston. Said lip governs the supply of fresh air which enters said cylinder through port 74. The hollow piston rod 81 extends through said piston, and is fastened thereto by nut 82. Said piston passes through stuffing-box 61, which is provided with split metallic packing rings 83, preferably of triangular section. Said packing rings 83, when forced together by nut 84, form an adjustable, as well as an air tight, bearing. The other end of said piston rod is welded or brazed to a Scotch yoke 85, which is slidably and rotatably mounted on crank-shaft 3 by means of ball-bearing collar 86. The members of each pair of piston rods 81 are fastened diametrically opposite to each other to one of the Scotch yokes 85, and thus balance the motor. The perforations 68 in the cap of the cylinder 67 increase the radiating surface, and, consequently, aid in cooling the cylinder.

The casing 1 is filled with lubricating oil, which preferably contains a quantity of graphite, which prevents the objectionable deposit in the cylinder of carbon from the burning gases. Said lubricant is supplied to the cylinders through an aperture 87 in casing 1. Said aperture 87 registers with valve 88 in the chamber 63 of suffing box 60. A ball 89 is integrally formed on the end of valve stem 90, which operates in an elongated passage 91 in the plug 92. Spring 93 normally keeps said valve 88 closed, said valve being opened by the centrifugal force of the motor, thus allowing the cylinder to receive its supply of lubricant proportional to the speed of the motor.

The operation of the motor is as follows: In starting the motor, the driving-shaft 26, which may be conveniently rotated by a crank-handle, causes the cylinders to rotate therewith. The rotation of the cylinders results in the compression of the fresh air in the head of each of said cylinders during the outward or compression stroke of its piston, which produces a temperature about equal to the heat of combustion. Coincident with the completion of the compression stroke, the passage 32 registers with the outlet passage 22 of the diaphragm pump 8, and the lever 35 registers with a cam 39, which depresses said lever and causes the depression of the diaphragm 19. This depression of the said diaphragm closes the check valve 17 and forces a charge of the liquid fuel (which is preferably gasolene, but heavier hydro-carbon fluids may be successfully used) in the diaphragm chamber 24 through the passages 22 and 32, thence through pipe 34, and sprays the liquid fuel through check valve 71 into the air in the head of the cylinder made hot by compression. The charge of the liquid fuel sprayed into the head of the cylinder mixes with the charge of highly compressed air therein, and ignites from the temperature of the said compressed air. The ignition of the mixture results in a slow burning of the gases, and, expanding, forces

the piston in the direction away from the head of the cylinder, and, by reason of the connection of said piston with the Scotch yoke 85, causes the motor to rotate and take up its cycle and run from the power generated within. When the piston is at the end of the compression stroke, a charge of fresh air (governed by the lip 80 on said piston) enters port 74 under said piston, and is compressed during the inward stroke of said piston, and forced into the by-pass chambers 63 through the openings 75. When the inward stroke of the piston nears its end, the burned gases exhaust through said port 74, and the pre-compressed charge of fresh air in the said by-pass chambers passes through openings 76 into the cylinder, and is deflected toward the head of said cylinder by the deflector 79 in the side opposite the port 74. Constant charges of fresh air are supplied to the head of the cylinder by means of said by-pass chamber, forming a two-cycle motor.

The rotation of the cylinders obviates the necessity of a fly-wheel, and creates a condition adjacent to said cylinders and external thereto resembling a vacuum, which reduces the noise of scavenging the cylinders, thus rendering exhaust pipes and mufflers unnecessary. The omission of these parts and of an ignition system, all of which are customary in other motors of this general class, makes a motor embodying this present invention a much cheaper one to manufacture than those that have hitherto been known.

Many minor changes in construction may be made without departing from the spirit of this invention.

We claim:

1. A motor, comprising, in combination, a fixed crank shaft provided with a fuel supply conduit, a casing revoluble around said crank shaft, cylinders radiating from said casing and having pistons connected to said crank shaft, and a mechanical pump located at the outlet end of said fuel supply conduit and adapted to be automatically operated to pump a fuel supply through said shaft and successively to the cylinders.

