No. 770,717. PATENTED SEPT. 20, 1904.

J. J. FINNEY.

AUTOMATIC BRAKE SYSTEM.

APPLICATION FILED NOV. 27, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

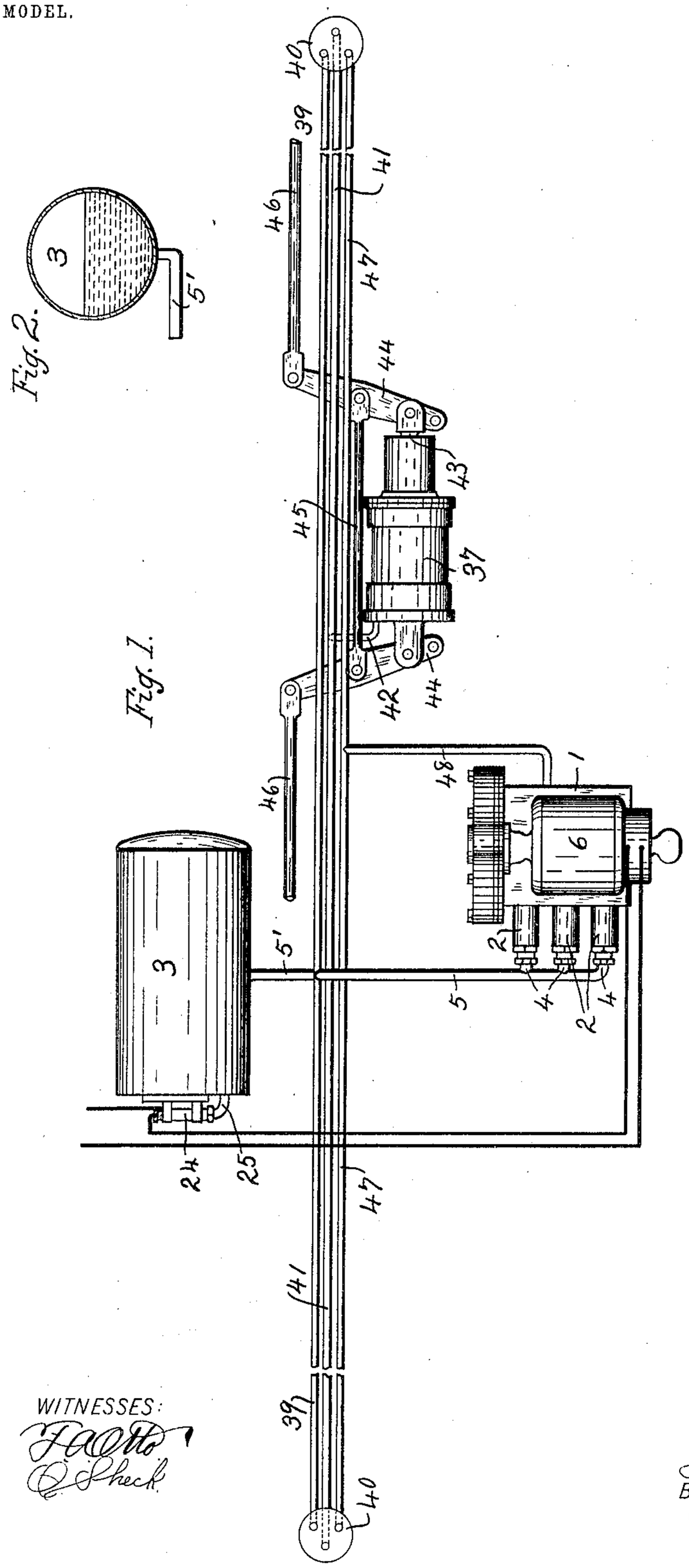

Fig. 1.

Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 2.

Fig. 3.

