

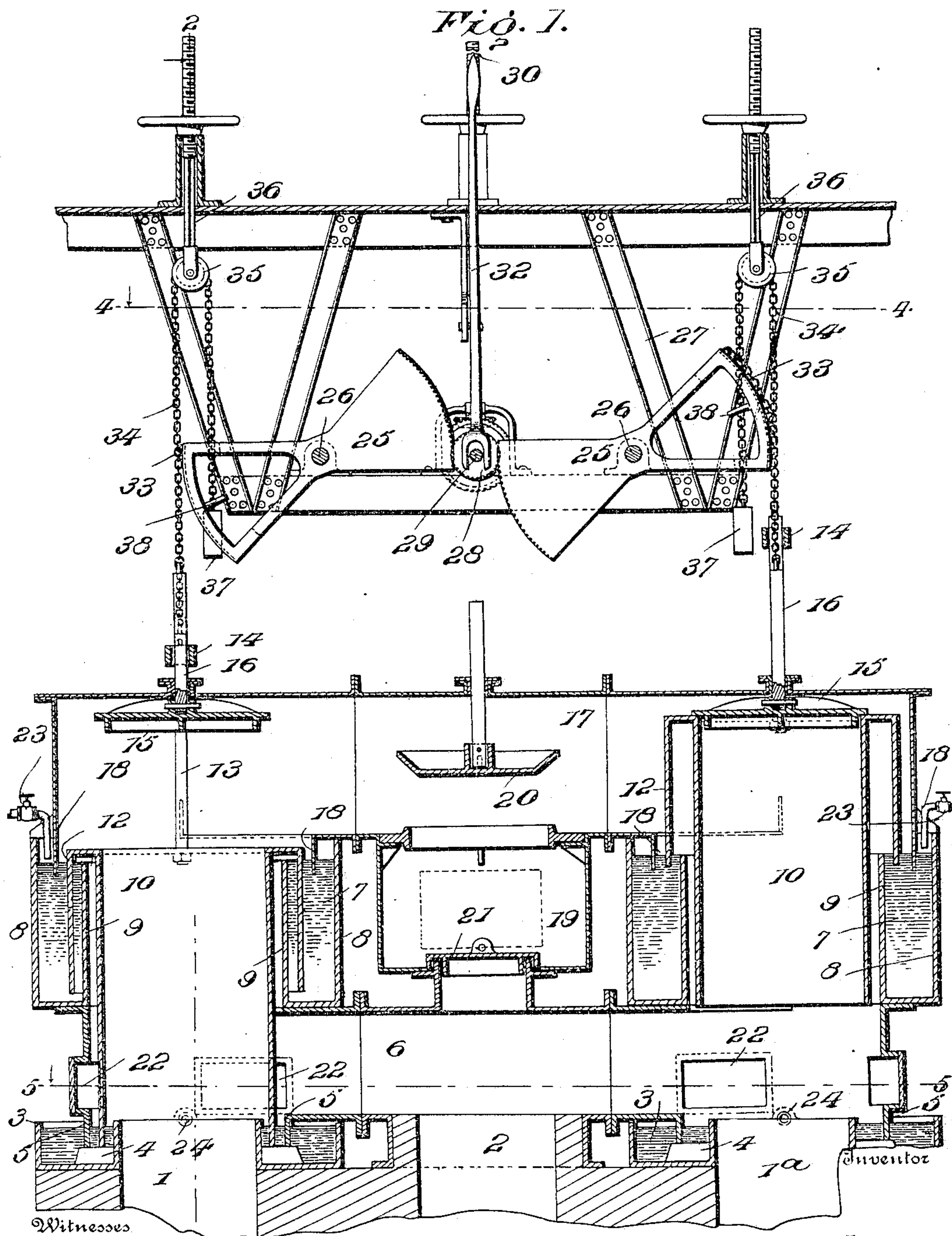
No. 787,222.

PATENTED APR. 11, 1905.

J. REULEAUX,  
REVERSING VALVE FOR REGENERATIVE FURNACES.

APPLICATION FILED MAY 19, 1904.

4 SHEETS—SHEET 1.



Witnesses

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By

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No. 787,222.