2. A motor, comprising, in combination, a fixed hollow crank shaft, a casing revoluble around said crank shaft, cylinders radiating from said casing and having pistons connected to said crank shaft, means located at the end of said hollow crank shaft for pumping fuel from said hollow shaft successively to the cylinders, and means connected to said revoluble casing for automatically operating said pumping means.

3. A motor, comprising, in combination, a fixed hollow crank-shaft, a casing revoluble around said crank-shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, a driving shaft connected to said casing, means carried by said hollow shaft to feed fuel therethrough, and means carried by said driving shaft to automatically operate said feeding means.

4. A motor, comprising, in combination, a fixed hollow crank shaft, a casing revoluble around said crank-shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, a driving shaft connected to said casing, means carried by said hollow shaft to feed fuel therethrough, means carried by said driving shaft to automatically operate said feeding means, and means for regulating said automatic fuel supply.

5. A motor, comprising, in combination, a fixed hollow crank-shaft, a casing revoluble around said crank-shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, a driving shaft connected to said casing, means carried by said hollow shaft to feed fuel therethrough; and means carried by said driving shaft to automatically operate said feeding means, and means surrounding said driving shaft for regulating said automatic fuel supply.

6. A motor, comprising, in combination, a fixed hollow crank-shaft, a casing revoluble around said crank-shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, a driving shaft connected to said casing, means carried by said hollow shaft to feed fuel therethrough, pivoted means carried by said driving shaft to automatically open and close said fuel feeding means, and adjustable cam surfaces for rocking said pivoted means.

7. A motor, comprising, in combination, a fixed crank-shaft, provided with a fuel-supply conduit, a driving shaft, a casing revoluble around said crank- shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, means carried by said hollow shaft for pumping a fuel supply to said cylinders, and means actuated by said driving shaft for operating said pumping means.

8. In a motor, the combination of a stationary crank-shaft, a casing rotatably mounted thereon, a plurality of cylinders mounted on said casing and rotating therewith, a plurality of caps closing the head of each of said cylinders, each of said caps being provided with an aperture adapted to receive a pipe and a check-valve, the outer surface of each of said caps having perforations extending partly therethrough, and a recess in the inner surface of each of said caps.

9. A motor, comprising, in combination, a fixed hollow crank-shaft, a casing revoluble around said crank-shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, means for

feeding fuel through said hollow shaft, conduits for conducting said fluid from said feeding means to the heads of said cylinders, and means to introduce air to the heads of said cylinders.

10. A motor, comprising, in combination, a fixed hollow crank-shaft, a casing revoluble around said crank-shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, means for feeding fuel through said hollow shaft, means to automatically operate said feeding means, conduits for conducting said fluid from said feeding means to the heads of said cylinders, and means to introduce air to the heads of said cylinders.

11. A motor, comprising, in combination, a fixed hollow crank-shaft, a casing revoluable around said crank-shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, means for feeding fuel through said hollow shaft, conduits for conducting said fluid from said feeding means to the heads of said cylinders, said cylinders having air ports located to supply air to said cylinder heads for the combustion of said fuel.

12. A motor, comprising, in combination, a fixed hollow crank-shaft, a casing revoluble around said crank-shaft, cylinders radiating from said casing and having pistons connected to said crank-shaft, means for feeding fuel through said hollow shaft, conduits for conducting said fluid from said feeding means to the heads of said cylinders, by-pass chambers for the compression of air, and air ports to supply air to said cylinders to be compressed in said by-pass chambers and to explode said fuel.

13. In a motor, the combination of a stationary crank-shaft, a casing rotatably mounted thereon, a plurality of stuffing-boxes mounted on said casing and adapted to rotate therewith, each of said stuffing-boxes being adapted to receive and hold a cylinder, a piston operating in said cylinder, said piston being provided with a lip, and a recess in said stuffing-box adapted to receive said lip.

