

No. 854,795.

PATENTED MAY 28, 1907.

R. C. BROMLEY.  
ELEVATOR VALVE MECHANISM.  
APPLICATION FILED SEPT. 19, 1905.

4 SHEETS—SHEET 1.

Fig. 1.

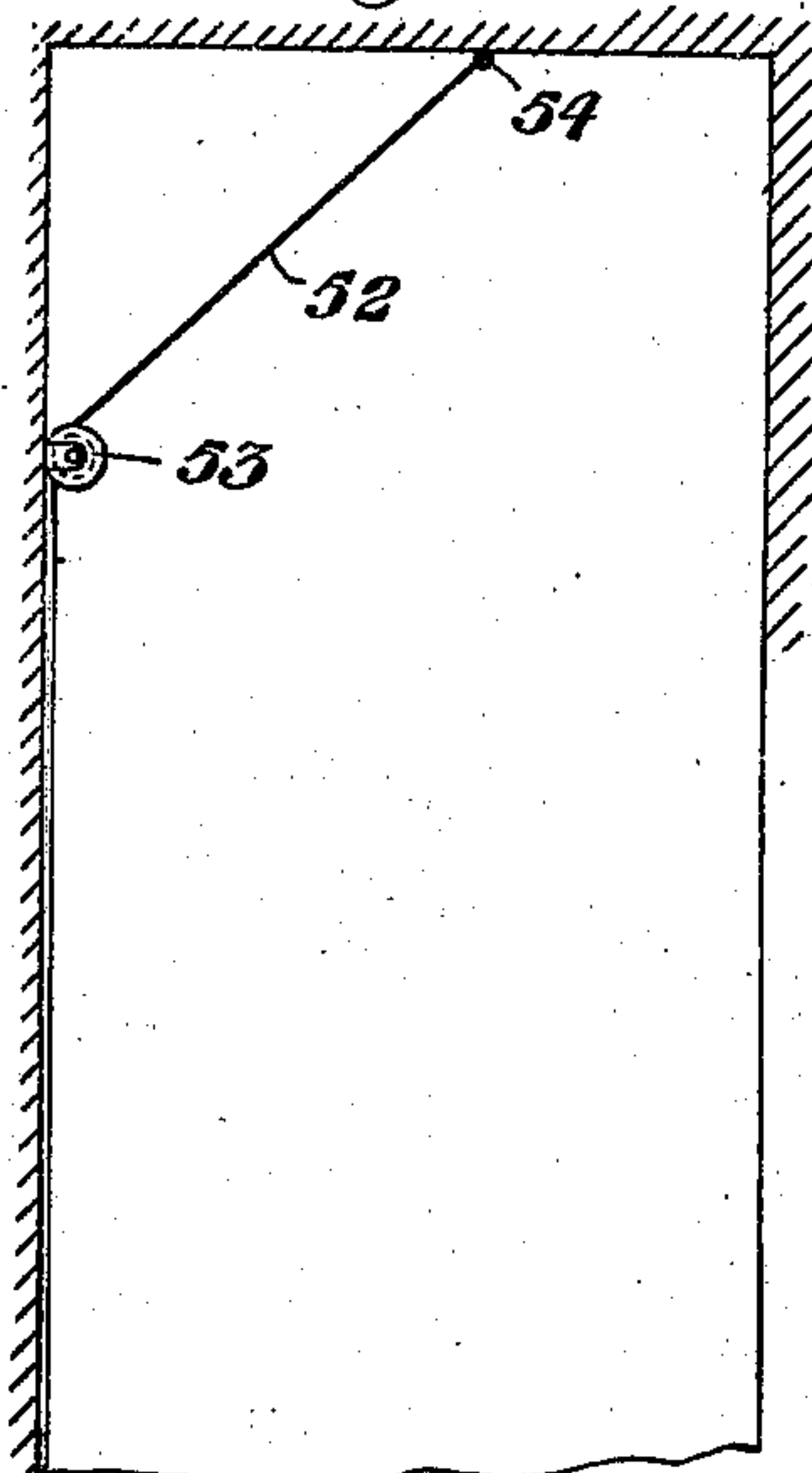


Fig. 2.

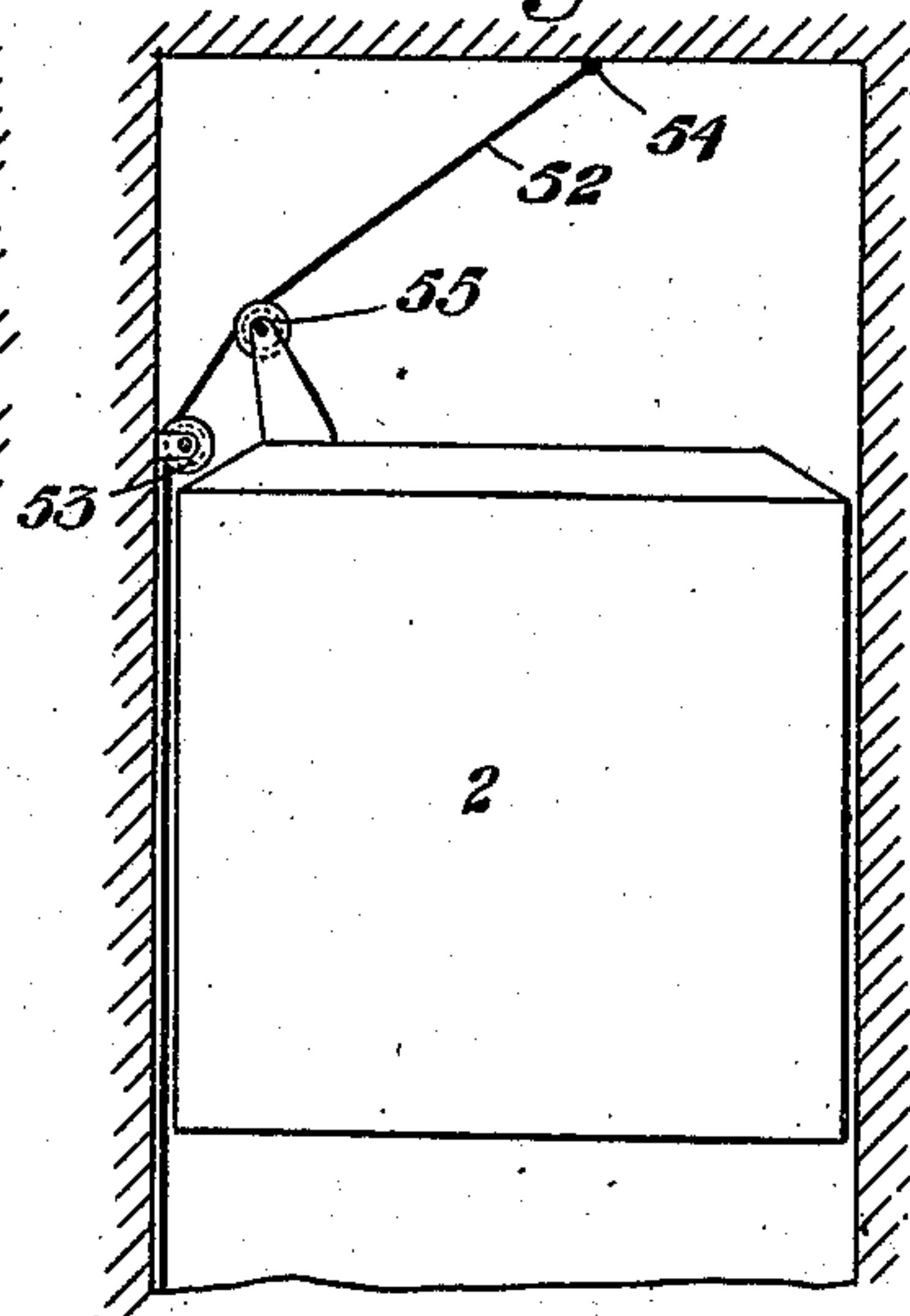


Fig. 4.

