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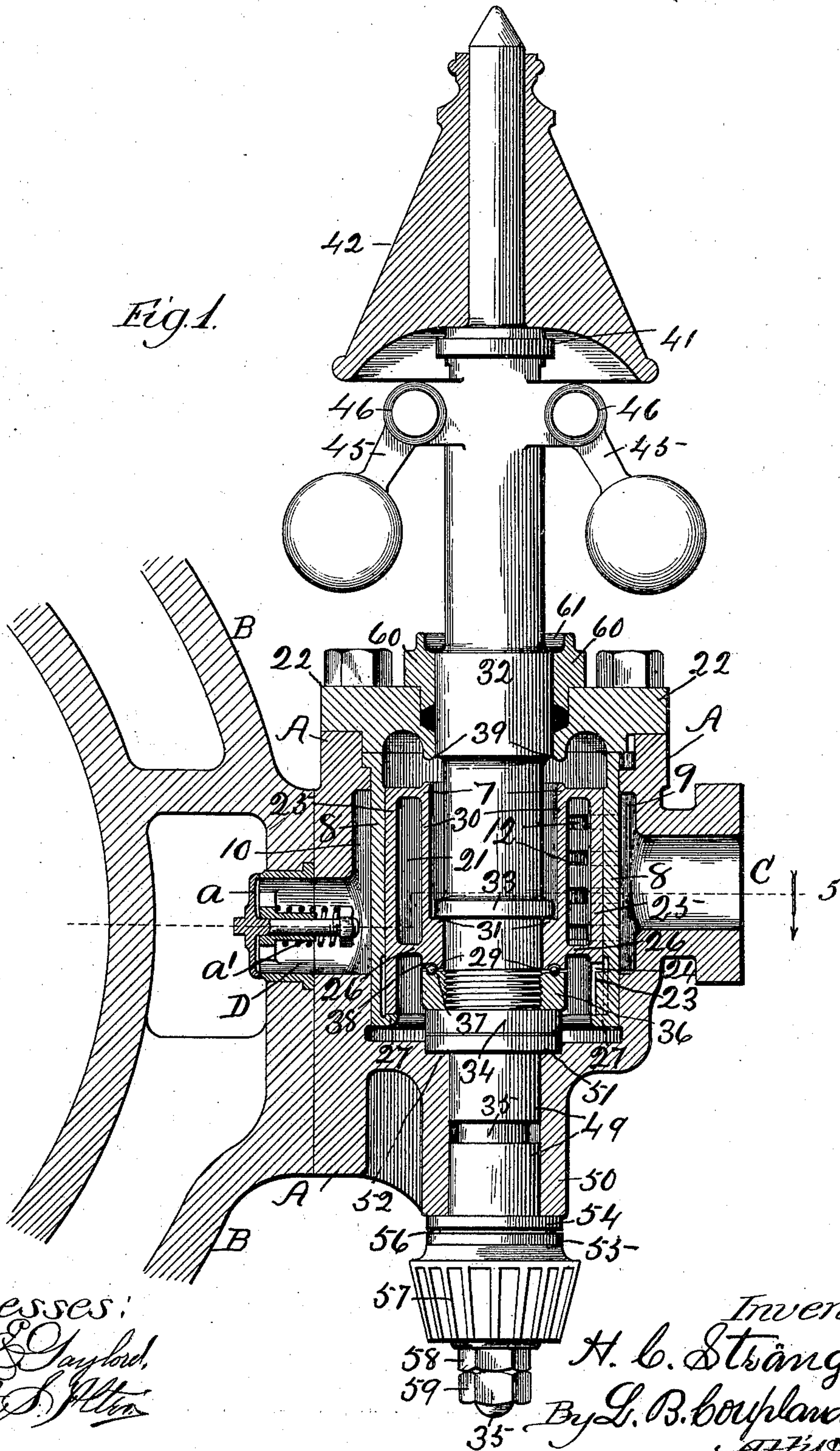
Patented Sept. 16, 1902.

H. C. STRÄNG.  
ENGINE GOVERNOR.

(Application filed Dec. 27, 1898. Renewed Feb. 20, 1902.)

(No Model.)