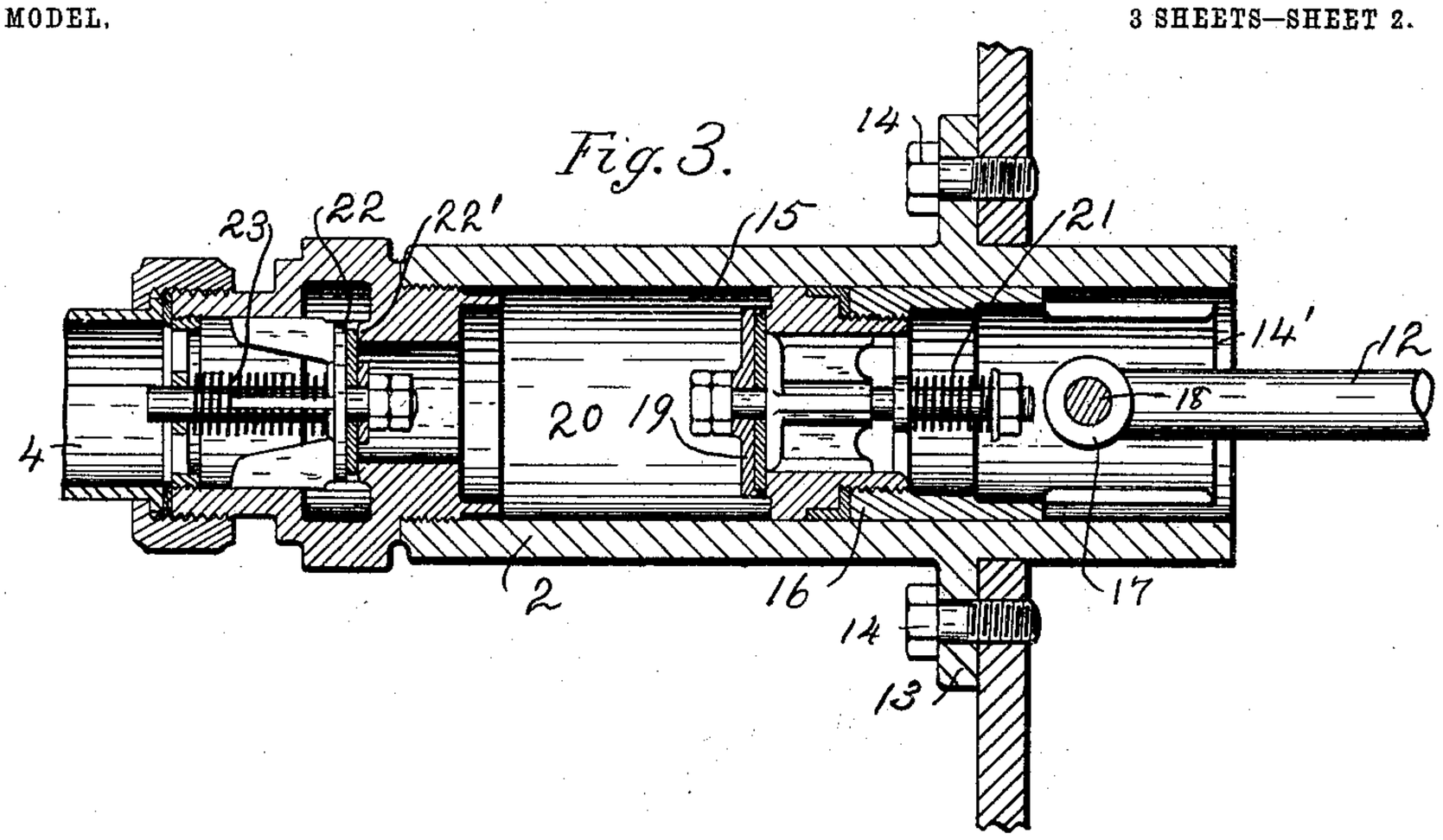
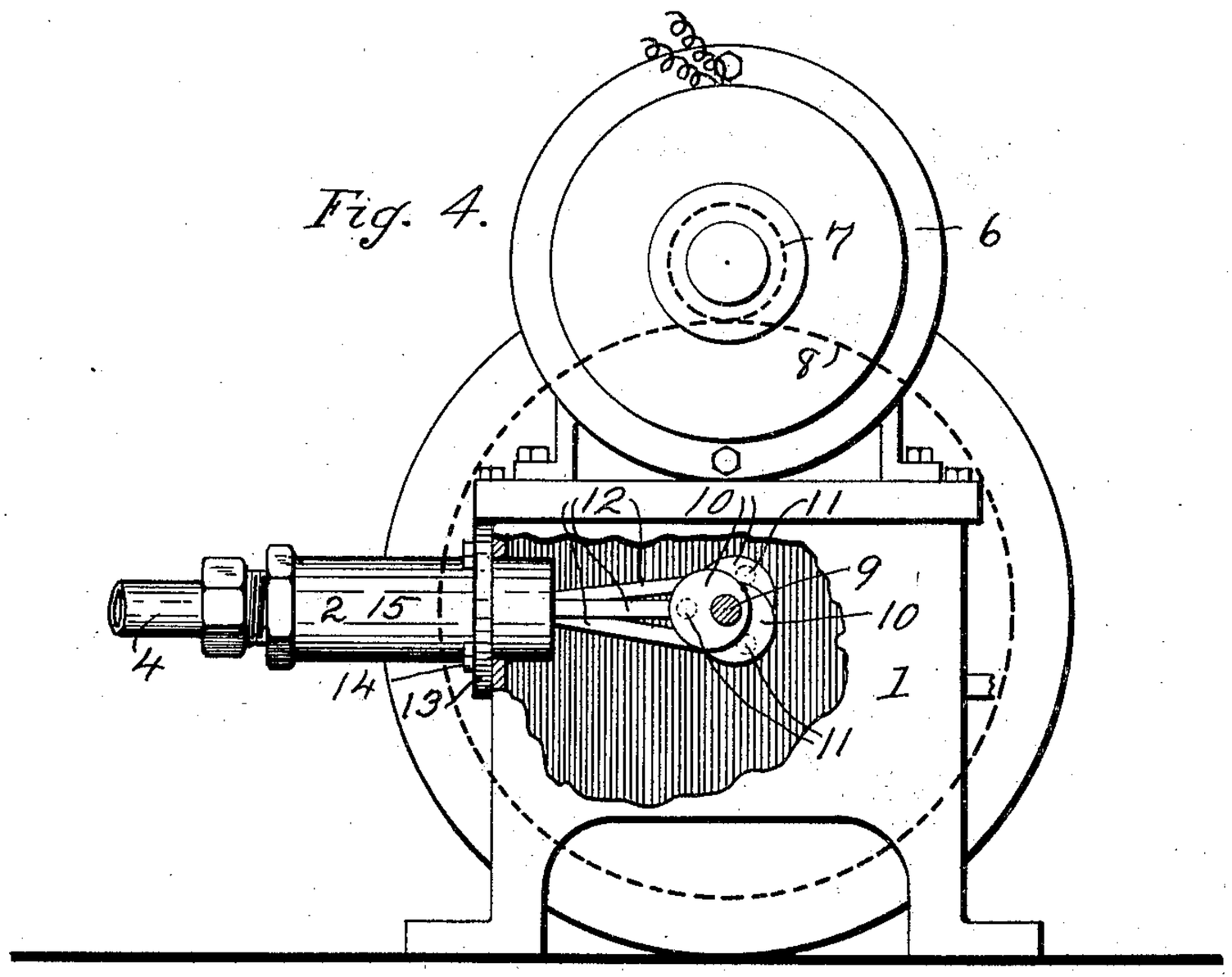