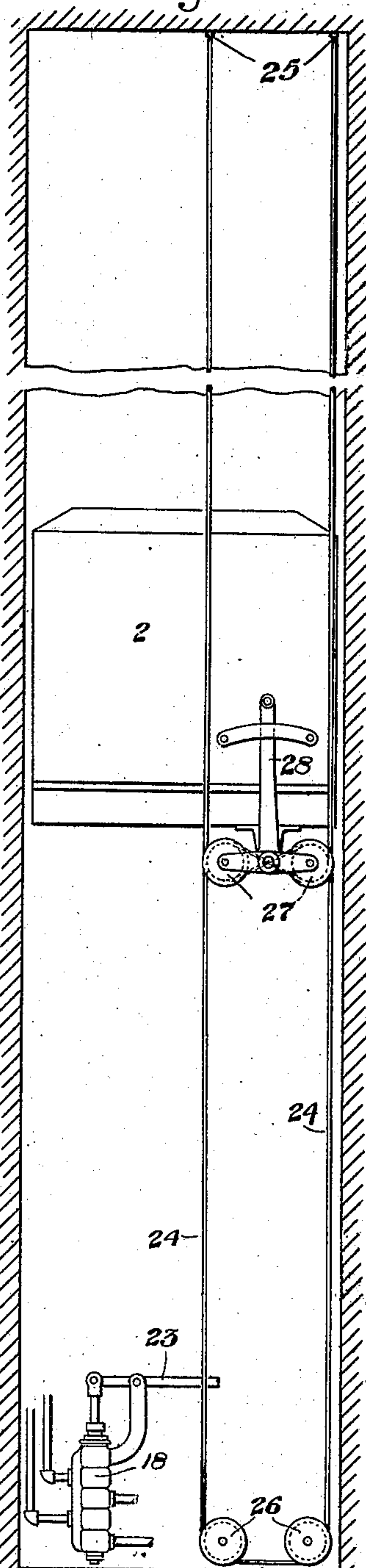
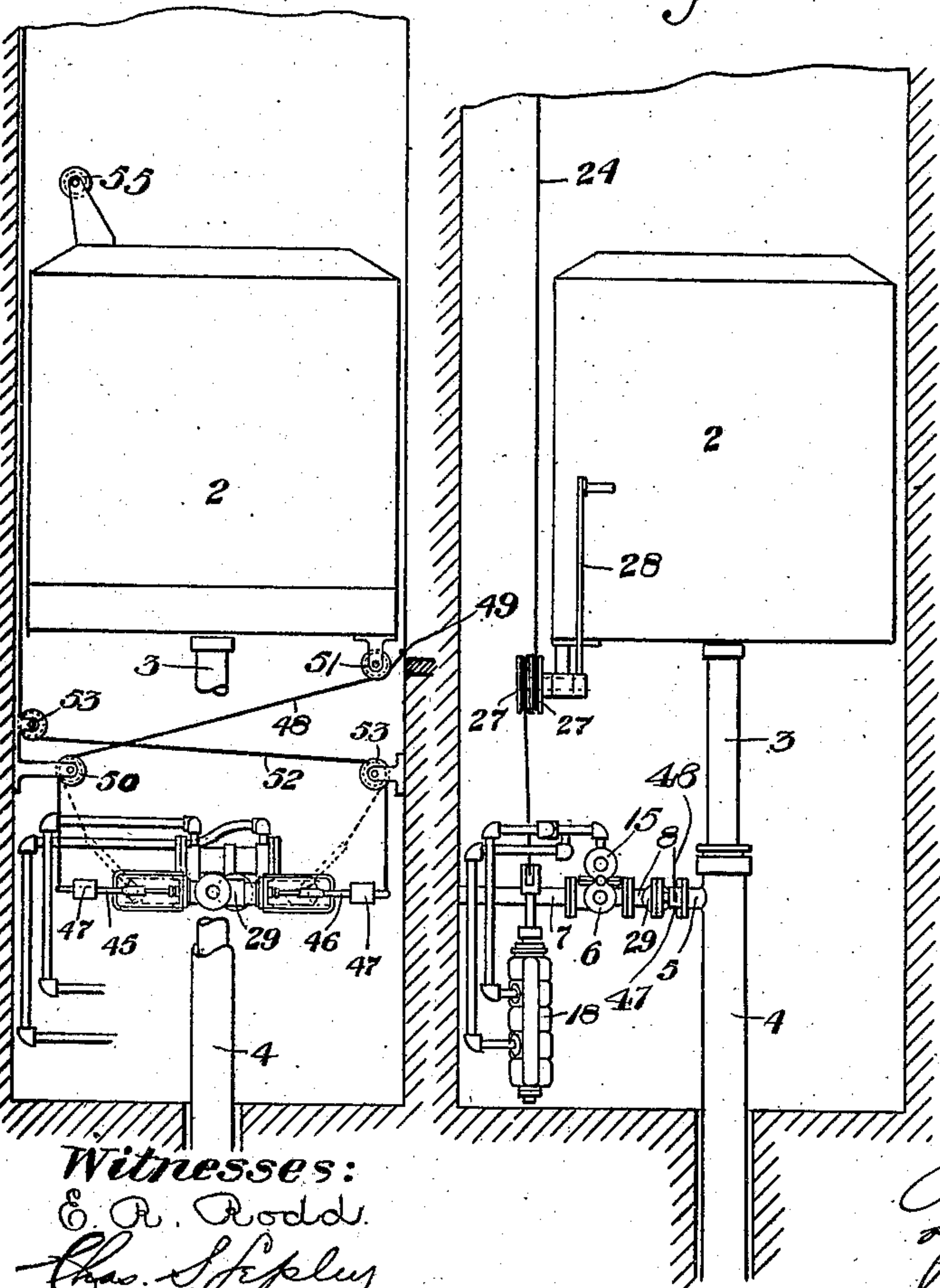


Fig. 3.



Witnesses:  
E. R. Rodd.  
Chas. S. Spley

Inventor:  
Robert C. Bromley  
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his attorney

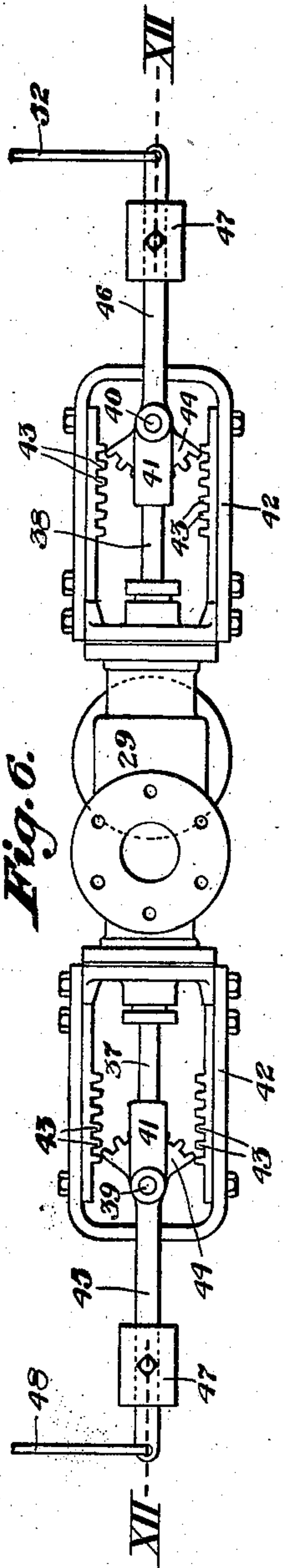
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4 SHEETS—SHEET 2.