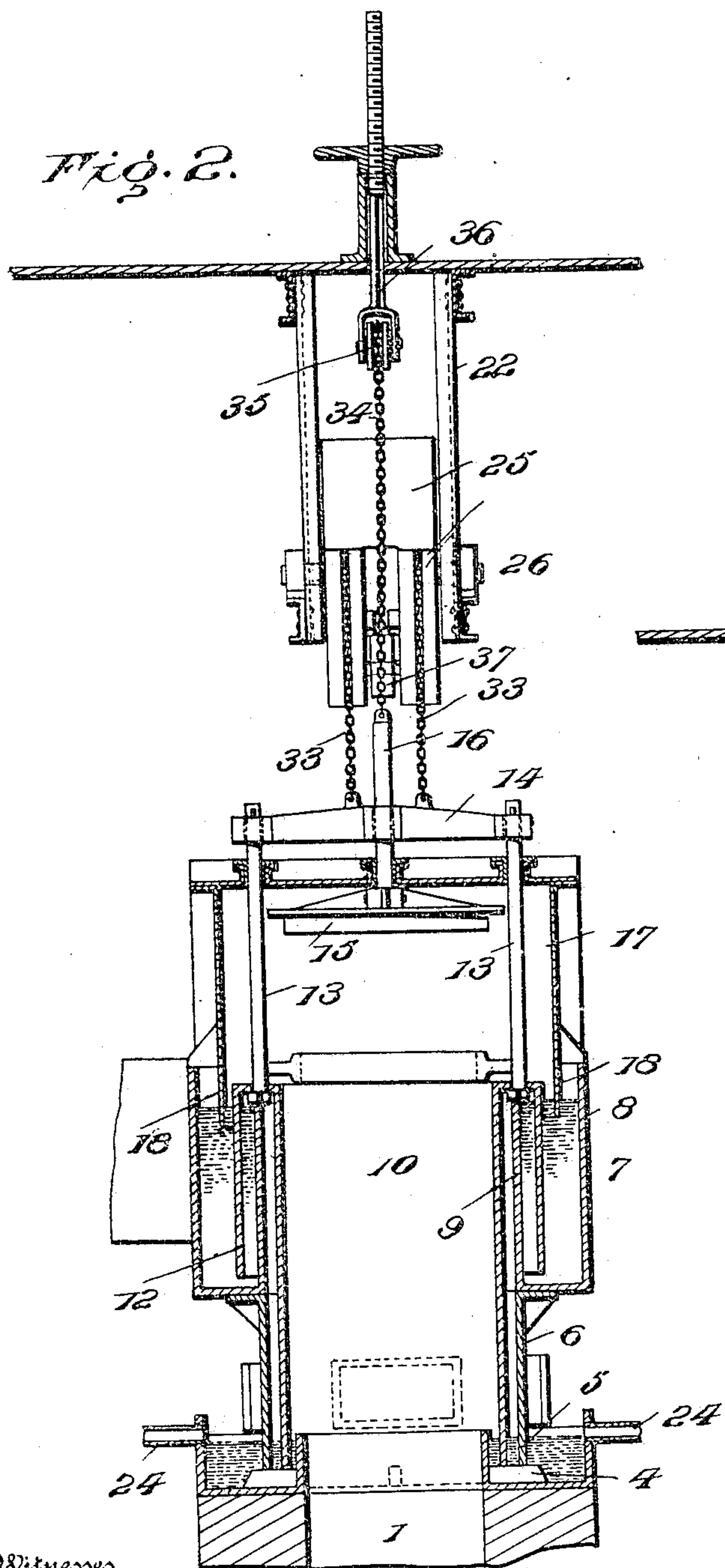
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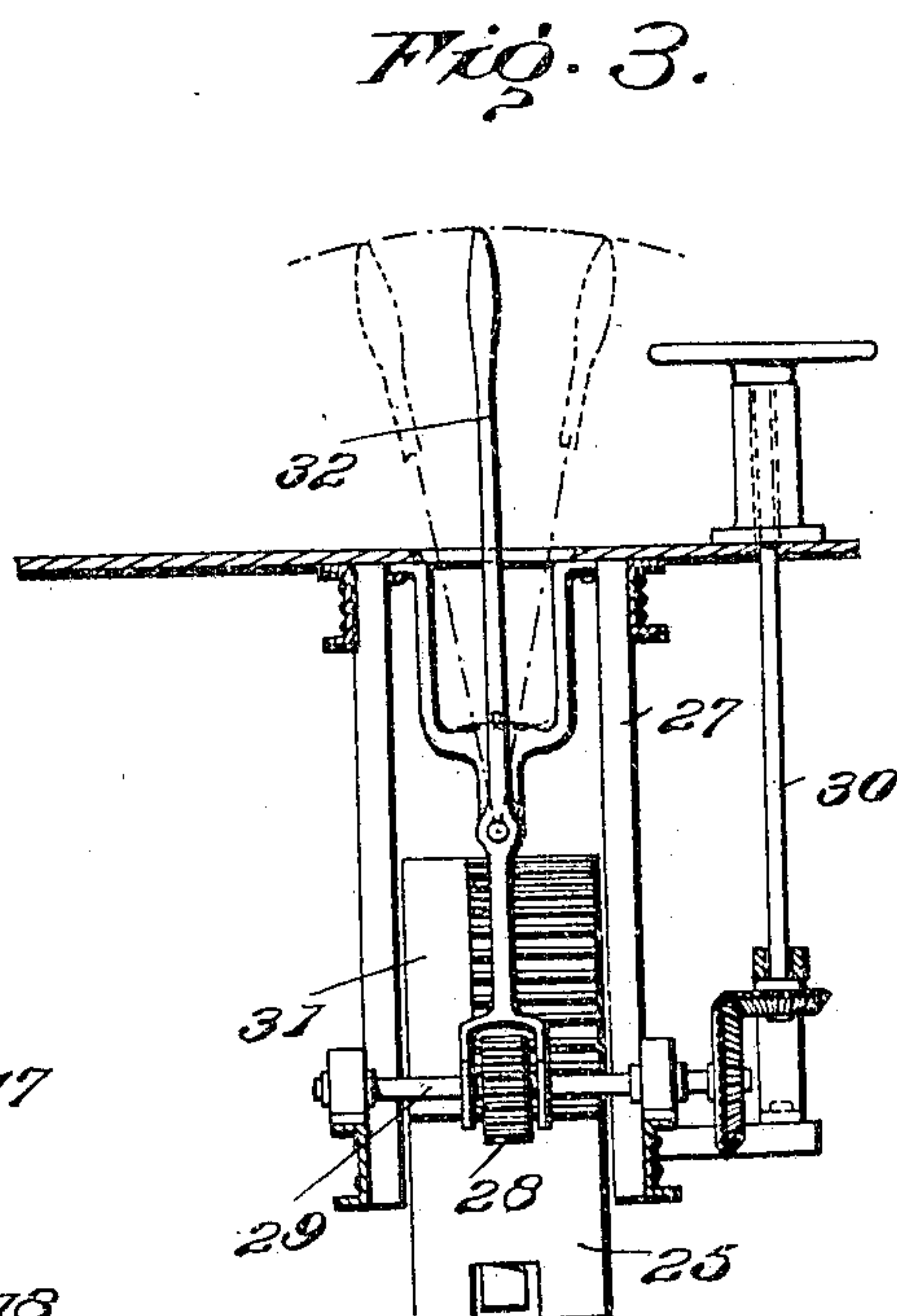
4 SHEETS—SHEET 2.