Fig. 4.



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AUTOMATIC BRAKE SYSTEM.

APPLICATION FILED NOV. 27, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

Fig. 5.

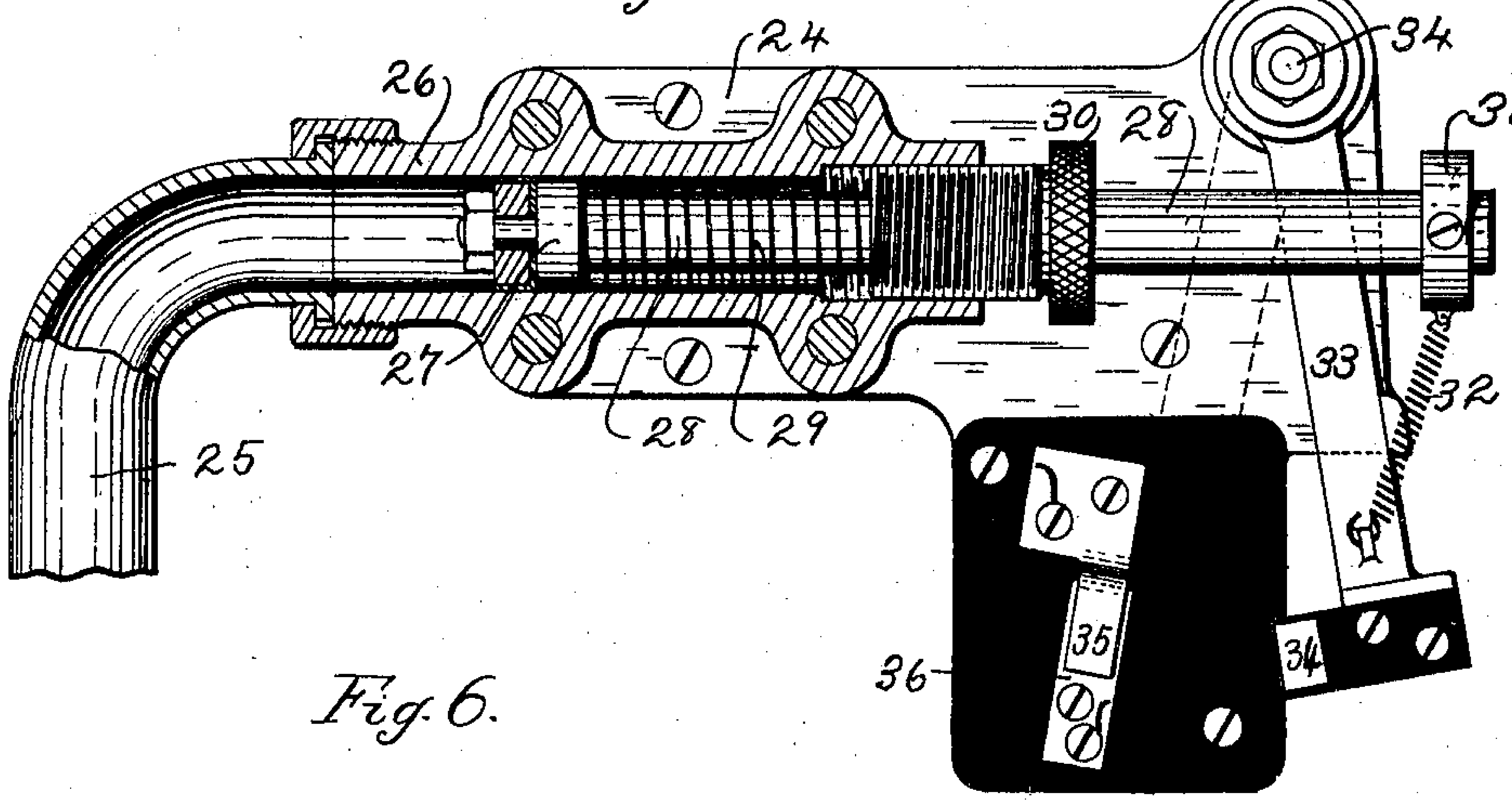


Fig. 6.