*Fig. 6.*

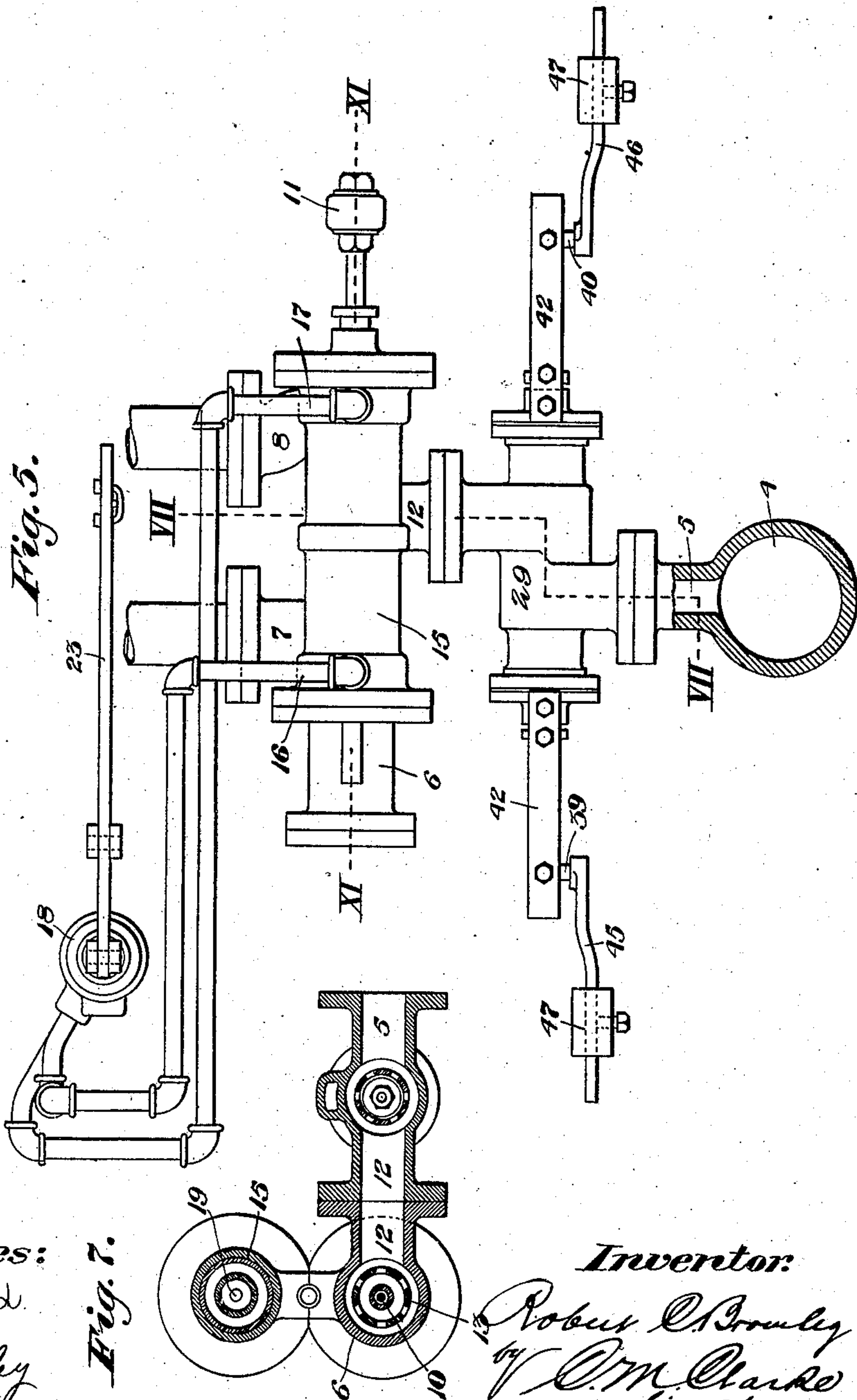


Fig. 5.

Fig. 2.

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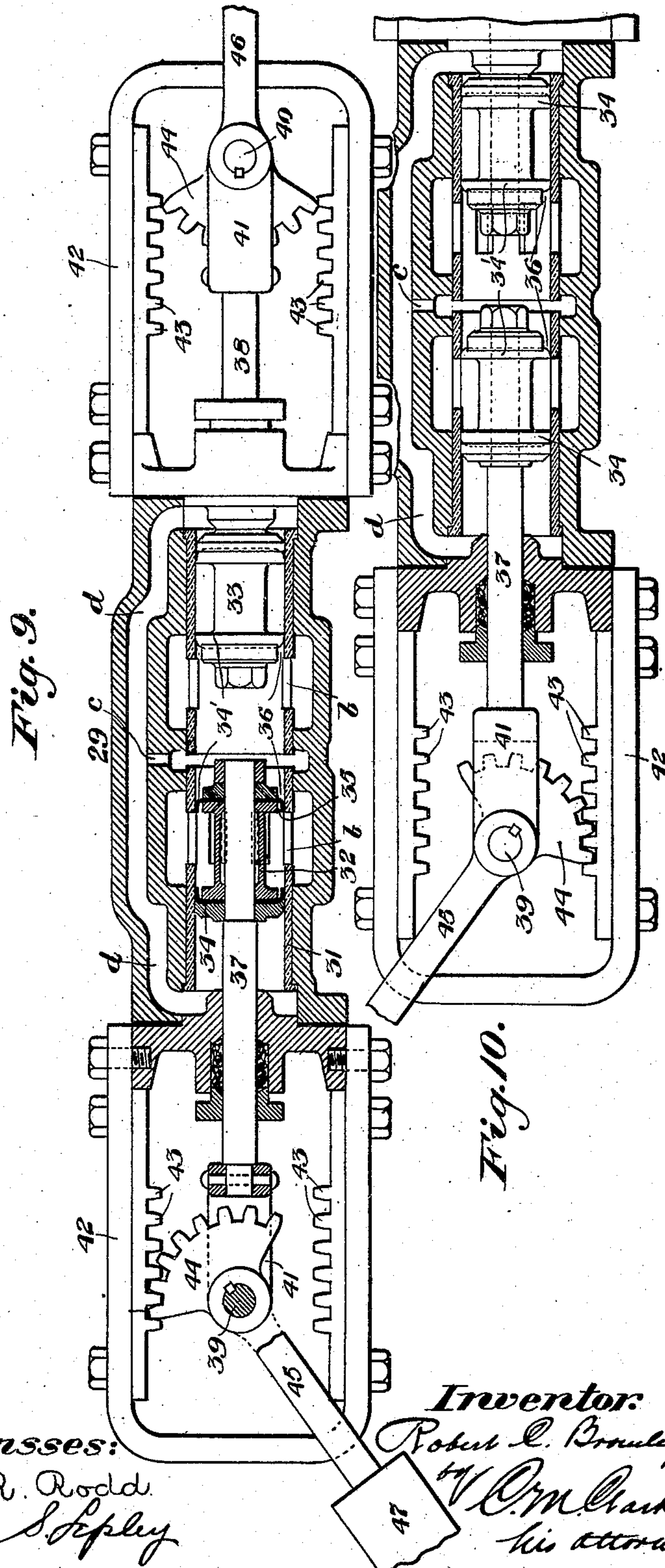
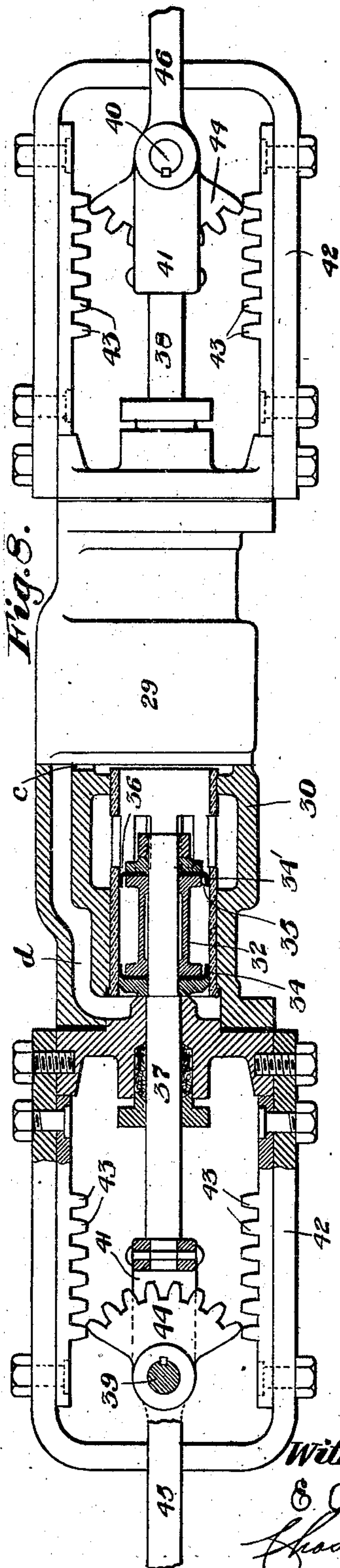
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