Witnesses

For Francis  
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4 SHEETS—SHEET 3.

Fig. 4.

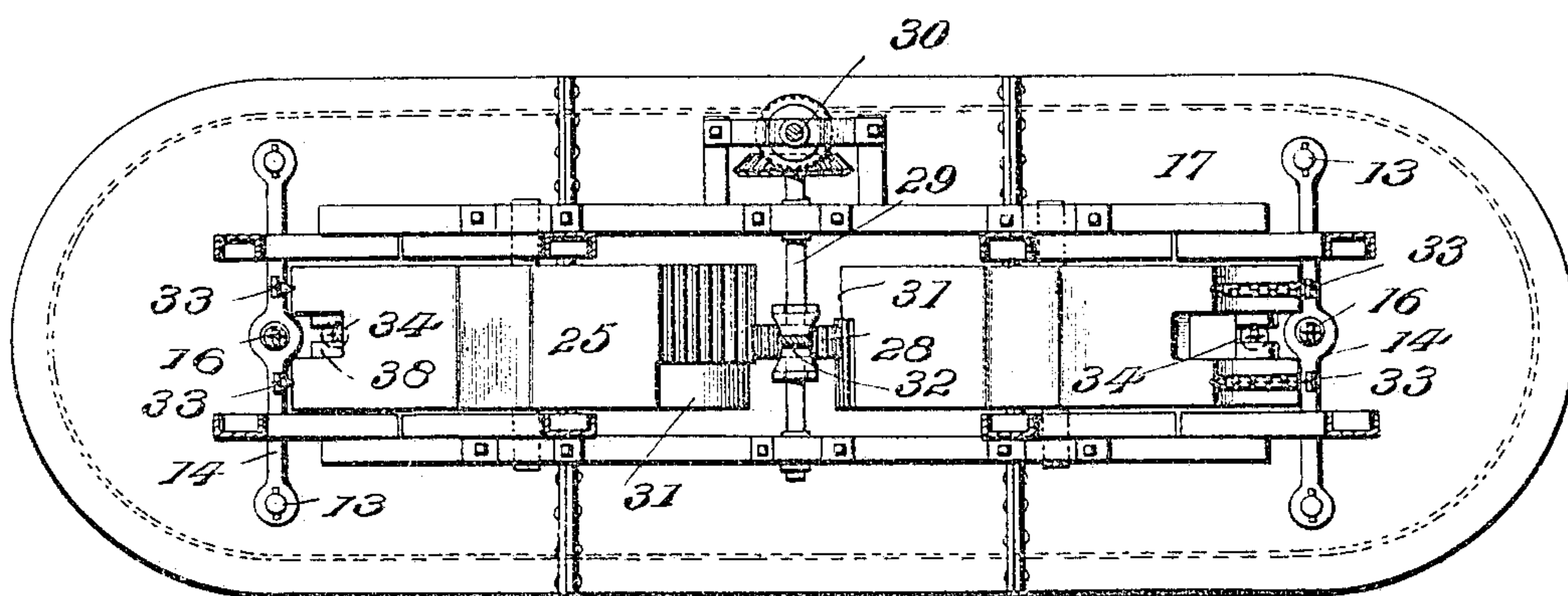
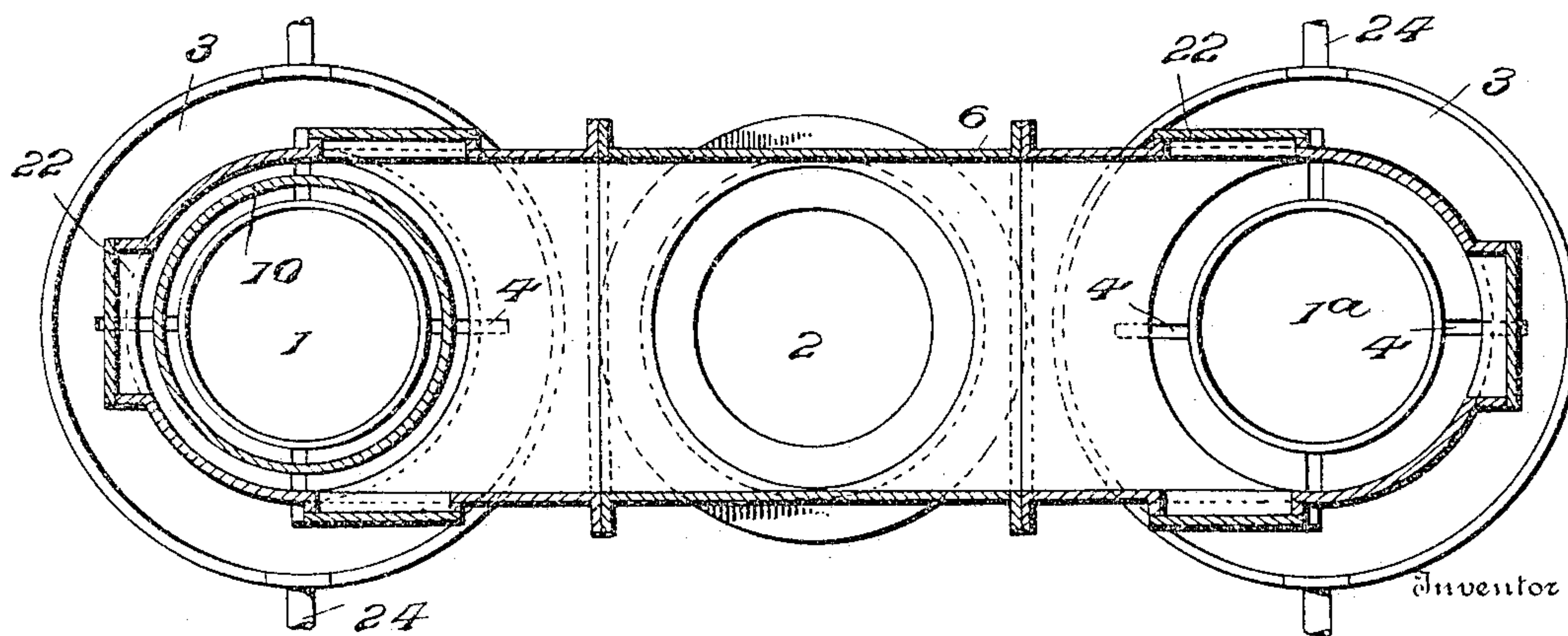