14. In a motor, the combination of a casing rotatably mounted on a stationary crank-shaft, a plurality of stuffing-boxes mounted on said casing and adapted to rotate therewith, each of said stuffing-boxes being adapted to receive and hold a cylinder, said cylinder being provided with a port in its side, and a piston operating in said cylinder and provided with a lip, each of said stuffing-boxes being provided with a recess, and said lip being adapted to open and close said port and being slidable in said recess.

15. In a motor, the combination of a casing mounted on a stationary crank shaft, a plurality of stuffing boxes mounted on said casing, and having recessed seats formed therein, a cylinder mounted in the recessed seat of each stuffing box, an arcual upright projection formed on each stuffing box to form a by-pass chamber with said cylinder, and pistons operating in said cylinders.

16. In a motor, the combination of a casing rotatably mounted on a stationary crank-shaft, a plurality of cylinders mounted on said casing and adapted to rotate therewith, each of said cylinders being provided with a by-pass chamber, and a check-valve in said by-pass chamber adapted to allow a lubricant to enter from said casing.

17. A motor, in combination with a hollow crank shaft adapted to receive fuel through one end, and a fuel pump located at the opposite end of said hollow crank shaft and adapted to distribute the fuel through said last mentioned end.

18. In a motor, the combination of a hollow crank-shaft, a pump attached thereto, said pump being provided with a diaphragm, a diaphragm chamber, an inlet from the hollow compartment of said hollow crank-shaft to the diaphragm chamber, a check-valve in said diaphragm chamber, said check-valve being adapted to operate in said inlet, and an outlet to said diaphragm chamber.

19. In a motor, the combination of a hollow crank-shaft, a pump attached thereto, said pump being provided with a diaphragm, a diaphragm chamber, said diaphragm chamber being in communication with the hollow compartment of said crank-shaft, a check valve operating in said diaphragm chamber, an outlet leading from said diaphragm chamber, and a housing encircling said pump and being rotatable thereon, said housing being provided with a plurality of passages which register with said outlet when said housing is rotated.

20. In a motor, the combination of a hollow crank-shaft, a pump attached thereto, said pump being provided with a diaphragm, a diaphragm chamber, said diaphragm chamber being in connection with the hollow compartment of said crank-shaft, a check-valve operating in said diaphragm chamber, an outlet leading from said diaphragm chamber, a housing encircling said pump and being rotatable thereon, said housing being provided with a plurality of passages which register with said outlet when said housing is rotated, and a lever pivoted in said housing and adapted to rotate therewith, said lever connecting with said diaphragm.

21. In a motor, the combination of a hollow crank-shaft, a diaphragm pump attached thereto, said pump being in connection with the hollow compartment of said crank-shaft, an outlet from said pump, a housing encircling, and being adapted to rotate on, said pump, said housing being provided with a plurality of passages which register with said outlet when said housing

is rotated, a lever pivoted in said housing and rotatable therewith, said lever connecting with the diaphragm in said pump, and a plurality of stationary cams which operate said lever.

22. In a motor, the combination of a stationary hollow crank-shaft, a diaphragm pump attached thereto, a housing encircling and rotatable on said pump, a lever pivoted in said housing and rotatable therewith, said lever being in connection with the diaphragm pump, a driving shaft attached to said housing, and a plurality of stationary cams adapted to operate said lever, said cams being adjustable independently or as a whole.

23. In a motor, the combination of a stationary crank-shaft, a casing rotatably mounted thereon, a plurality of cylinders mounted on said casing and rotatable therewith, a diaphragm pump attached to said crank-shaft, a housing attached to said casing and rotatable therewith, said housing encircling, and adapted to rotate on, said pump, said pump being in communication with the hollow compartment of said crank-shaft, an outlet from said pump, a plurality of passages in said housing which register with said outlet when said cylinders are revolved, a plurality of pipes, each of said pipes connecting one of said cylinders with one of said passages, a lever pivoted in said housing and rotated therewith, said lever connecting with said pump, a plurality of stationary cams which operate said lever, and a driving shaft attached to said housing and rotatable therewith.

In testimony whereof we have affixed our signatures in presence of two witnesses.

CHARLES E. GODLOVE.
JAMES L. VAN NORT.

Witnesses:
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