3 Sheets—Sheet 1.





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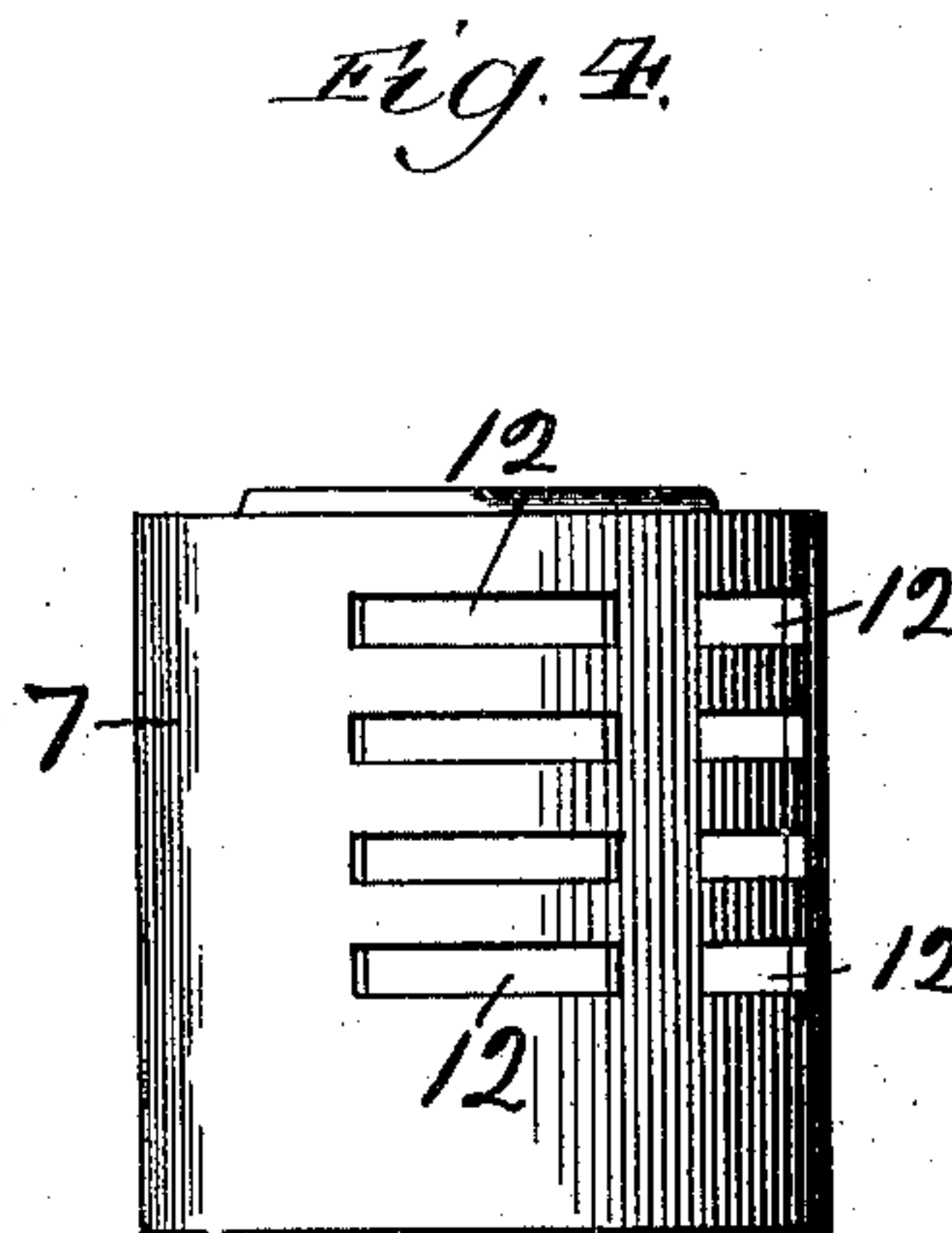