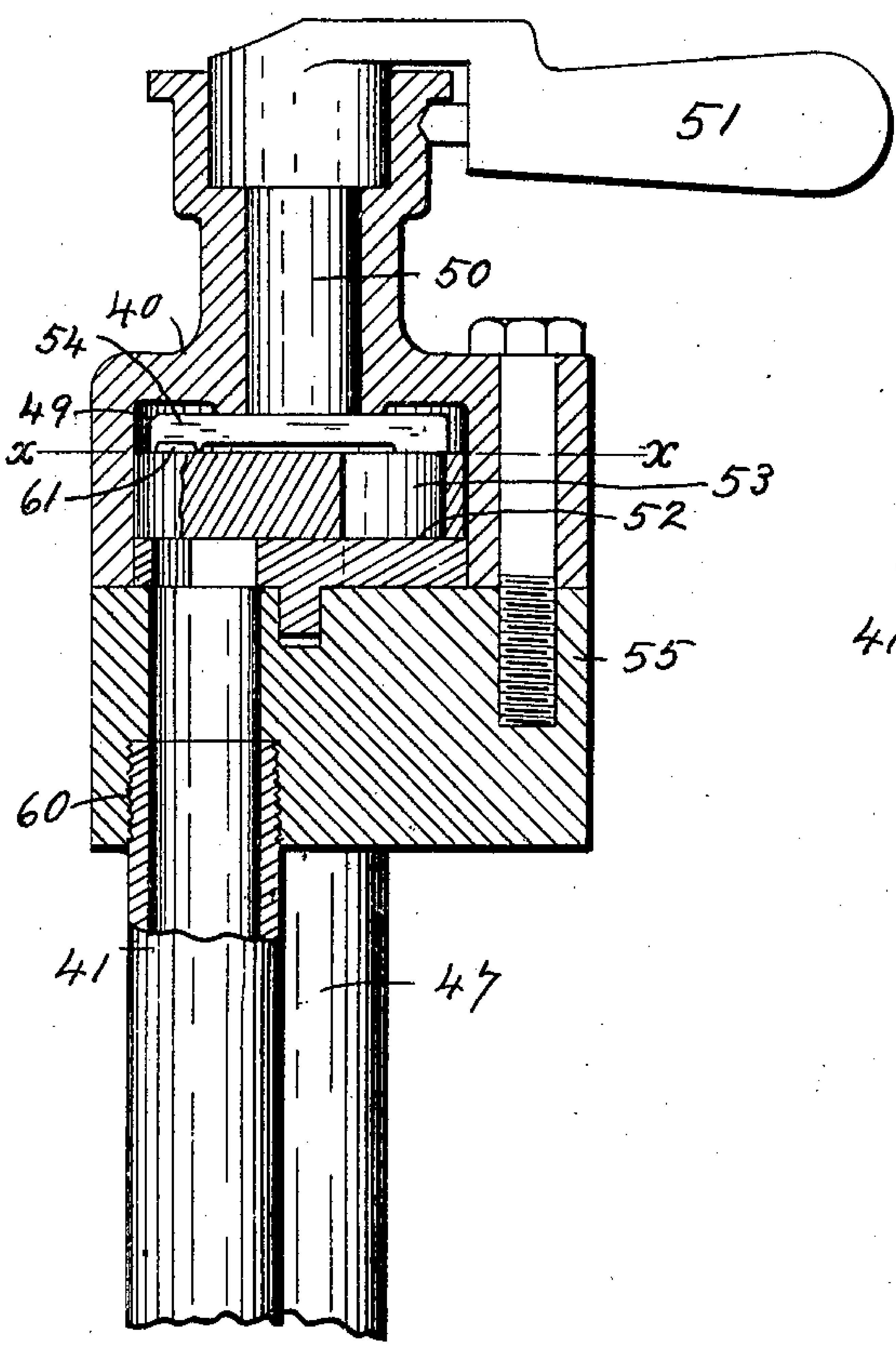


Fig. 7.