Fig. 5.



Witnesses

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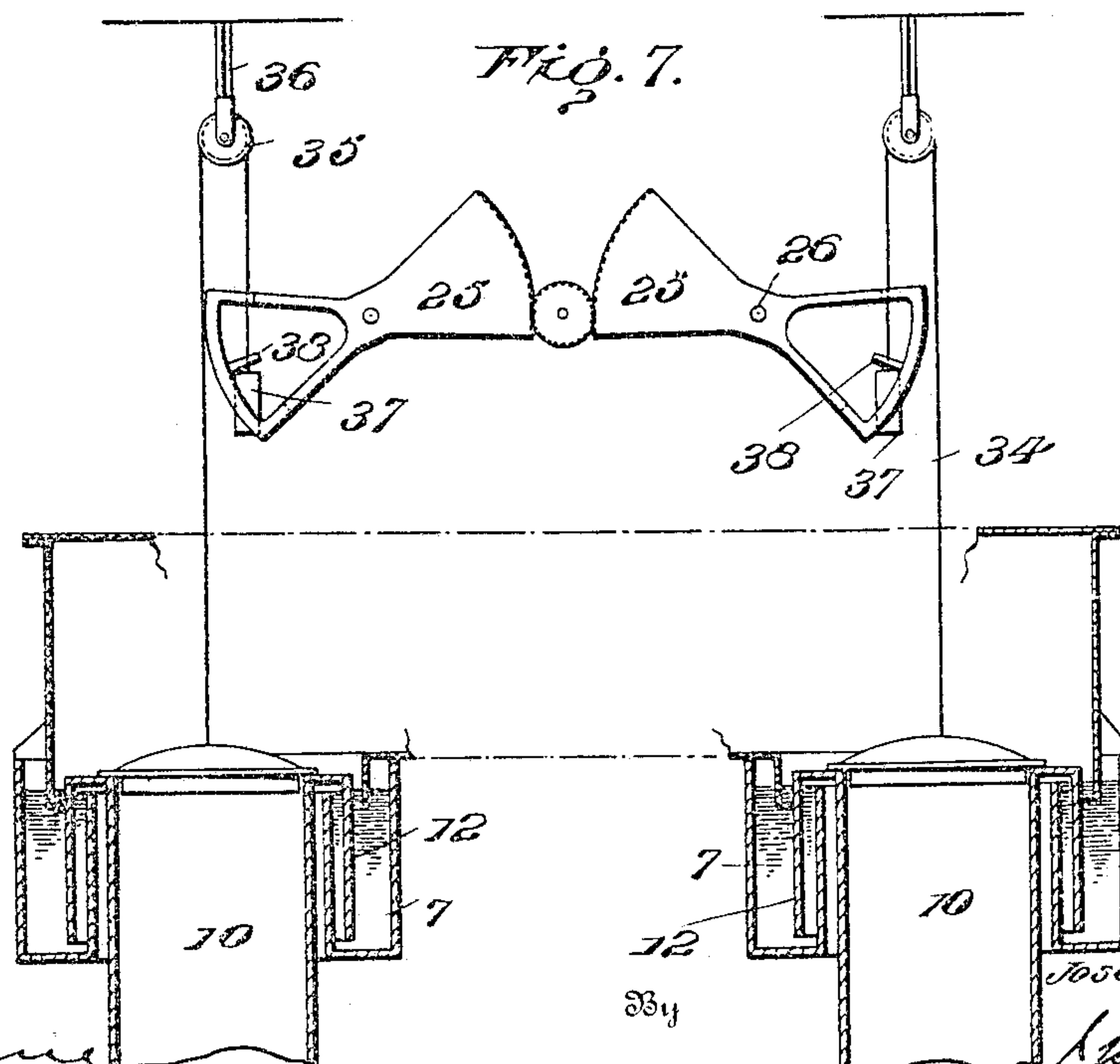
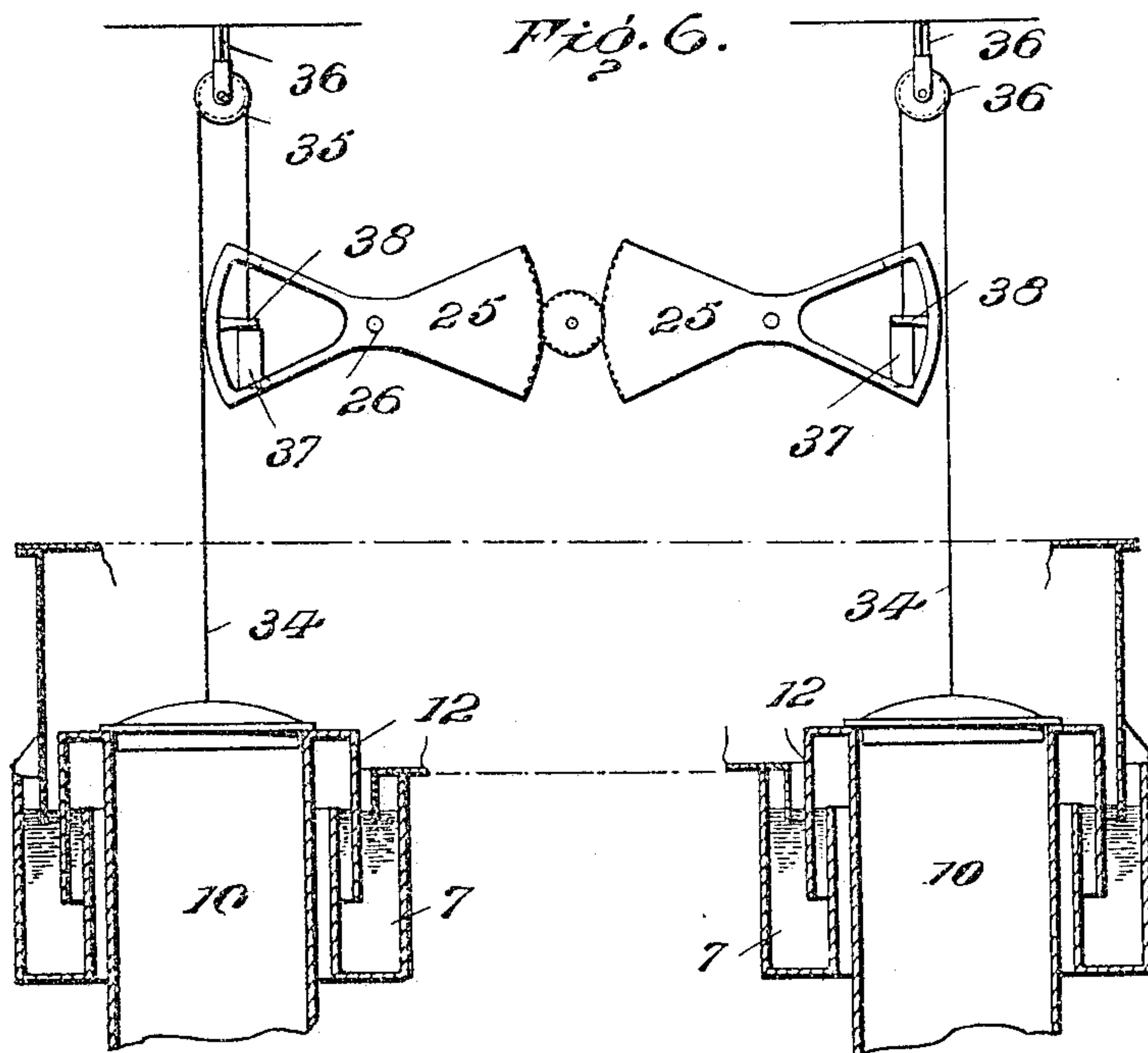
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4 SHEETS—SHEET 4.



Witnesses

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# UNITED STATES PATENT OFFICE.