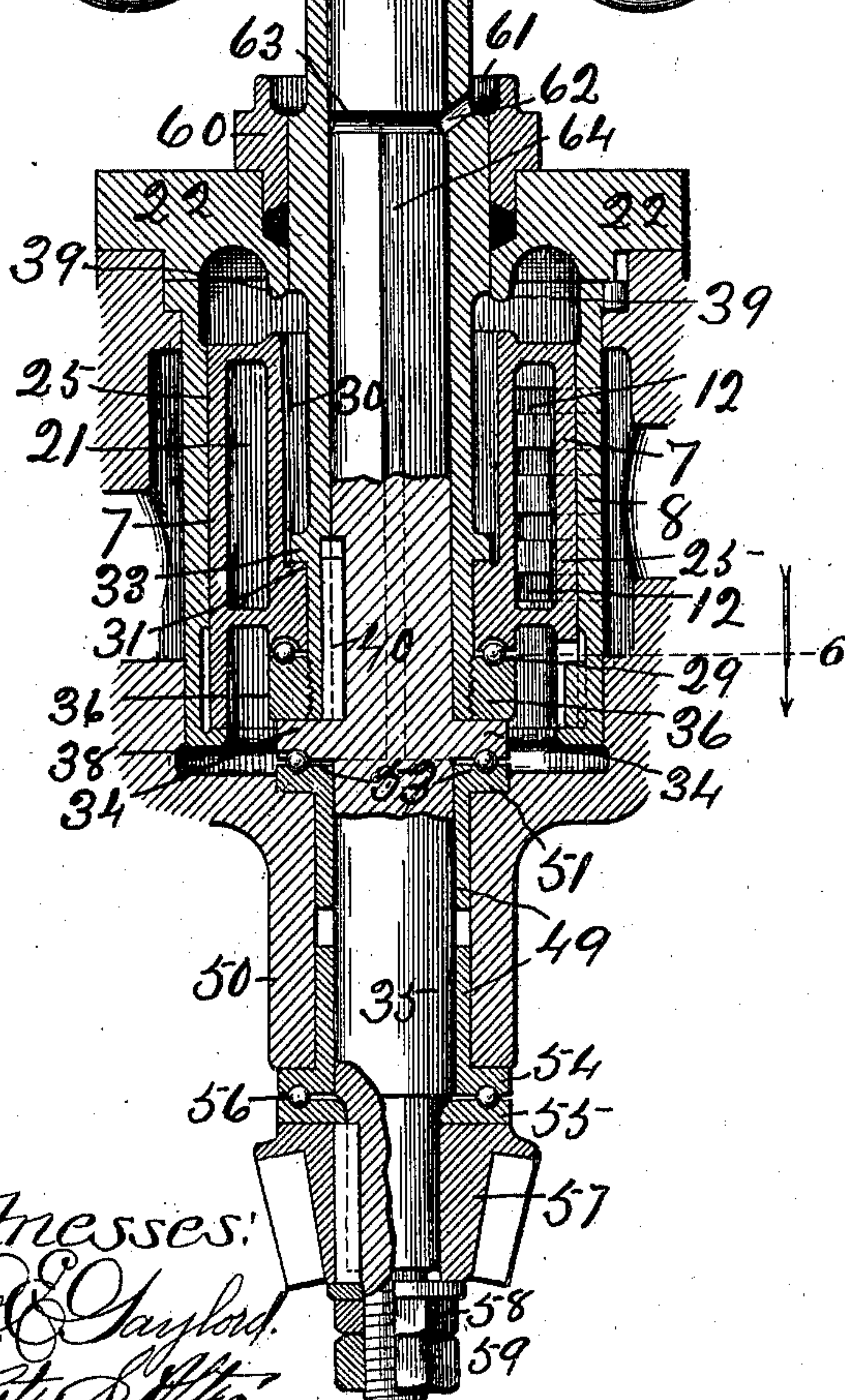
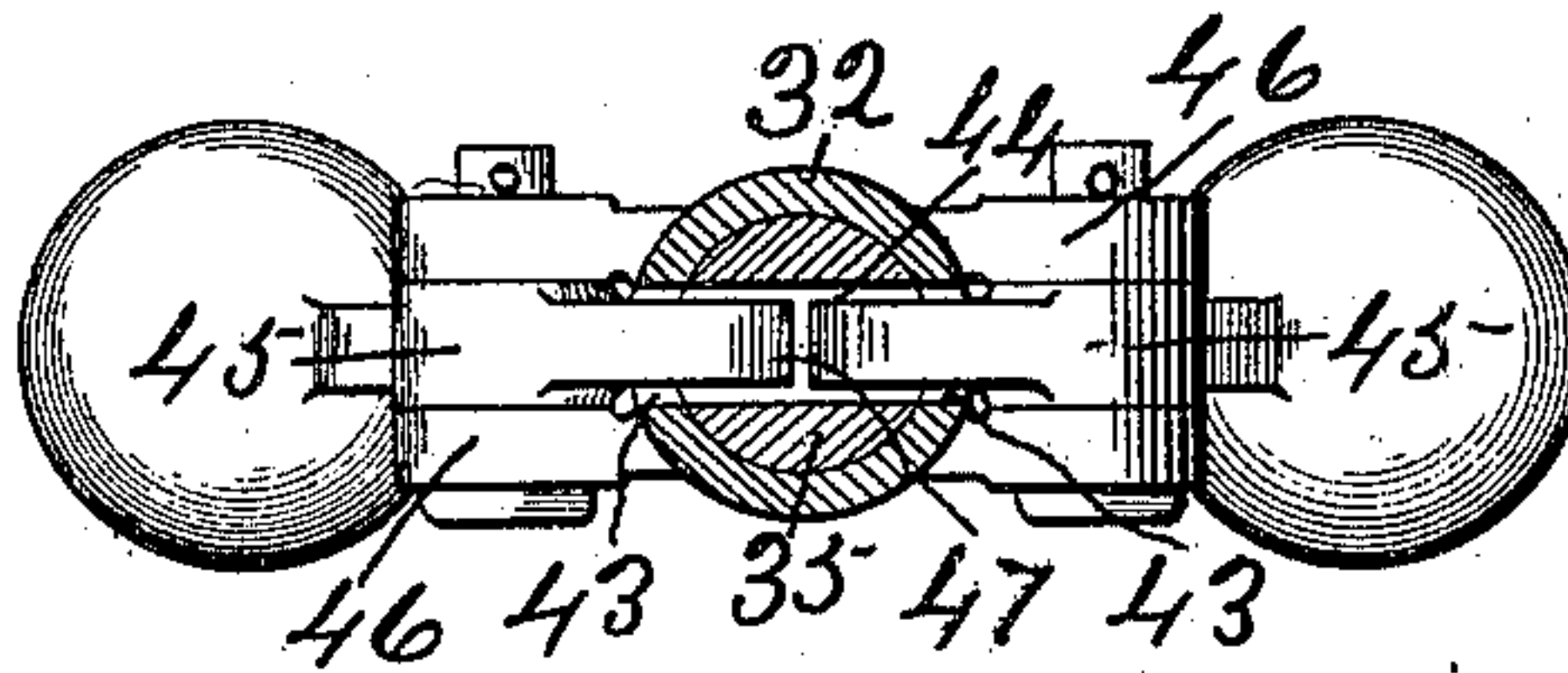
