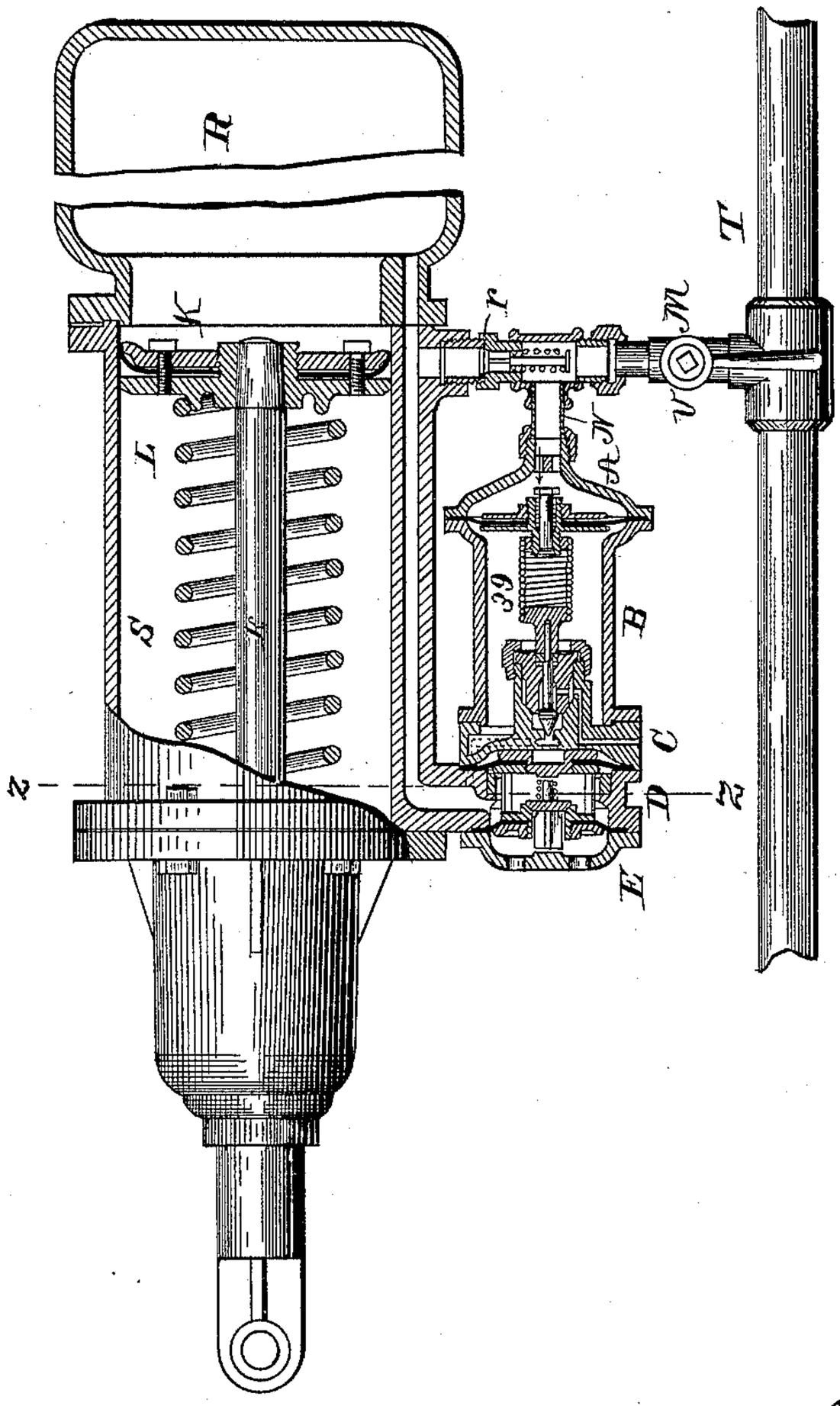
(No Model.) 3 Sheets—Sheet 1.

H. GUELS.

FLUID PRESSURE BRAKE.

No. 391,962. Patented Oct. 30, 1888.

Fig. 1.



Witnesses.

G. A. Tauberschmidt,

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Inventor,

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By his Attorney F. W. Ritter.