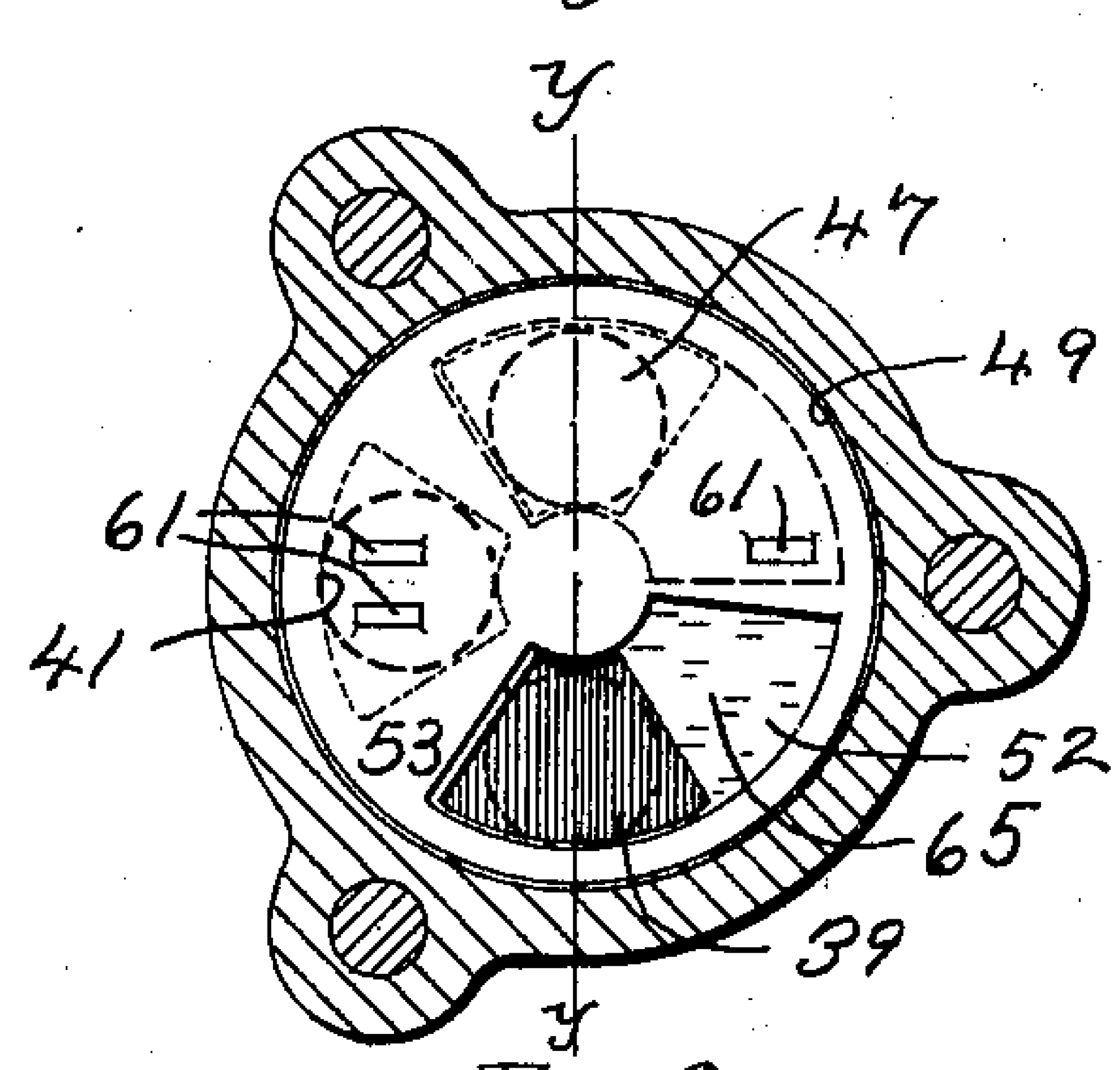
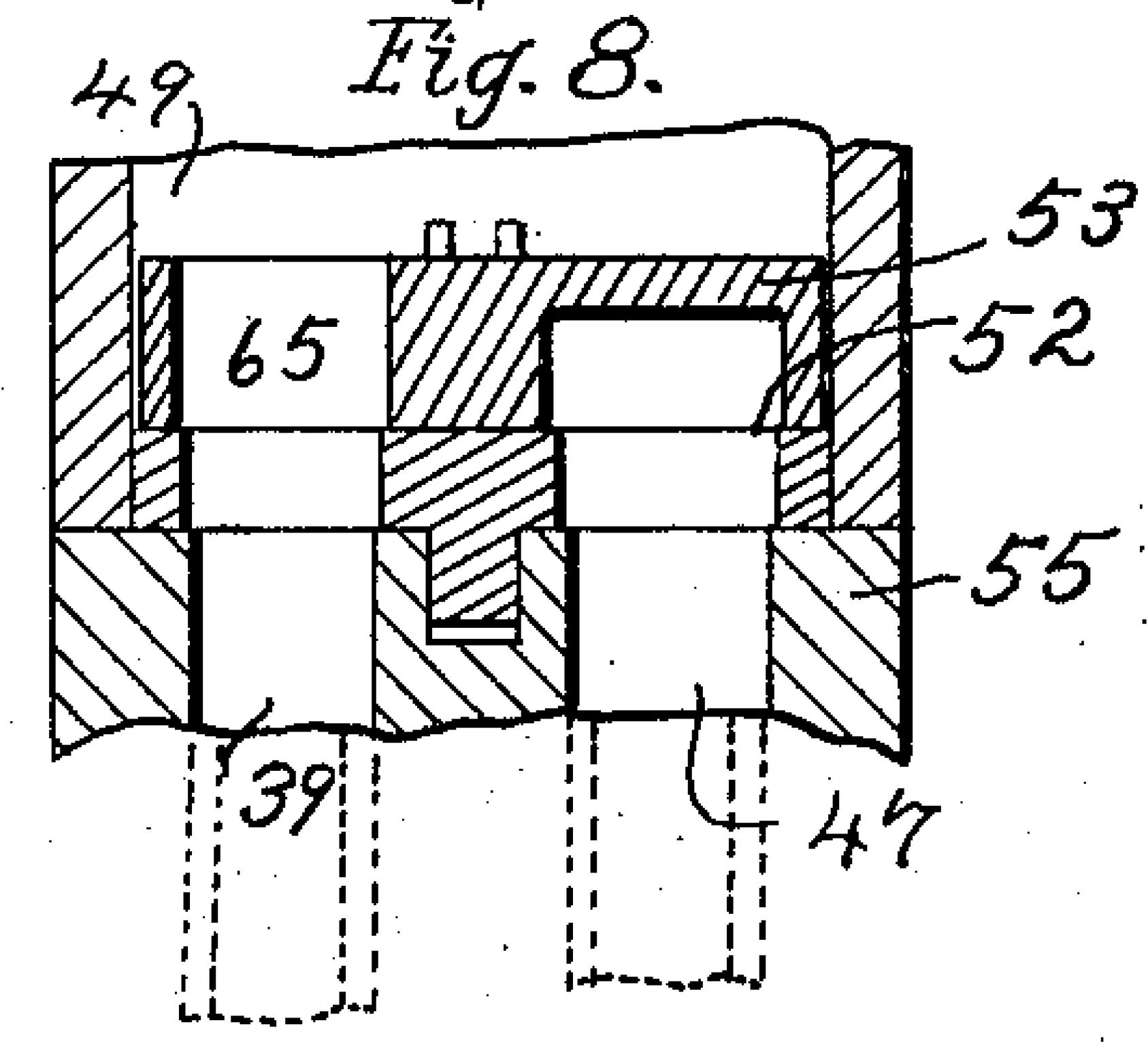