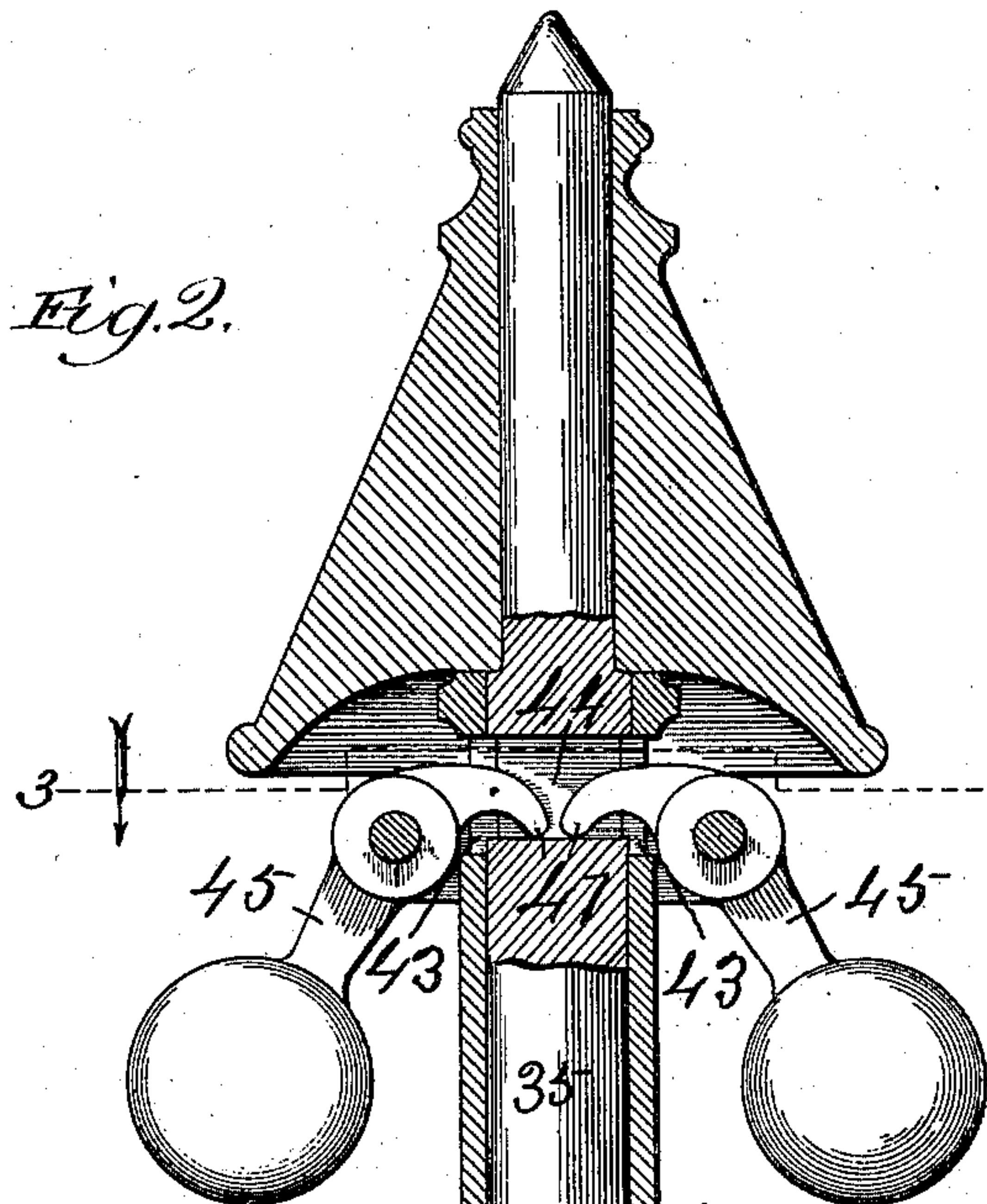
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3 Sheets—Sheet 2.