JOSEF REULEAUX, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO  
ALEXANDER LAUGHLIN, OF SEWICKLEY, PENNSYLVANIA.

## REVERSING-VALVE FOR REGENERATIVE FURNACES.

SPECIFICATION forming part of Letters Patent No. 787,222, dated April 11, 1905.

Application filed May 19, 1904. Serial No. 208,790.

*To all whom it may concern:*

Be it known that I, JOSEF REULEAUX, of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Reversing-Valves for Regenerative Furnaces; 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.

The primary object of this invention is to provide in water-sealed reversing-valves capable of controlling the passage of gases from the supply-chamber to the flues of regenerative furnaces and from the latter to the chimney-flue means whereby there can be no possibility of loss of gas during the closing of one valve and the opening of another.

A further object is to so construct or arrange two such conjointly operating-valves that they will not only control the inflow of the gas, but will also regulate the outflow thereof and at the same time maintain the integrity of the seal; and a further object is to provide means for manipulating both valves conjointly or either of them separately from a common source and providing for conjoint action between the valves and their covers.

The invention will be hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view with parts broken away, showing the two valves in different extreme positions. Fig. 2 is a transverse sectional view on line 2-2, Fig. 1. Fig. 3 shows the means for shifting the actuating gear-wheel by which the rocking beams are operated. Fig. 4 is a plan view. Fig. 5 is a horizontal sectional view on line 5-5, Fig. 1. Fig. 6 is a diagrammatic view showing the two valves at the midway points of their strokes with the lids in engagement therewith. Fig. 7 is likewise a diagrammatic view showing both valves at their extreme lower seats with their lids lowered thereon.

Referring to the drawings, 1 and 1<sup>a</sup> design-

nate the regenerator-flues of reversing-furnaces, intermediate which is the chimney-flue 2. Surrounding the top of each regenerator-flue is a water-containing trough 3 of circular formation, open at the top and provided adjacent its inner wall with lugs 4. Depending into these troughs 3 and resting on the lugs 4 are the flanges 5 of an outlet-casing 6, which latter extends over and opens into the chimney-flue.

Resting on the top of casing 6 are two circular water-containing troughs 7, formed with continuous circumferential water-spaces of approximately U shape in cross-section, the outer walls 8 thereof being somewhat higher than the inner walls 9, the water-space being open at the top.

10 10 designate the two valves, which are of cylindrical formation and designed to move up and down within openings in the top of casing 6 coincident with the spaces formed by the inner walls 9 and flanges 5. Each of these valves has at its top an outer depending concentric wall 12, the space between the valve-body and wall being sufficient to accommodate the inner walls 9 of the upper seal-trough. These outer walls 12 extend downwardly about half the length of the valves, and when the latter are lowered onto the lugs 4 in the troughs 3 the lower edges of walls 12 are within a short distance of the bottoms of troughs 7, and when raised the lower edges of walls 12 will still overlap the inner walls, and hence remain within the water in the upper trough, the water being always maintained at the level of the top of this inner wall.

To each of the valves are secured hanger-rods 13, depending from a cross-beam 14. The cylindrical valves are open at both ends; but their upper ends may be closed by lids or covers 15, mounted on the lower ends of rods 16, capable of being moved independently of as well as in conjunction with the means for raising and lowering the valves. These lids are movable within an upper supply-casing 17, extending above the two valves and resting on the outer walls 8 of the water-seal troughs 7, its depending portions or



flanges 18 extending downwardly into the upper seals.

The gas is supplied to the casing 17 from a centrally-disposed compartment 19 between casings 6 and 17, its entrance being controlled by a valve 20. The opening in the bottom of this compartment in direct line above the chimney-flue is normally closed by a cap 21; but when it is desired to burn out accumulated matter this cap is removed and the gas passes directly to flue 2. The lower casing 6 is provided with door-covered openings 22 to permit of ready access thereto.

Water is supplied to troughs 7 through pipes 23, and the water rising to the tops of the inner walls 9 will overflow into troughs 3, wherein it will rise sufficiently to seal the lower ends of the valves as well as flanges 5, the surplus water passing off through overflow-pipes 24.

It will be seen that when a valve is lowered, as at the left-hand end of Fig. 1, it is sealed both at the top and bottom and that when raised to allow of the outflow of the gases it still remains sealed at its upper end, the integrity of such seal being maintained at every point of adjustment or movement of the valve. According to the illustration in Fig. 1 the gases are passing from the supply-casing 17 downwardly through the valve at the left into regenerator-flue 1, the lid 15 being raised, while the outlet-gases from the regenerator-flue 1<sup>a</sup> are passing into outlet-casing 6 and thence to the chimney-flue 2, the valve to the right being elevated. Now it is obvious that if it be desired to regulate the outflow this valve may be lowered to the desired extent, the gases continuing to flow outwardly, but in diminished quantity, as long as the lower end of the valve is not sealed. In thus lowering the valve to regulate the outflow its lid comes downwardly with it, whereas in opening up communication through the valve of flue 1 as the latter is being seated its lid after engaging therewith will be elevated. In order to reverse the operation, it is only necessary to raise the valve of flue 1 and close its top, the valve of flue 1<sup>a</sup> being at the same time lowered into the lower seal-trough while its lid is raised.