Fig. 11.

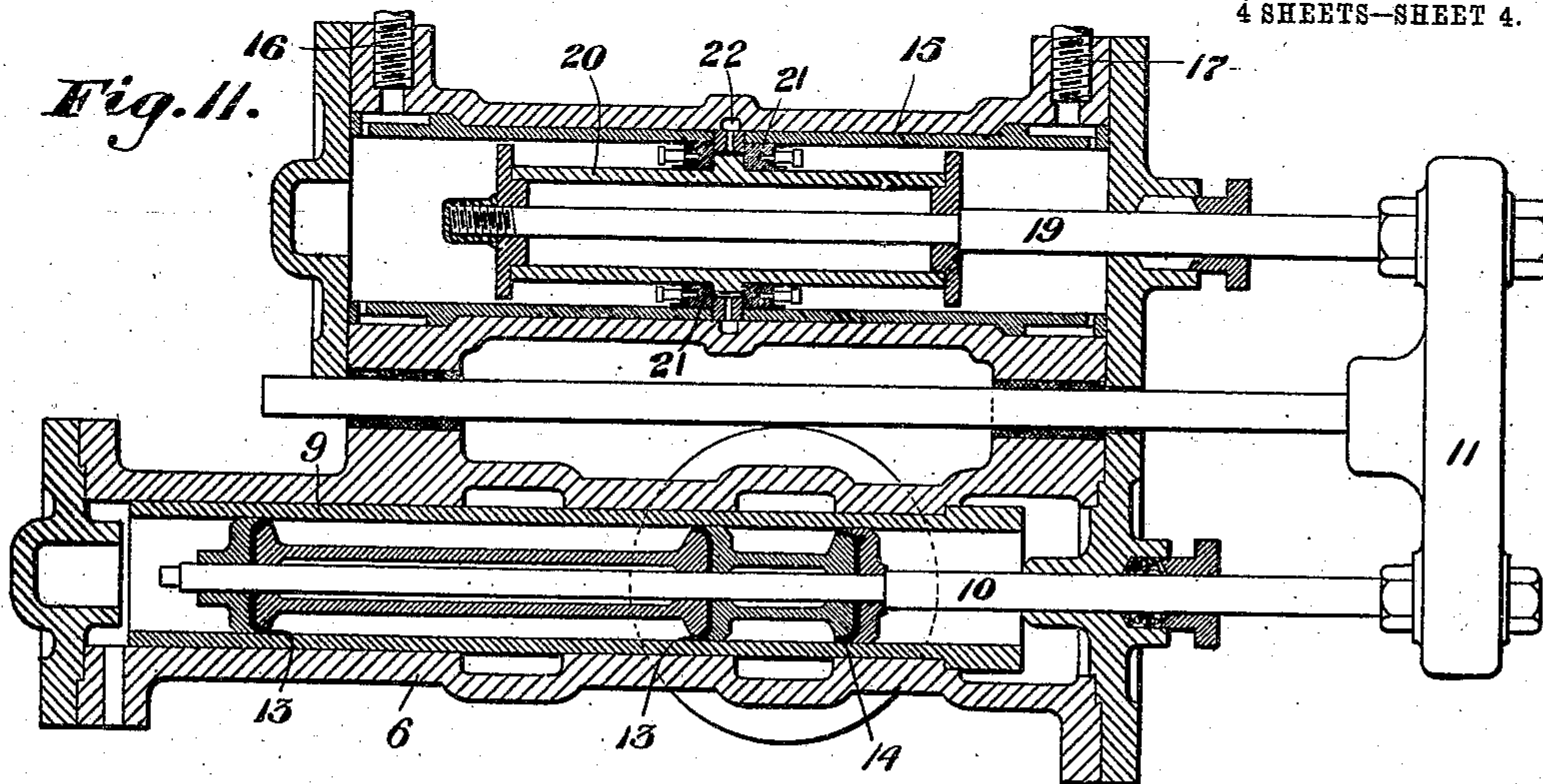


Fig. 12.