Witnesses:  
E. C. Gaylord,  
L. B. Coupland.

Inventor:  
H. C. Sträng.  
By L. B. Coupland,  
Att'y.



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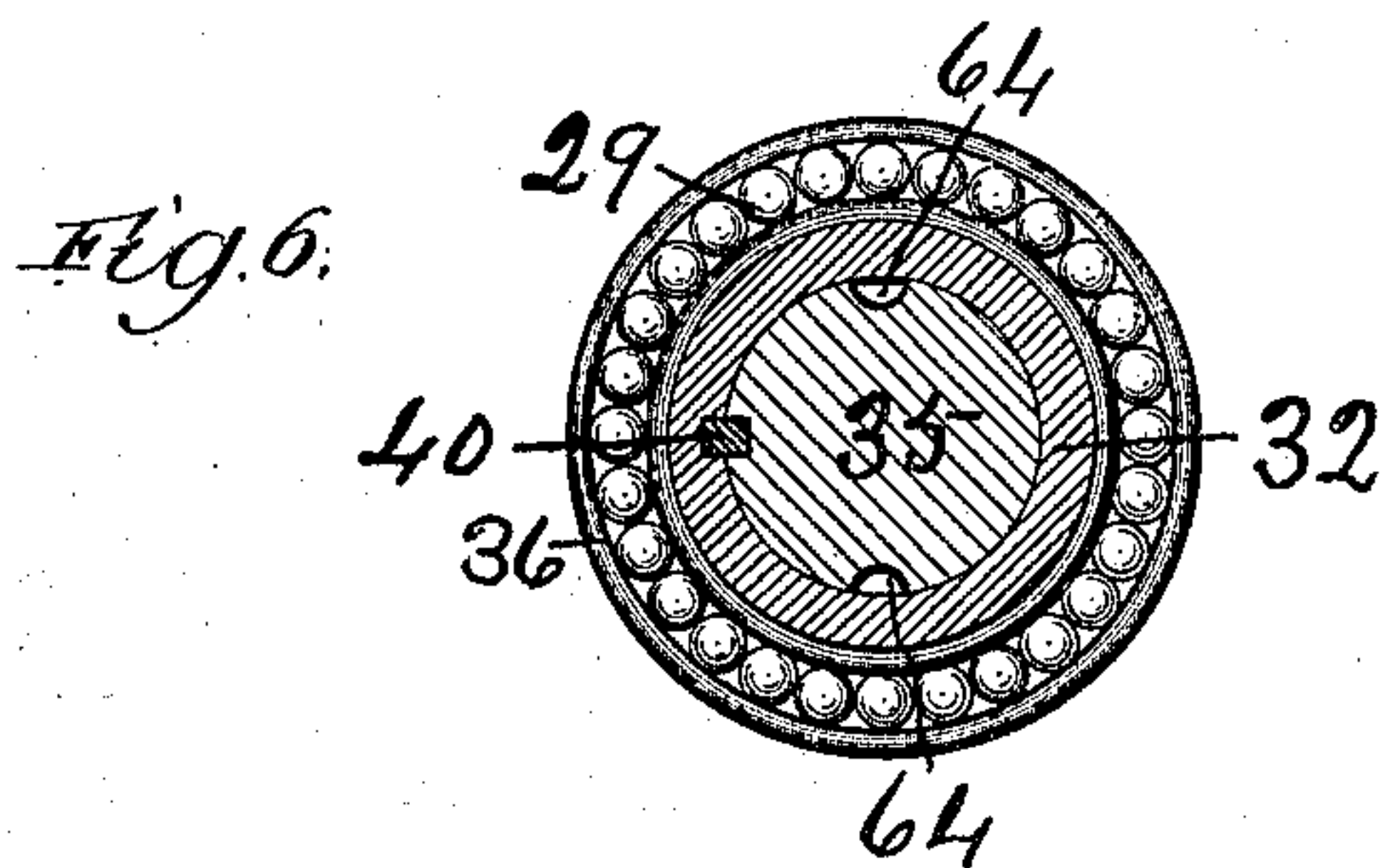
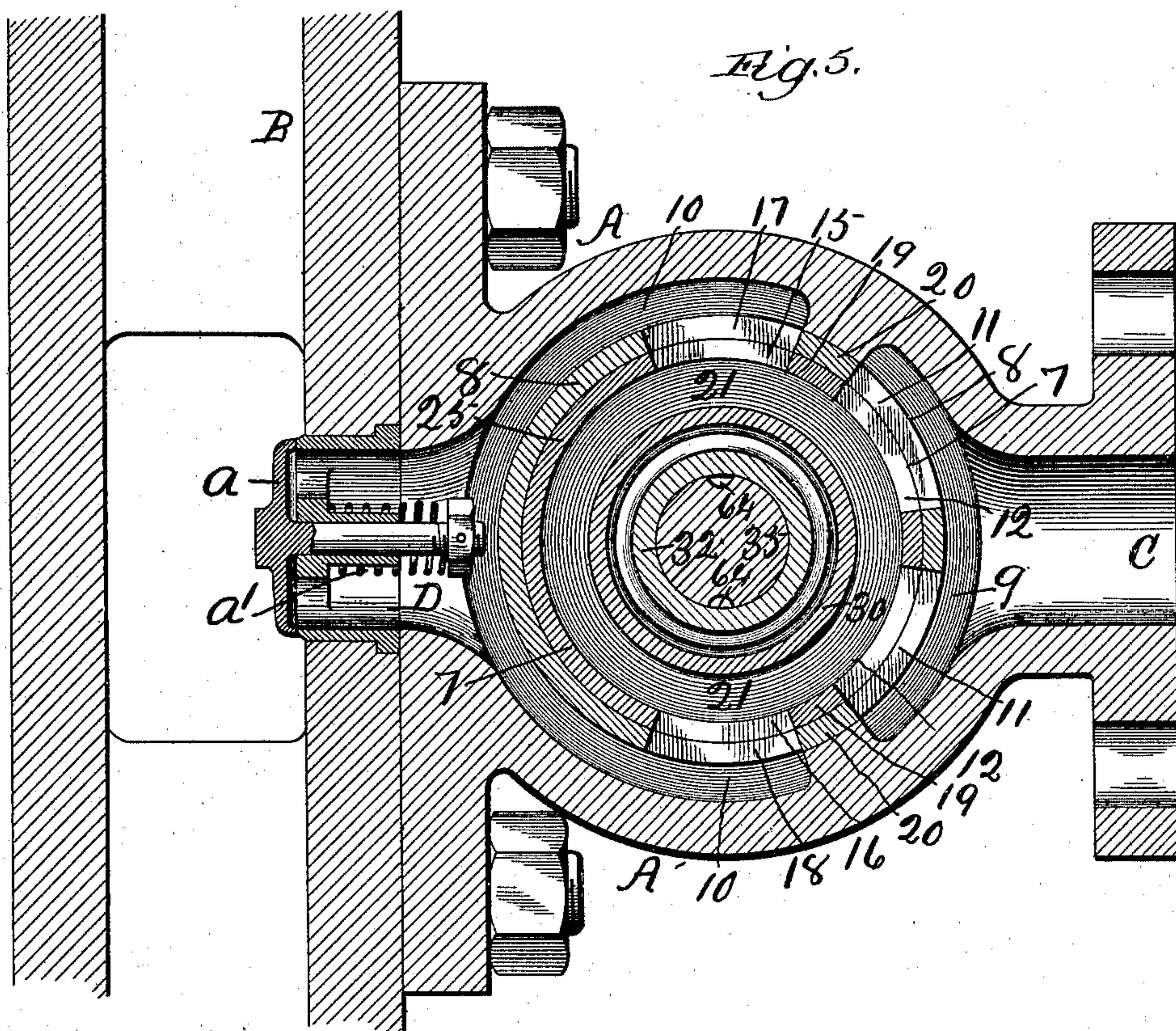
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**3 Sheets—Sheet 3.**