Fig. 8.



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No. 770,717. Patented September 20, 1904.

UNITED STATES PATENT OFFICE.

JAMES J. FINNEY, OF MILWAUKEE, WISCONSIN.

AUTOMATIC BRAKE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 770,717, dated September 20, 1904.

Application filed November 27, 1903. Serial No. 182,899. (No model.)

To all whom it may concern:

Be it known that I, JAMES J. FINNEY, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Automatic Brake Systems, of which the following is a specification.

My invention relates to improvements in automatic brake systems for controlling the movement of railway-cars in a one-car system.

The object of my invention is to provide a more efficient means for both storing and applying the necessary power used in controlling the brake mechanism, and it pertains more especially, first, to the means employed for compressing air in a reservoir by pumping oil or other liquid into such reservoir against the confined air therein, the air thus compressed serving as a means of storing the required energy for actuating the brakes from time to time, as circumstances may require.

My invention pertains, second, to the means employed for applying the stored energy of the compressed air to the brake-cylinders through the medium of a liquid without permitting the compressed air to escape; third, to the means controlled by the pressure of the power medium for automatically starting and stopping the pump mechanism by which the air is compressed as may be required to maintain the air in the reservoir at the desired uniform pressure, and, fourth, to the general construction and coöperative arrangement of the several parts of the system, as hereinafter more fully set forth.

My invention is further explained by reference to the accompanying drawings, in which—

Figure 1 represents a diagrammatic view of the system comprising the several coöperative parts. Fig. 2 represents a vertical section of the power-reservoir. Fig. 3 represents a longitudinal section of one of the pumps used for forcing the liquid into the power-reservoir. Fig. 4 represents one of the pumps in connection with an electric motor employed for driving such pumps, a part of such figure being broken away to show the interior mechanism. Fig. 5 represents a circuit-closing mechanism by which the motor is automatically started and stopped. Fig. 6 represents a longitudinal section of the three-way valve employed for controlling the power medium used in operating the brake mechanism. Fig. 7 represents a transverse section drawn on line $x\,x$ of Fig. 6, and Fig. 8 is a vertical section drawn on line $y\,y$ of Fig. 7.

Like parts are identified by the same reference characters throughout the several views.

1 represents the liquid-reservoir from which the oil or other liquid is forced by the pumps 2 to the power-reservoir 3 through the branch ducts 4 and main duct 5, said pumps being driven by the action of an electric motor 6 of ordinary construction. Power is communicated from the electric motor 6 to the pistons in the several pumps 2 through the pinion 7, gear-wheel 8, shaft 9, eccentrics 10, wrist-pins 11, and piston-rods 12. The pumps 2 are secured to the side of the tank 1 by flanges 13 and bolts 14, and the liquid in the reservoir 1 enters the pumps through the open ends 14′ of the pump-cylinders 15.

16 represents the piston of one of the pumps, which is connected with the piston-rod 12 through the sleeve 17 and cross-pin 18. The front end of the piston 16 is provided with a check-valve 19, which opens with the backward movement of the piston and permits the liquid to pass into the chamber 20 in front of the piston, when with the forward movement of the piston the valve 19 is closed by the action of the spring 21 when the liquid is forced from the pump through the check-valve 22. This check-valve is normally retained in contact with its seat 22′ by the action of the spiral spring 23. Thus it will be obvious that with each backward movement of the piston 21 the pump-cylinder is filled with liquid which is displaced and driven to the power-reservoir 3 through the branch ducts 4 and main duct 5 with each stroke of the piston.