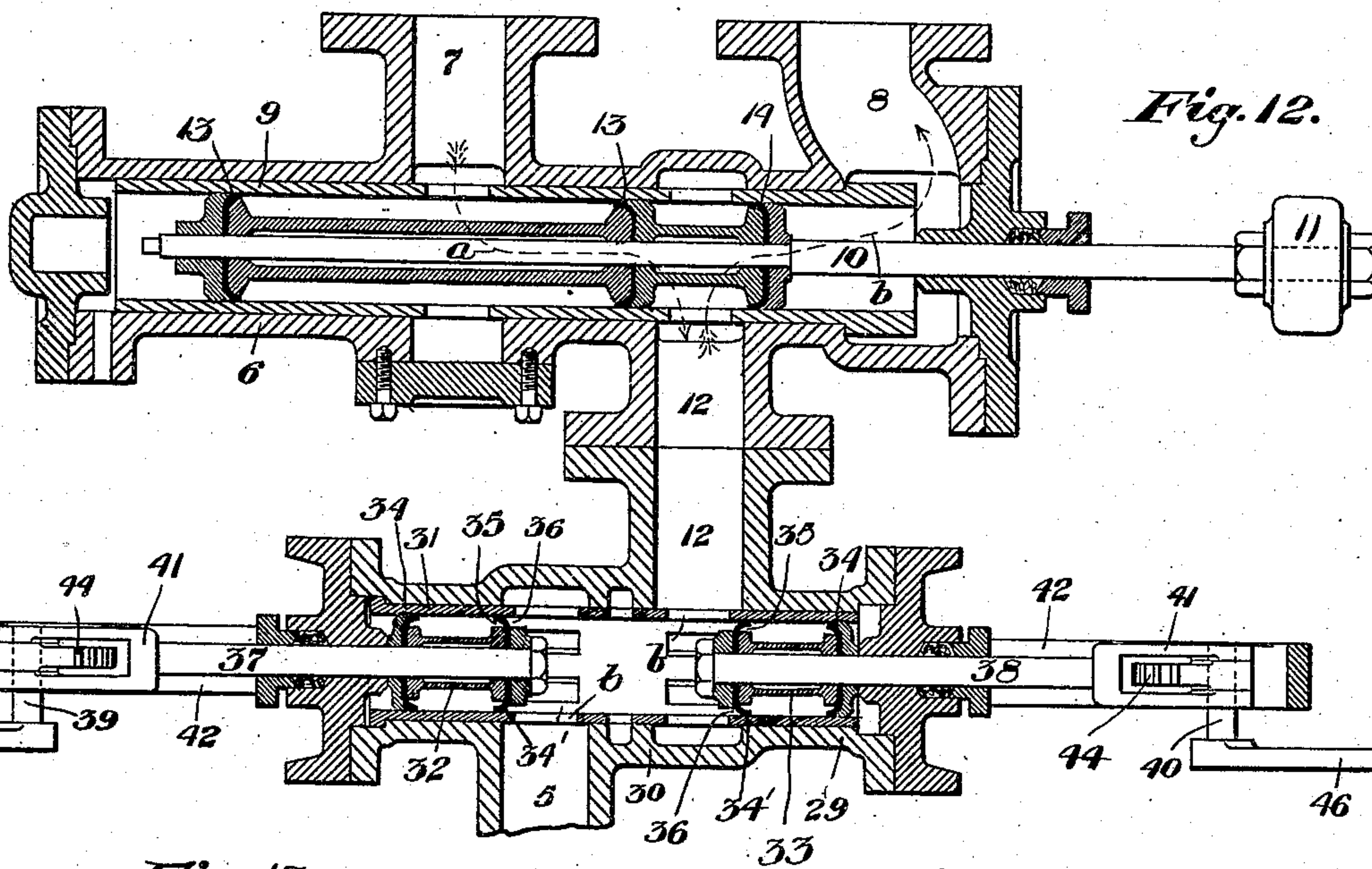


Fig. 13.

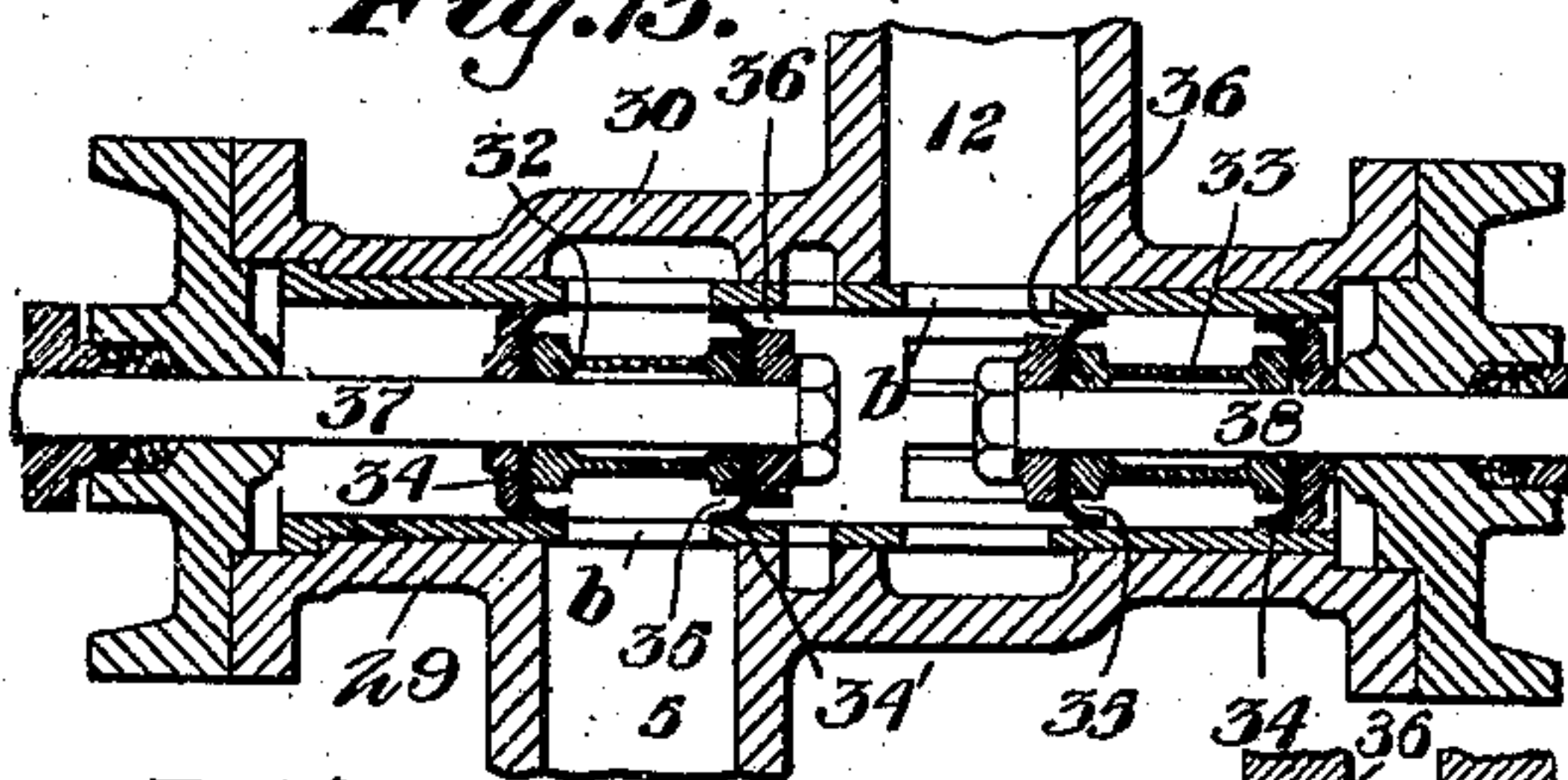
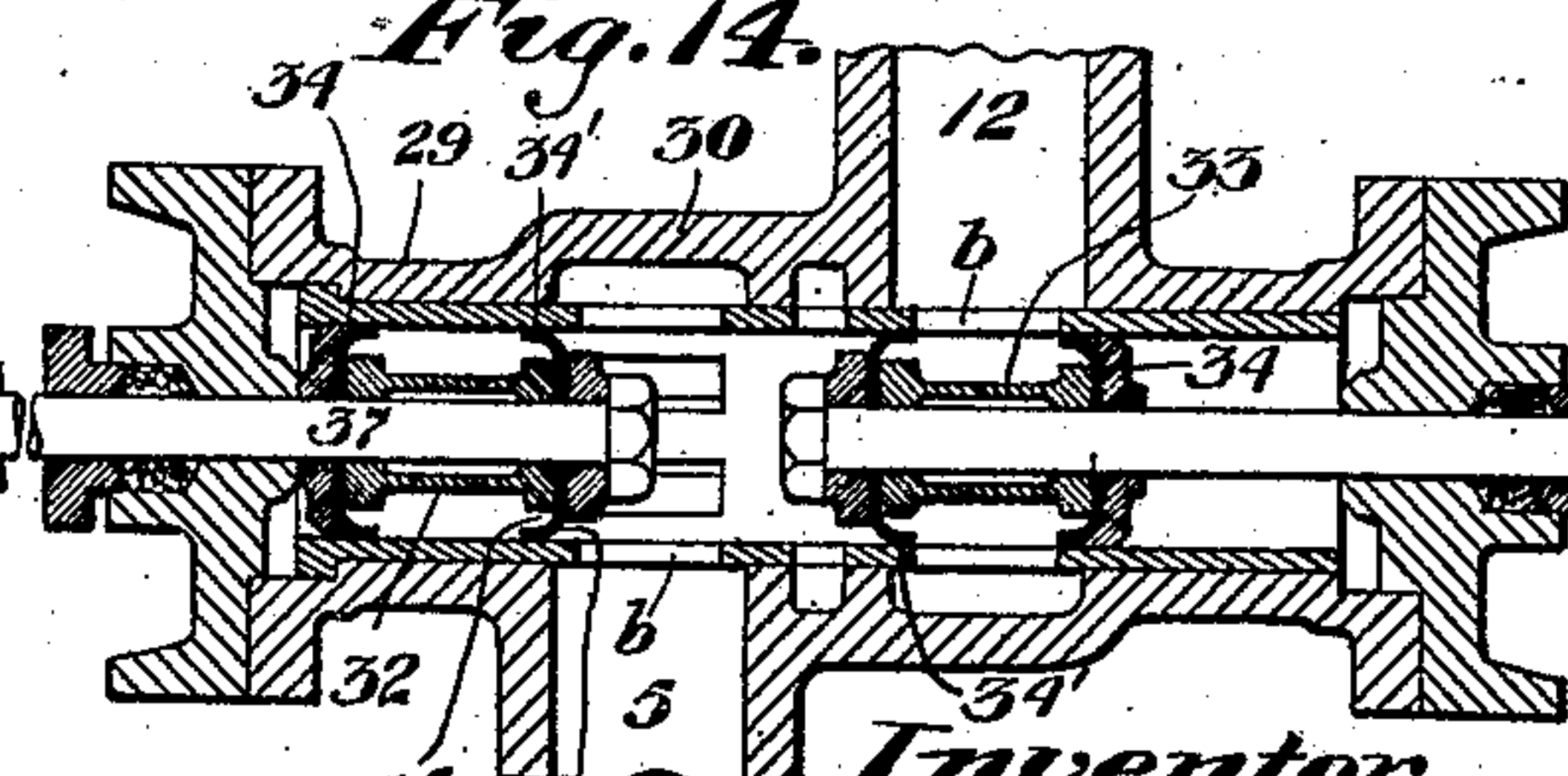
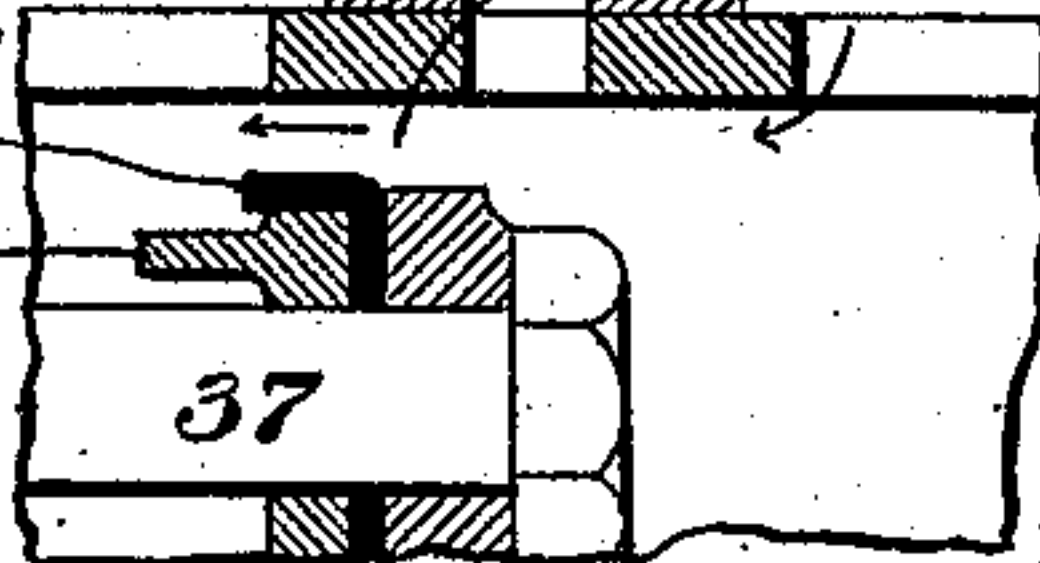