Witnesses:  
 East Gaylord,  
 Lute S. Allen

Inventor:  
H. C. Strang.  
By L. B. Coupland & Co.  
Attorneys



# UNITED STATES PATENT OFFICE.

HENRIK C. STRÄNG, OF CHICAGO, ILLINOIS.

## ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 709,059, dated September 16, 1902.

Application filed December 27, 1898. Renewed February 20, 1902. Serial No. 94,926. (No model.)

*To all whom it may concern:*

Be it known that I, HENRIK C. STRÄNG, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Engine-Governors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in the class of governors that are adapted for use on gas, steam, or other engines of an analogous character, but is more especially intended for use on the different types of gas-engines using a fluid as a motive agent.

Great difficulty has been and is still being experienced in successfully and economically operating gas-engines for the want of a suitable governing device that would fully control and regulate the supply of the motive agent by the load on the engine under all the variations to which engines of this type are subjected.

The object, therefore, of this invention is to provide a governing device that is extremely sensitive in action, so as to instantly respond to the slightest variation of the load on the engine and maintain a uniform speed and at the same time automatically control and regulate the mixture and the supply of the motive agent proportionately, and thus insure the greatest possible efficiency in operation.

The device might be termed a "combined governor and equilibrium valve and gas-supply regulator."

Figure 1 is a vertical longitudinal section and elevation of the device in its working position. Fig. 2 is a similar view, but showing more of the spindle, the inclosing sleeves being in section. Fig. 3 is a horizontal plan section on line 3, Fig. 2, looking in the direction indicated by the arrow. Fig. 4 is a detached elevation of the governor-valve. Fig. 5 is a horizontal section on line 5, Fig. 1; and Fig. 6 a horizontal section on line 6, Fig. 2, the casing being omitted.

A may indicate the governor-casing, which is in the present instance rigidly secured to the cylinder B of an engine. This casing is provided with the inlet or receiving passage

C and the outlet or discharge passage D on the opposite side, leading into the cylinder. The inlet-passage will be controlled by a suitable stop valve or cock for closing the passage when the mechanism is at rest. The passage D, communicating with the cylinder, is normally closed by a check-valve *a*. This valve is only used when the motive fluid is air or gas and is automatically opened for the admission of the fluid by the action of the vacuum created by the suction of the piston and is returned to and held in its normally closed position by a spring *a'*. This valve serves the purpose of closing the passage D and prevents the gas from escaping accidentally should the supply-passage be left open when the engine is at rest.