The means for raising and lowering the two valves and controlling the positions of the lids or covers thereof comprises two rocking beams 25, centrally mounted at 26 on suitable superposed framing 27. The ends of these rocking beams are curved on corresponding segments of a circle, the inner opposed ends of the two beams being toothed, so as to engage an intermediate gear-wheel 28, shiftably mounted on a shaft 29, capable of being manipulated by an upright shaft 30 or by any other suitable means. The toothed face of each rocking beam does not extend the full width of the latter—that is to say, a cut-out or toothless surface 31 is left in the

face of each beam—the two not being opposite to each other. The toothed portions, however, overlap, so that when the gear-wheel 28 is in its central position it will mesh simultaneously with both rocking beams, but when shifted to either side of the center it will mesh with but a single beam. This shifting of the gear-wheel is controlled by a lever 32, bifurcated at its lower end to span the wheel. In this way provision is made for controlling both rocking beams simultaneously from a common source or either of them independently. To the upper outer end of each rocking beam are secured the ends of chains 33, from which the cross-beam 14 is suspended. The rods 16 are suspended from chains 34, which pass over pulleys 35, mounted in vertically-adjustable brackets 36. To the free ends of chains 34 are secured weights 37, which serve to hold the chains 34 taut and to prevent any lateral swing or displacement thereof. These weights acting as stops serve the further purpose of enabling the lids to be raised and lowered by the movements of the beams. For this purpose the latter are formed with dogs 38, which upon engaging with weights 37 will effect the elevation of the lids. The weight of each lid itself being in excess of that of its weight 37, as a rocking beam is turned so as to move its dog out of engagement with a weight 37 the lid to which latter is connected will move downwardly. At the same time the valve to which such lid belongs is being raised. Consequently the lid and the valve will meet when the latter is about midway of the extent of its upward stroke. At this time both the cylindrical valves are closed by the lids. (See Fig. 6.) In the further elevation of the valve whose lid has just engaged therewith the lid will naturally move upwardly along with the valve and at the same time the lid of the other valve, having reached the midway point, is lifted to its highest point by reason of the dog of the rocking beam contacting with its weight, its respective valve being lowered.

When it is desired to cut off the two flues from communication with the chimney-flue, the valve already seated is allowed to remain so, and the respective bracket 36 is adjusted so as to allow the lid 16 of such valve to lower onto the latter. The operator then throws the lever 32 so that gear-wheel 28 will engage with the toothed portion of but one rocking beam. Thereupon the latter is turned so as to effect the lowering of its respective valve, and at the same time or subsequently the bracket 36 in line with the lid thereof is adjusted to permit such lid to lower onto its valve. In this way I am enabled to readily cut off all communication with the chimney-flue and avoid all loss of heat through the chimney when the furnace is out of operation, as occurs when repairs are necessary or the furnace is temporarily thrown out of op-



eration. By a proper adjustment of the brackets 36 neither lid will open just as the lid of the other valve is closing, such opening following shortly thereafter, so that for a short time the lids of both valves may be closed. It will be noted that the gear-wheel 28 serves to lock the two beams in all positions.

It will be observed that by means of the two valves communication may be established between the supply-casing and either of the regenerative flues and between the other flue and the chimney-flue, that the walls 12 being always submerged the seal between the supply-casing and the valves is constant that the outflow from a regenerative flue may be readily controlled without affecting the seal between the valve thereof and the supply-casing, that the valves and their closing-lids may be operated synchronously or independently, and that likewise the two valves may be moved in unison or one independently of the other. It will also be noted that the flanges 18 of the supply-casing are submerged by the water in the upper trough, while the flanges 5 of the lower or outlet casing are submerged by the water in the lower trough.

I claim as my invention—

1. In a reversing-valve, in combination, an upper supply-casing, a lower outlet-casing, upper and lower seal-troughs for such casings, two cylindrical valves working in said seal-troughs and through which the gases pass from the supply-casing to a regenerative flue or which permit the gases to pass from one regenerative flue to the outlet-casing, means for moving the valves lengthwise, and means for maintaining the integrity of one seal of each valve during the movements of the valves.

2. In a reversing-valve, in combination, an upper supply-casing, a lower outlet-casing, upper and lower troughs, two cylindrical valves working in said troughs and through which the gases pass from the supply-casing to a regenerative flue or which permit the gases to pass from one regenerative flue to the outlet-casing, means for moving the valves lengthwise, said upper casing having sealing-flanges extending into said upper troughs, and means for constantly maintaining the integrity of one seal of each valve during the movements of the valves.

3. In a reversing-valve, in combination, an upper supply-casing, a lower outlet-casing, upper and lower seals for such casings, two cylindrical valves through which the gases pass, said valves working at their lower ends in said lower seals and having at their upper ends outer depending portions extended into the upper seals to an extent greater than the range of movements of the valves, and means for moving the latter lengthwise, the gases passing through said valves from

the supply-casing to a regenerative flue or from one flue to the outlet-casing.

4. In a reversing-valve, in combination, an upper supply-casing, a lower outlet-casing, upper and lower seals, two cylindrical valves through which the gases pass, movable covers for said valves located within said supply-casing, means for moving the valves lengthwise, and means carried by the valves for maintaining constant the upper seals thereof at all stages of movement.