While a single pump only may be employed for forcing the liquid to the power-reservoir, I preferably employ a plurality of pumps and connect them at uniform distances apart around the shaft 9, whereby the resistance of the pumps to the motor is more uniformly dis-

tributed and more uniform pressure is maintained in the power-reservoir. The power of the motor being applied to the pumps, the liquid is forced into the power-reservoir 3 until the desired predetermined pressure is reached, when the action of the electric motor is automatically stopped by throwing the same out of electric circuit with the electric-power supply. To accomplish this object, I connect a circuit-closing mechanism 24 with the power-reservoir 3 through the duct 25, a longitudinal section of which controlling mechanism is shown in Fig. 5. The power-controlling mechanism comprises the cylinder 26, provided with a piston 27, piston-rod 28, spiral spring 29, hand-nut 30, collar 31, and spiral spring 32. It will be understood that when the air in the power-reservoir 3 has been pumped to the predetermined pressure (or a pressure greater than the resistance of the spring 29) the piston 27 will be moved outwardly by the pressure from such power-reservoir against the recoil of such spring 29, whereby the piston-rods will be carried to the right, as indicated in Fig. 5, past the switch-arm 33, when such arm is in the position indicated by dotted lines in Fig. 5, whereby said arm, which is pivotally supported from the bolt 34, will be thrown from the position indicated by said dotted lines to that shown in Fig. 5, when the circuit-closing bearing 34 will be thrown out of contact with the electric terminals 35 and 36, whereby the electric motor will be thrown out of circuit and cease to run.

It will be understood that the electric terminals 35 and 36 are connected with the source of electrical energy in the ordinary manner and that the bearing 34 is insulated from the switch-arm 33, so that when said bearing 34 is brought in contact with said terminals 35 and 36 an electric circuit will be established between the motor and the supply and said motor will be again started. The tension of the spring 29 is such as to force said piston 27 back to its former position as soon as the air in the power-reservoir has been reduced to the original pressure, whereby the spring 32 will be caused to act in the opposite direction upon the switch-arm 33, when said switch-arm will be again thrown into circuit-closing position in contact with the terminals 35 and 36, when the motor and pumps will be again started and continue to act until the pressure on the air in the power-cylinder has been raised to the predetermined point, when the motor will be again thrown out of electric circuit and the pump stopped, as previously described.

It will of course be understood that when desirous to maintain a higher pressure than normal the hand-screw 30 is turned forward against the resisting spring 29, and if desirous for any reason to reduce the normal pressure of the air in the power-reservoir said hand-nut 30 is turned in the opposite direction, so that a less pressure of air will be required to throw the electric motor out of circuit. The liquid under pressure is led from the power-reservoir 3 to the brake-cylinder 37 through the branch duct 5′, main duct 39, three-way valve 40, main duct 41, and branch duct 42, whereby the piston in said brake-cylinder is thrown toward the right and the brake set, motion being communicated to the brakes in the ordinary way through the piston-rod 43, levers 44, link 45, and connecting-rods 46. When desirous to release the brakes, pressure on the piston in the brake-cylinder 37 is released by closing communication between the ducts 39 and 41 and opening communication between the main ducts 41 and 47, when the liquid in the brake-cylinder passes back through the branch duct 42, main duct 41, three-way valve 40, main duct 47, branch duct 48, and from thence into the liquid-reservoir 1, whereby the pressure on the brake-cylinder is released, the liquid in the brake-cylinder flowing through said ducts back to the reservoir 1 preparatory to being again pumped into the power-reservoir 3, as previously described. To provide for operating the brake mechanism from both ends of the car, a duplicate of the valve 40 is connected with the opposite ends of said pipes 39, 41, and 47, by which the power medium is controlled, as heretofore described. The liquid-controlling valve 40, details of which are shown in Figs. 6 to 8, inclusive, comprises the valve-chamber 49, valve-rod 50, operating-handle 51, valve-seat 52, valve 53, valve-operating arm 54, and valve-base 55. The several ducts 39, 41, and 47 are respectively connected with the valve-base 55 by ordinary joints 60. The valve 53 is provided with upward-projecting lugs 61, by which motion is communicated to said valve from the arm 54 as said arm is turned in either direction, whereby said valve 53 is permitted to find its own seat and is not interfered with in this respect by the movement of the actuating-arm 54, said lugs forming a simple and efficient means for connecting such parts operatively together. Thus it will be obvious that the power medium is controlled in its passage from the power-reservoir 3 to the brake-cylinder and from the brake-cylinder back to the liquid-reservoir by the power-controlling valve 40. When desirous to set the brakes, the operating-handle 51 is so adjusted that the liquid from the power-cylinder will enter the valve 40 through the duct 39 and pass from thence to the brake-cylinder through the ducts 41 and 42, and when desirous to release the brakes the handle 51 is adjusted, so that the power medium will pass from the brake-cylinder back to the liquid-reservoir 1 through the ducts 42, 41, and 47, the valve 53 being so constructed that the port 65, which com-

municated with the inlet-duct 39 is always open to the chamber 49, whereby the chamber 49 is always filled with the power medium, the construction of the valve also being such that it always opens communication between the brake-cylinder with either the power-reservoir (when desirous to set the brakes) or with the liquid-reservoir when desirous to release the brakes.