Fig. 14.



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# UNITED STATES PATENT OFFICE.

ROBERT C. BROMLEY, OF PITTSBURG, PENNSYLVANIA.

## ELEVATOR VALVE MECHANISM.

No. 854,795.

Specification of Letters Patent.

Patented May 28, 1907.

Application filed September 19, 1905. Serial No. 279,095.

*To all whom it may concern:*

Be it known that I, ROBERT C. BROMLEY, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Elevator Valve Mechanism, of which the following is a specification, reference being had therein to the accompanying drawing, forming part of the specification, in which—

Figure 1. is a longitudinal vertical section showing an elevator shaft and car located therein, provided with my improved mechanism. Fig. 2. is a partial similar view showing the elevator car at the upper end of the shaft and in contact with one of the automatic operating cables, acting to shut off pressure to the cylinder. Fig. 3. is a similar view at right angles to Fig. 1 showing the connections from the pilot valve. Fig. 4. is a view similar to Fig. 1 from the opposite side. Fig. 5. is a general plan view of the complete operating mechanism assembled. Fig. 6. is a view in front elevation of the automatically operating terminal stop valve, disconnected from the plunger cylinder. Fig. 7. is a cross section on the line VII. VII. of Fig. 5. Figs. 8 and 9 are enlarged detail views, partly in section, of said valve. Fig. 10. is a partial similar view. Fig. 11. is a vertical longitudinal section on the line XI. XI. of Fig. 5. Fig. 12. is a horizontal sectional view on the line XII. XII. of Fig. 6, showing the circulation through the valve controlled ports. Fig. 13. is a partial similar sectional view of a portion of the automatic terminal stop valve, showing the valve set to close the exhaust from the cylinder. Fig. 14. is a similar view showing the other valve set to close pressure to the cylinder. Fig. 15. is a partial similar view showing the circulation past the cup leather due to the clearance.

My invention refers to improvements in the controlling mechanism for hydraulic elevators and is designed for the purpose of automatically preventing the rise or fall of the elevator car above or below a certain predetermined point, as for instance the uppermost and lowermost floors of the building; also to means whereby the pressure to the elevator cylinder and the release therefrom will be automatically cut off in case of breakage of the connections for operating the automatic shut-off mechanism; also to means whereby the elevator may be moved upwardly or downwardly to the next floor not-

withstanding the automatic shut-off of pressure to the cylinder or exhaust therefrom; and to various other features of improvement as shall be more fully hereinafter set forth.

Referring now to the drawings, 2 represents an elevator car mounted within the usual shaft upon a supporting plunger 3 located in a cylinder 4 provided with a supply and exhaust connection 5, by which fluid under pressure is admitted to the cylinder to raise the plunger and elevator, and through which, on lowering of the elevator, the fluid may escape through the waste pipe.