5. In a reversing-valve, in combination, a water-trough, a side outlet above the latter, a cylindrical valve over the trough, means for moving the valve lengthwise, an upper supply-casing, a cover for said valve located within said supply-casing, means for moving the cover, and a constant water seal for the valve intermediate the supply-casing and the side outlet.

6. In a reversing-valve, in combination, a lower seal-trough, a casing having depending flanges extending into said seal-trough, a cylindrical valve extended through said casing and working in said seal-trough, an upper seal-trough, a wall concentric with and depending from said valve into said upper seal-trough a distance greater than the movement of the valve, and means for moving the valve lengthwise.

7. In a reversing-valve, in combination, upper and lower water-seal troughs, an intermediate casing having a flange depending into the lower seal-trough and upon which the upper seal-trough is mounted, a cylindrical valve designed to work in said lower seal-trough and having a concentric portion depending into said upper seal-trough a distance greater than the range of movement of the valve, and means for moving the latter.

8. In a reversing-valve, in combination, upper and lower troughs forming water seals, the depth of the former being considerably greater than that of the latter, a cylindrical valve having an outer concentric wall depending into said upper seal-trough, and means for moving the valve, said wall extending into said upper seal-trough during all stages of movement of the valve.

9. In a reversing-valve, in combination, a trough adjacent to a regenerative flue, a casing forming a side outlet from such flue, a valve movable vertically into and out of said trough and having an external water seal in all positions.

10. In a reversing-valve, in combination, upper and lower casings, an intermediate supply-compartment opening into said upper casing, a valve therefor, two cylindrical valves, lids therefor within said upper casing, means for moving the valves lengthwise, and means for actuating the lids, said lids being movable with and independent of the cylindrical valves.

11. In a reversing-valve, upper and lower



casings, an intermediate supply-compartment opening into said upper casing, a valve therefor, two cylindrical valves, lids therefor within said upper casing, means for moving  
5 the valves lengthwise, and means for actuating the lids, said lids being movable with and independent of the cylindrical valves.

12. In a reversing-valve, upper and lower casings, an intermediate supply-compartment opening into said upper casing, a valve  
10 for controlling such opening, an opening in the bottom of said compartment in line with the chimney-flue, and a cover therefor.

13. In a reversing-valve, in combination,  
15 a lower outlet-casing common to two regenerator-flues and to the chimney-flue, an upper supply-casing, two cylindrical valves for the two regenerator-flues and through which the gases pass, upper and lower seals  
20 for such valves, lids therefor within said supply-casing, and means for moving either valve and its lid to any desired extent to regulate the outflow of the gases, one seal of such valve being constant.

25 14. In a reversing-valve, in combination, upper and lower water-seal troughs, an upper casing having a depending portion extending into the upper water-seal trough, a cylindrical valve working in said troughs  
30 and through which the gases pass, a lid for said valve within said casing, means for moving the valve and lid, and means for moving the lid independently of the valve.

15. In a reversing-valve, in combination, a  
35 vertically-movable cylindrical valve through which the gases pass, a lid for said valve, and means connected to the valve and its lid for moving them in unison and allowing one to move free of the other.

40 16. In a reversing-valve, in combination, a vertically-movable cylindrical valve through which the gases pass, a lid for said valve, means connected to the valve, and means connected to the lid for effecting the raising  
45 and lowering thereof, the lid moving but a portion of the stroke of the valve and in part while in engagement therewith.

17. The combination with a vertically-movable cylindrical valve through which the  
50 gases pass, chains connected to such valve for effecting the raising and lowering thereof, a lid for such valve, a chain connected thereto, means to which the chains of the valve

are secured for effecting the raising and lowering thereof, and means carried by such latter means for engaging the chain of the lid for controlling the position of the latter relative to the valve.

18. In a reversing-valve, in combination, two cylindrical valves through which the  
6 gases pass, lids therefor, two rocking beams from which the valves are suspended, means carried by such beams for effecting the raising and lowering of said lids simultaneously  
6 with the movements of the valves, and means engaging the two beams for moving them simultaneously or one independently of the other.

19. In a reversing-valve, in combination with the two valves, the rocking beams from  
7 which the valves are suspended, such beams having opposite toothed portions and smooth segmental portions, such smooth portions of the two beams being out of line with each  
7 other, a gear-wheel engaging said toothed portions, and means for shifting such gear-wheel into line with the smooth portion of one beam while it remains in gear with the other beam.

20. The combination with the two valves, 8 the rocking beams for raising and lowering the valves, and means for actuating the beams simultaneously or independently, of the lids for such valves, chains connected to  
8 such lids, and means carried by such beams for acting on said chains to effect the raising of the lids, pulleys over which such chains are passed, and means for raising and lowering the pulleys to regulate the extent of the  
9 movements of the lids.

21. The combination with a valve, of a rocking beam for raising and lowering the  
9 same, a lid for the valve, a chain connected to such lid, a pulley for such chain, an adjustable support for such pulley, means for  
9 actuating the rocking beam, and a dog carried by the latter for engaging the chain to effect the movement of the lid.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOSEF REULEAUX.

Witnesses:

J. NOTA MCGILL,  
FRANCIS S. MAGUIRE.