While I have shown the pump connected directly with the liquid-reservoir at a distance from the power-reservoir, it is obvious that said pumps may, if desired, be of the ordinary construction and located at a distance from such reservoir, when the liquid will flow to and from said pumps through pipes in the ordinary way. It is also obvious that, if desired, said liquid-reservoir and power-reservoir may be formed integrally and subdivided into two compartments by a partition, in which case the liquid will be forced from one compartment to the other by the pumps.

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

1. A brake system for railway-cars comprising a liquid-reservoir, a power-reservoir; means for forcing the liquid from the liquid-reservoir into the power-reservoir under pneumatic pressure; a system of car-brakes; a brake-cylinder provided with a piston; means for controlling the passage of the liquid from the power-reservoir to the brake-cylinder and means for controlling the passage of the liquid from the brake-cylinder back to the liquid-reservoir.

2. A brake system for railway-cars comprising a liquid-reservoir; a power-reservoir; a motor for forcing the liquid from the liquid-reservoir into the power-reservoir under pneumatic pressure; means actuated by pneumatic pressure in the power-reservoir for automatically starting and stopping the motor and maintaining the air in the power-reservoir at the desired predetermined pressure; a system of brakes; a brake-cylinder provided with a piston; means for controlling the passage of the liquid from the power-reservoir to the brake-cylinder and means for controlling the passage of the liquid from the brake-cylinder back to the liquid-reservoir.

3. A brake system for railway-cars comprising a liquid-reservoir; a power-reservoir; one or more pumps for forcing the liquid from the liquid-reservoir to the power-reservoir; an electric motor for driving said pumps; a switch for closing the electric circuit between the source of supply and said electric motor; means actuated by pneumatic pressure in the power-reservoir for automatically opening and closing said switch and controlling the action of said motor and pumps, whereby the air in the power-reservoir is retained at the desired predetermined pressure; a set of brakes; a brake-cylinder provided with a piston; means for manually controlling the passage of liquid from the power-reservoir to the brake-cylinder and means for manually controlling the passage of liquid from the brake-cylinder back to the liquid-reservoir.

4. A brake system for railway-cars comprising a liquid-reservoir; a power-reservoir; means for forcing the liquid from the liquid-reservoir into the power-reservoir under pneumatic pressure; a system of car-brakes; a brake-cylinder provided with a piston; a manually-operated three-way valve; a duct communicating from the power-reservoir to said three-way valve; a duct communicating from said valve to and from said brake-cylinder and a third duct communicating from said valve to the liquid-reservoir.

5. A brake system for railway-cars comprising a liquid-reservoir; a power-reservoir; means for forcing the liquid from the liquid-reservoir into the power-reservoir under pneumatic pressure; a system of car-brakes; a brake-cylinder provided with a piston; a manually-actuated three-way valve comprising a liquid-chamber; a revoluble valve located in said chamber; an operating-handle; a valve-stem; a valve-actuating arm rigidly affixed to said valve-stem and adapted to engage lugs projecting laterally from the upper surface of said valve as the latter is being turned thereby; a duct communicating from said power-reservoir to said three-way valve; a duct communicating from said valve to and from said brake-cylinder and a third duct communicating from said valve to the liquid-reservoir.

6. A brake system for railway-cars comprising a liquid-reservoir; a power-reservoir; a motor for forcing the liquid from the liquid-reservoir into the power-reservoir under pneumatic pressure; means actuated by pneumatic pressure in the power-reservoir for automatically starting and stopping the motor and maintaining the air in the power-reservoir at the desired predetermined pressure; a system of brakes; a brake-cylinder provided with a piston; a manually-actuated three-way valve; a duct communicating from said power-reservoir to said three-way valve; a duct communicating from said valve to and from said brake-cylinder and a third duct communicating from said valve to the liquid-reservoir.

7. A brake system for railway-cars comprising a liquid-reservoir; a power-reservoir; one or more pumps for forcing the liquid from the liquid-reservoir to the power-reservoir; an electric motor for driving said pumps; a switch for closing the electric circuit between the source of supply and said electric motor; means actuated by pneumatic pressure in the power-reservoir for automatically opening and closing said switch and controlling the action of said motor and pumps, whereby the air in the power-reservoir is retained at the desired predetermined pressure; a set of brakes; a brake-cylinder provided with a pis-

ton; a manually-actuated three-way valve; a duct communicating from said power-reservoir to said three-way valve; a duct communicating from said valve to and from said brake-cylinder; and a third duct communicating from said valve to the liquid-reservoir, all substantially as, and for the purpose specified.

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

JAMES J. FINNEY.

Witnesses:
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H. Z. TANGHER.