6 represents the controlling valve by which, through connection 7, pressure is admitted from the supply, and from which through connection 8 exhaust is discharged to the waste, both of said connections opening into the interior of the valve 6 which is preferably lined with a brass barrel 9 having suitable ports or openings registering with the inlet and outlet openings respectively.

Within the interior cavity of valve 6 is located a valve rod 10 projecting outwardly at one end through a stuffing box as shown and connected to a yoke 11 by which the controlling valve is actuated from the centralizing motor 15 hereinafter described, under the immediate control of the pilot valve 18.

12 is the connection from valve 6 leading, through the automatic shut-off valve 29, to the cylinder 4, said connection 12 being arranged to be placed in communication with pressure supply 7 and exhaust passage 8 respectively by means of the valve cups 13, 13, and 14 respectively.

In the views shown in the drawings, Figs. 11 and 12 show the above described mechanism in its normal position, and it will be observed that if the valve stem 10 is moved to the right it will place the port 12 in communication with the pressure supply 7, as indicated by the arrow *a*, and if moved to the left will place the passage 12 in communication with the outlet passage 8, thus accomplishing the desired functions. Such movement of the cups of the controlling valve 6 is imparted through stem 10 and yoke 11 by the operation of the centralizing motor 15, similar in construction and mode of operation to the centralizing operating mechanism for hydraulic valves shown in my prior patent No. 767,732 dated August 16th, 1904. In such device pressure is admitted at one end or the other through pressure pipes 16, 17, leading from the pilot valve 18, and by which the mo-



tor stem 19 is thrown to one side or the other according to whether it is desired to raise or lower the elevator, which stem is connected to yoke 11 and will impart corresponding movement to the stem 10 of the controlling valve 6. The barrel 20 of the centralizing motor 15 is provided with independently movable piston rings 21 by which, when pressures at each end are equalized, the barrel is caused to assume its middle normal position, as shown in Fig. 11, said rings 21 bearing against a middle stationary limiting abutment 22, in the same general manner as set forth in my previous patent above referred to.

The pilot valve 18 by which the pressure to the centralizing motor 15 is controlled, from any suitable source of supply, is provided with the usual lever 23 connected with the cable 24 attached at 25 at the top of the shaft and passing around lower sheave wheels 26, 26, at the bottom of the shaft respectively, and around the tilting sheaves 27, 27, mounted upon the usual rock shaft controlling mechanism provided with the customary lever 28 within reach of the operator, as will be readily understood.

29 is the automatic terminal stop or shut-off valve through which pressure and exhaust freely circulate to and from the cylinder 4 in the normal position of the valve, *i. e.* its position during the normal operation of the elevator under the control of the mechanism just described between the bottom and top floors. This valve 29 is designed to operate automatically to shut off the waste from the cylinder when the car has reached its lowermost level and to shut off the pressure to the cylinder when the car has reached its uppermost level, as stated. For this purpose it consists of a shell 30 preferably provided with an internal lining barrel 31 having ports *b, b*, communicating through its interior with the supply and exhaust opening 12 and with the connection 5 to the cylinder respectively. Within the valve chamber are mounted two independently operating valves 32 and 33 respectively each provided with an outwardly turned cup 34 so arranged as to expand tightly outwardly against the lining 31 when pressure is exerted against its interior and to make a sealing closure. The innermost cups 34' of each of said valves, *i. e.* the cups adjacent to each other, are however capable of admitting a reduced flow backwardly between the valve and the casing, for which purpose clearance 35 and 36 is provided. Each of these valves is mounted at the inner end of its stem 37, 38, respectively, capable of movement independent of each other, which stems extend outwardly through suitable stuffing boxes and are provided with rock shafts 39 and 40 mounted in suitable terminal bearings 41 at the ends of the valve stems. For the purpose of equalizing the

pressure at each end of the stop valves 32 and 33 a by-pass port *c* communicates from the interior intermediate chamber between the valves through the longitudinal ports *d, d*, with the casing at each outer end beyond each valve, whereby their movement in either direction is not interfered with by unequal pressures. Extending outwardly in opposite directions from the valve case or shell 30 are frames 42, 42, forming rigid extensions of the construction and provided on their upper and lower sides with a series of rack teeth 43.

44 is a toothed segment keyed or otherwise secured to shafts 39 and 40 and adapted to intermesh with either the upper or lower series of rack teeth 43 according to the direction that either of shafts 39 or 40 is turned. It will thus be seen that if either of said shafts be turned in one direction or the other, the teeth of the segment 44 will intermesh with one of the racks 43 and will impart inward movement to valve stem 37 or 38 and corresponding inward movement to valve 32 or 33. For the purpose of actuating shafts 39 and 40, they are each provided with outwardly extending levers 45, 46, having counterweights 47. One of said levers 45, is connected by a flexible element as a cable 48 to any suitable point 49 within the elevator shaft near its lower portion, passing around a suitably located sheave wheel 50, so as to be within the path of a downwardly extending sheave or abutment 51 mounted on the lower portion of the elevator car. The other of said levers 46, is connected to a similar flexible element 52, passing around suitably located sheaves 53, 53, 53, and attached at 54 at the upper portion of the elevator shaft so as to be within range of an actuating sheave or abutment 55 mounted at the upper portion of the elevator car. By this arrangement it will be seen that when the car descends to within a short distance of the lowermost floor, sheave 51 will come into contact with cable 48, lifting the lever 45, causing the rack mechanism to thrust valve 32 inwardly as shown in Fig. 13, thus shutting off the exhaust from the cylinder 4 and stopping the downward travel of the elevator automatically and independent of the usual valve actuating mechanism. Similarly, when the car has arrived within a short distance of its upward desired limit of travel, sheave 55 will make contact with cable 52, as shown in Fig. 2, lifting the opposite lever 46, thrusting valve 33 inwardly as indicated in Fig. 14 and shutting off the supply to the cylinder 4, arresting the upward travel of the elevator, also independent of the usual valve operating mechanism.

Owing to the connection of the flexible elements 48 and 52 when not engaged by sheaves 51 or 55, levers 45 and 46 will be suspended in a horizontal position as indicated



in Figs. 1 and 8, maintaining the valves in their normal open position indicated in Figs. 1 8 and 12, and should breakage of either of said cables occur, the suspended lever 45 or 46 will fall, due to the counterweight 47, and will effect an inward travel of its appropriate valve 32 or 33 by engagement of segment 44 with the upper series of rack teeth 43, thus automatically shutting off the exhaust from the cylinder 4 or supply thereto. An important feature of advantage and convenience in this construction is that by reason of the clearance provided for the endmost cups 34', above described, it is possible when either of said valves 32 or 33 is thrust inwardly, as in Figs. 13 or 14, to either raise the elevator slowly by admitting pressure past the cup 34' of valve 32 as in Fig. 13, or to lower it slowly to the next adjacent floor by releasing the fluid within the cylinder, under pressure of the superimposed weight past the cup 34' of valve 33, as in Fig. 14. This latter feature thereby enables the operator to bring the elevator car to the next upper or lower floor in case of breakage of either of the connections, thus overcoming any such delay as usually attends derangement of such elevator operating mechanism. Operation of the mechanism independent of the operation of the pilot valve is likewise absolutely prevented, so that while a restricted supply to or exhaust from the cylinder is provided for in case of emergency, such circulation is at all times under the control of the operator. Also, should any derangement or breakage of the controlling apparatus of the car occur, movement of the car is entirely prevented, the centralizing motor 15 always closing the supply and exhaust through valve 6 automatically. In the stoppage of the car automatically at the limit of its downward or upward travel, as described, or at any intervening point due to breakage of connections 48 or 52, the cups 34 and 34' of either valve 32 or 33 are brought into the position assumed for either stop, whereby the cups entirely seal the exhaust from or supply to the cylinder 4 in the regular way.