The cylindrical equilibrium governor-valve 7, Fig. 4, is inserted loosely in place and is separated from the inclosing wall of the casing by a stationary lining 8, between which lining and the wall is a semicircular space 9 on the inlet side, Fig. 5, and the corresponding space 10 on the discharge or suction side. The valve and its lining are each provided with a number of ports, which are so disposed that the governor-valve will maintain a proper equilibrium under all the variations it may be subjected to and in no wise be affected by the vacuum or suction action of the piston. The cylindrical lining 8 is provided with the rectangular or elongated inlet or receiving ports 11 and the governor-valve with the corresponding inlet or receiving ports 12, registering therewith, as indicated in Fig. 5. The governor-valve is provided with the outlet-ports 15 and 16 and the lining with the corresponding registering outlet-ports 17 and 18. The inlet and outlet ports are separated from each other by the web partitions 19 in the valve and the partitions 20 in the lining. The double-walled governor-valve provides an annular chamber 21, which is of sufficient area to equalize the pressure and maintain a proper balance, as this chamber will always be filled with the active motive fluid. The outlet-ports are located diametrically opposite each other and at right angles to the passage communicating with the cylinder, the valve and its lining presenting a solid wall on the cylinder side, and thereby preventing the action of



the piston from affecting the equilibrium of the valve. The valve-lining is held in a stationary position by the closing-cap 22 seating down on the upper end thereof. A rib or ribs 5 23 is formed on the inner side and lower part of the lining and extends into an opening 24 in the lower exterior wall 25 of the valve below the bottom diaphragm 26. This rib feature prevents a rotary movement of the governor-valve and allows for the necessary vertical movement. The lower end of the lining is provided with the inturned horizontal flange 27, on which the lower end of the exterior wall 25 of the valve seats when resting in 15 its lowermost position and supports the valve out of contact with the ball-bearing 29 when at rest. The interior wall 30 of the double-walled governor-valve is cut away at its lower end and does not extend down on a line with 20 the lower end of the exterior wall, but stops short of the ball-bearing 29, as shown. The lower part of the interior wall is thickened to form the annular shoulder 31. A sleeve 32, inclosing the upper portion of the governor-spindle, is provided at this point with 25 a flange 33, resting on the shoulder 31. The lower end of this sleeve rests on a flange 34, formed on the governor-spindle 35. A screw-nut 36 has a threaded engagement with the 30 lower end of the sleeve 32 and is provided in the upper side with an annular groove 37 for the reception of the balls forming the bearing 29. The adjacent lower end of the inner wall of the governor-valve is provided with the corresponding ball-groove 38, forming the upper 35 half of the bearing, but which only has contact when the sleeve is moving up and down in the work of governing. The flange 33 on the sleeve 32 forms a shoulder-bearing with 40 the governor-valve and prevents the latter from having a vertical movement independently of the sleeve. The lower inner downwardly-projecting edge 39 of the cap 22 limits the up movement of the sleeve and governor-valve. The sleeve 32 is feathered on 45 the spindle 35, Figs. 2 and 6, by a key 40, so as to provide for both a vertical and a rotary movement thereon. The upper end of the sleeve is provided with a flange 41, on which 50 is loosely seated the conical weight 42, inclosing the upper end of the spindle. This sleeve is also provided with openings 43 on opposite sides, and the spindle is provided with a slot 44 in line therewith for the insertion of the 55 inner ends of the weighted governor-arms 45, pivoted to the companion lugs 46, forming a rigid part of the sleeve. The inner hook ends 47 bear on the horizontal bottom surface 48 of the spindle, formed by cutting out the slot 60 44, and provide for the required fulcrum-leverage in imparting a vertical movement to the sleeve and the governor-valve by the centrifugal force developed in regulating the speed of the engine in accordance with its 65 varying load.

A bearing-bushing 49 is inserted in the lower contracted end 50 of the casing and in-

closes the lower part of the governor-spindle running therethrough. A flange 51 is formed on the upper end of this bushing and is seated in the recess 52, formed in the casing. This flange, with the corresponding flange 34 on the spindle, provides for the ball-bearing 53. A flange 54 is formed on the lower end of the bearing-bushing. A bearing-ring 55 is mounted on the spindle underneath and adjacent 75 to the flange 54 and forms the lowermost ball-bearing 56. Next to the bearing-ring is mounted the pinion 57, with which suitable operative connection may be made. The 80 lower end of the spindle is threaded for the engagement of the two nuts 58 and 59, by means of which the ball-bearing may have proper adjustment.

The stuffing-box gland 60 is provided with 85 the oil-chamber 61, from which the oil-passage 62 leads through the sleeve into the annular groove 63 in the spindle. The spindle is in turn provided on opposite sides with vertical oil-grooves 64, which run downwardly 90 from the groove 63. By this arrangement all the parts and bearings of the apparatus are thoroughly lubricated. Every part of the apparatus is so constructed and assembled that the friction is reduced to a minimum 95 and the working parts move with the greatest possible ease and lightness. The feature of the governor-valve loosely inclosing the rotating spindle is an important one in maintaining a proper equilibrium and insuring a 100 sensitive and positive action.