The entire apparatus is comparatively simple, is within the control of the operator at all times, effectually prevents the running of the elevator into the head or bottom of the shaft by reason of inattention of the operator or other cause, and is effective to prevent the usual accidents in this class of machinery. By reason of the location of the automatic stop valve 29 being between the cylinder 4 and the controlling valve 6 its operation is not affected by injury or derangement of said controlling valve or the other parts, as it is obvious that the automatic stop valve will operate to perform its functions entirely independent of such parts. This is due to the fact that movement of the elevator is prevented by the sealing action of the same cups

which control the ordinary usual circulation without the employment of any other supplemental or additional valves, whether the valves are operated by the movement of the car at its limits of travel or by the breaking of either flexible connection.

The invention is not limited in its application to elevators wherein the travel of the plunger is for the full travel of the car, but may be also used with equipments employing a hydraulic cylinder and piston connected with cables and a system of multiplying sheaves, or with any other construction wherein the power is derived from a hydraulic cylinder.

Various changes or modifications may be made by the skilled mechanic in the design, arrangement or adaptation of the invention or its various features, and these may be also applied to different conditions of use or applications, but all such changes and variations are to be considered as within the scope of the following claims.

What I claim is:

1. An automatic terminal stop valve comprising a casing having a port communicating with a source of pressure and a port communicating with a cylinder respectively, two independent valves therein having depressible cups and arranged to close said communication by either valve, and means for actuating either of said valves to close the circulation, substantially as set forth.

2. An automatic terminal stop valve comprising a casing having a port communicating with a source of pressure and a port communicating with a cylinder respectively, and a valve therein arranged to close the exhaust from the cylinder and having a depressible cup adapted when in such position to admit a restricted supply to the cylinder, substantially as set forth.

3. An automatic terminal stop valve comprising a casing having a single port communicating with a source of pressure and a single port communicating with a cylinder respectively, a valve therein arranged to close the exhaust from the cylinder provided with oppositely arranged inwardly turned cups, with clearance for one of said cups whereby, when in sealing position it will admit a restricted supply to the cylinder, substantially as set forth.

4. An automatic terminal stop valve comprising a casing having a port communicating with a source of pressure and a port communicating with a cylinder respectively, and a valve therein arranged to close the supply to the cylinder and having a depressible cup adapted when in such position to admit a restricted exhaust from the cylinder, substantially as set forth.

5. An automatic terminal stop valve comprising a casing communicating with a source of pressure and with a cylinder respectively,



a valve therein arranged to close the supply to the cylinder provided with inwardly turned cups, with clearance for one of said cups whereby, when in sealing position, it will admit a restricted exhaust from the cylinder, substantially as set forth.

6. An automatic terminal stop valve for hydraulic elevators comprising a casing having a port communicating with a source of pressure and a port communicating with the cylinder respectively, two independent valves therein having depressible cups and arranged to independently close said communication by either valve, and means arranged to be actuated by engagement of a device mounted on the elevator car for actuating either of said valves to close the circulation, substantially as set forth.

7. An automatic terminal stop valve for hydraulic elevators comprising a casing having a port communicating with a source of pressure and a port communicating with the cylinder respectively, two independent valves therein having depressible cups and arranged to independently close said communication by either valve, and means arranged to normally maintain either valve open to provide circulation to and from the elevator cylinder and to be actuated by engagement of a device mounted on the elevator car for actuating either of said valves to close the circulation, substantially as set forth.

8. An automatic terminal stop valve comprising a casing having supply and distribution ports respectively, a valve arranged to close one of said ports provided with a stem carrying a rock shaft and a toothed gear, rack teeth arranged to be engaged by said gear, and an operating lever for said rock shaft, substantially as set forth.

9. An automatic terminal stop valve comprising a casing having supply and distribution ports respectively, a valve arranged to close one of said ports provided with a stem carrying a rock shaft and a toothed gear, rack teeth arranged to be engaged by said gear, and an operating lever for said rock shaft, with means for suspending said lever to maintain said mechanism in inoperative position, substantially as set forth.

10. An automatic terminal stop valve comprising a casing having supply and distribution ports respectively, a valve arranged to close one of said ports provided with a stem carrying a rock shaft and a toothed gear, rack teeth arranged to be engaged by said gear, an operating lever for said rock shaft provided with a counterweight, and means for suspending said lever to maintain said mechanism in inoperative position, substantially as set forth.

11. In an automatic terminal stop valve, the combination of a casing provided with supply and distribution ports respectively, oppositely located valves arranged to cover

each of said ports, valve stems extending outwardly and provided with rock shafts and toothed gearing, upper and lower series of rack teeth arranged to engage said gearing, counterweighted levers connected with said rock shafts, and means suspending said levers horizontally to maintain the valves in normal inoperative position, substantially as set forth.

12. In an automatic terminal stop valve, the combination of a casing provided with supply and distribution ports respectively, oppositely located valves arranged to cover each of said ports, valve stems extending outwardly and provided with rock shafts and toothed gearing, upper and lower series of rack teeth arranged to engage said gearing, counterweighted levers connected with said rock shafts, means suspending said levers horizontally to maintain the valves in normal inoperative position, and a movable element provided with abutting devices adapted to engage the suspending elements of said levers, substantially as set forth.

13. In elevator valve mechanism, the combination with a source of pressure and a hydraulic cylinder, of a controlling valve governing the supply to and exhaust from the cylinder, means for actuating said valve, and automatic terminal stop valve mechanism located between the controlling valve and the cylinder, having a port leading to the controlling valve and a port leading to the cylinder, and independently operating valves having depressible cups and adapted to cover one or the other of said ports and to be actuated by mechanism engaged by the elevator car, substantially as set forth.

14. In elevator valve mechanism, the combination with a source of pressure and a hydraulic cylinder, of an elevator car provided with a plunger mounted in the cylinder, a controlling valve governing the supply to and exhaust from the cylinder, means for actuating said valve, automatic terminal stop valve mechanism located between the controlling valve and the cylinder, having a port leading to the controlling valve and a port leading to the cylinder, and independently operating valves having depressible cups and adapted to cover one or the other of said ports and to be actuated by mechanism engaged by the elevator car, substantially as set forth.

15. In elevator valve mechanism, the combination with a source of pressure and a hydraulic cylinder, of a controlling valve governing the supply to and exhaust from the cylinder, means for actuating said valve, and an automatic terminal stop valve located between the controlling valve and the cylinder having a port at one side leading to the controlling valve, a port at the other side leading to the cylinder, independent stop valves having depressible cups and adapted to cover



one or the other of said ports, and connections thereto arranged to be actuated by devices mounted on the elevator car, substantially as set forth.

5 16. In elevator valve mechanism, the combination with a source of pressure and a hydraulic cylinder, of a controlling valve governing the supply to and exhaust from the cylinder, means for actuating said valve, and  
10 automatic terminal stop valve mechanism located between the controlling valve and the cylinder, said valve mechanism being

provided with cups having clearance at one side, arranged to shut off the full feed or exhaust but to admit a restricted feed or ex- 15  
haust to or from the cylinder, substantially as set forth.

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

ROBERT C. BROMLEY.

Witnesses:

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C. M. CLARKE.