The gas-supply alone passes through the governor-valve. The atmospheric-air portion of the mixture comes through the passage E, which leads from the hollow pedestal 105 or stool supporting the engine-cylinder, as shown in another application filed by me, Serial No. 723,332, so that the volume of air admitted is not controlled by the governor. The amount of air flowing in is uniform, and 110 the gas-supply is varied and controlled by the governor, thus increasing or diminishing the strength of the mixture and the force of the explosion in accordance with the load on the engine and maintaining a uniform speed, 115 no matter how much the load may vary. By this means the highest efficiency is attained in the most economical manner. The air and gas mix after the gas has passed through the valve. In operation as the governor-valve 120 rises it diminishes the area of the openings and proportionately lessens the volume of the gas or motive fluid admitted. Moving in the opposite direction the area and volume are proportionately increased. Thus the amount 125 of the motive fluid supplied is regulated to a nicety in accordance with the variable requirements of the working capacity of the engine, as the governor instantly responds to the lightest or heaviest variation in speed or 130 the demand for more or less power.

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



1. In a device of the kind described, the combination of the governor-casing, the stationary valve-lining, inclosed thereby and provided with receiving and discharge ports, the governor-valve, loosely seated inside of said lining and having corresponding receiving and discharge ports, means for actuating the governor-valve in varying the area of the port-openings, the direct passage, between said valve and the engine-cylinder, and the check-valve located in and controlling said passage.

2. In a device of the kind described, the governor-casing, the lining inclosed by said casing and held in a rigid position and provided with receiving and discharge ports, the discharge-ports being located opposite each other and at right angles to the passage leading into the engine-cylinder, the spaces, between said casing and lining on the receiving and discharge sides respectively, the governor-valve, seated loosely inside of said lining and provided with receiving and discharge ports corresponding to the ports therein, the means substantially as described for actuating the governor-valve in regulating the admission of the motive agent, and the check-valve, located in and automatically controlling the passage between the governor-valve and engine-cylinder.

3. In a device of the kind described, the governor-casing, the stationary valve-lining, provided with receiving and discharge ports with corresponding spaces between said casing and lining, the double-walled governor-valve, having an annular chamber and loosely seated in place and the means described for actuating and controlling the movement of said valves in regulating the supply of gas or other motive fluid.

4. In a device of the kind described, the casing, the stationary lining, inclosed thereby, the governor-valve, loosely seated on the inside of said lining and both being provided with receiving and discharge ports so disposed that a solid wall is presented on the side adjacent to the passage leading into the engine-cylinder, and the check-valve, located in said passage and automatically controlling the flow of the motive agent therethrough.

5. In a device of the kind described, the combination of the casing, the valve-lining, provided with receiving and discharge ports, the cap, holding the lining in a stationary position, the governor-valve, seated loosely on the inside of its lining and provided with corresponding ports, means for preventing a rotary movement of said valve, and the annular space between said lining and casing on both the receiving and discharge sides.

6. In a device of the kind described, the double-walled governor-valve, having the lower end of the inner wall stop short of the

corresponding end of the outer wall and is thickened to form an annular shoulder, the vertically-reciprocating sleeve, provided with a flange engaging the shoulder on the valve, the governor-spindle, provided with a flange on which the sleeve loosely rests, the nut, having a screw-threaded engagement with the lower end of the sleeve, the ball-bearing between said valve and sleeve, and means for imparting a vertical movement to said sleeve in controlling the movement of the governor-valve.

7. In a device of the kind described, the combination with the governor-valve of its inclosing lining, provided on the lower end with an inturned flange on which the lowermost ends of said valve seats when in the lowest position and supports the same out of contact with its ball-bearing and providing space for the lubricant to reach said bearing.

8. In a device of the kind described, the combination of the casing, the stationary lining, having ports therethrough, the governor-valve having corresponding ports, the governor-spindle, the sleeve, inclosing said spindle and having both a rotary and endwise movement, and the weighted governor-arms, pivoted to said sleeve and engaging loosely with said spindle at a point above the governor-valve.

9. In a device of the kind described, the governor-valve, having double walls with an annular chamber therebetween and having receiving and discharge ports in the exterior wall only, the sleeve, inclosed by said valve and having an operative connection therewith, and the spindle, inclosed by said sleeve having both a rotary and an endwise movement thereon.

10. In a device of the kind described, the casing, having a contracted lower part, the bearing-bushing, provided with flanged ends, the governor-spindle, provided with a flange adjacent to the upper flanged end of the bushing, the bearing-collar, mounted on said spindle under the lower end of said bushing, the bearing-balls, inserted between said parts, and the adjusting screw-nuts, threaded on the lower end of said spindle.

11. In a device of the kind described, the combination of the stuffing-box gland, having an oil-chamber with an oil-passage leading therefrom, the governor-spindle, provided with an annular and vertical oil-grooves, the sleeve, inclosing said spindle, and the series of ball-bearings, lubricated from said oil-passages.

In testimony whereof I affix my signature in presence of two witnesses.

HENRIK C. STRÄNG.

Witnesses:

L. M. FREEMAN,  
L. B. COUPLAND.