(No Model.)

3 Sheets—Sheet 2.

H. GUELS.

FLUID PRESSURE BRAKE.

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Fig. 1.

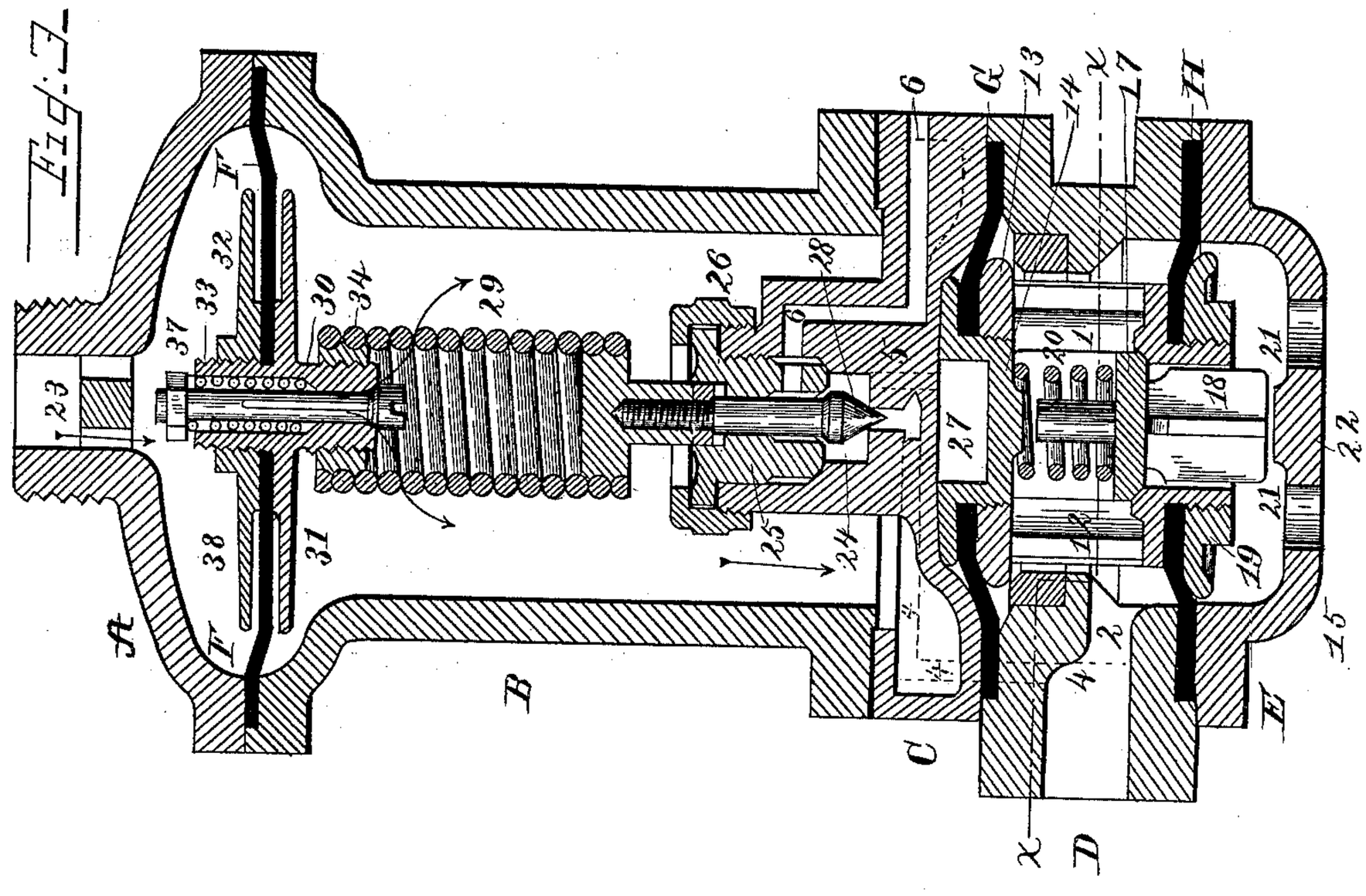
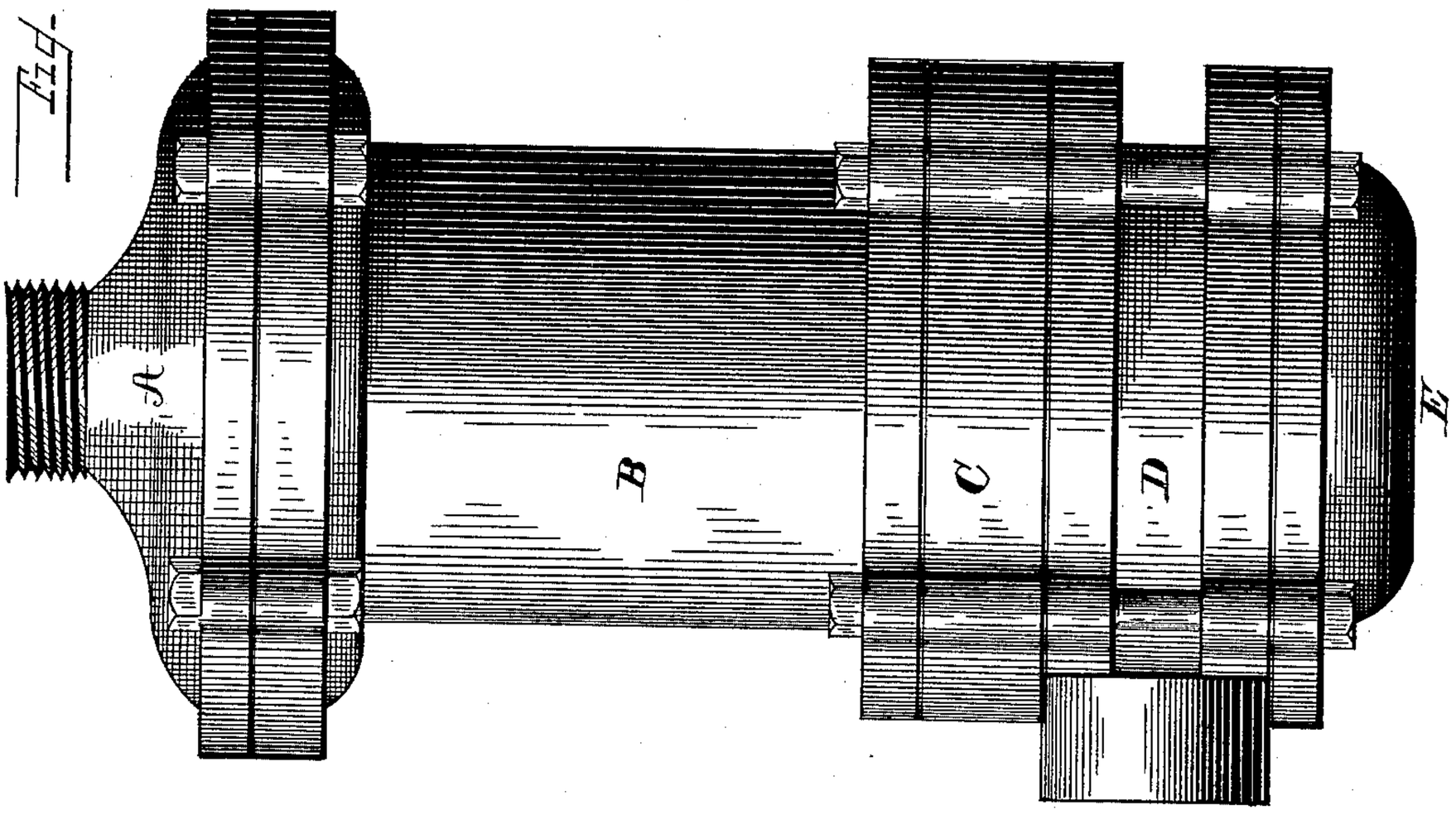


Fig. 2.



Witnesses.

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(No Model.) 3 Sheets—Sheet 3.

H. GUELS.

FLUID PRESSURE BRAKE.

No. 391,962. Patented Oct. 30, 1888.

Fig 4

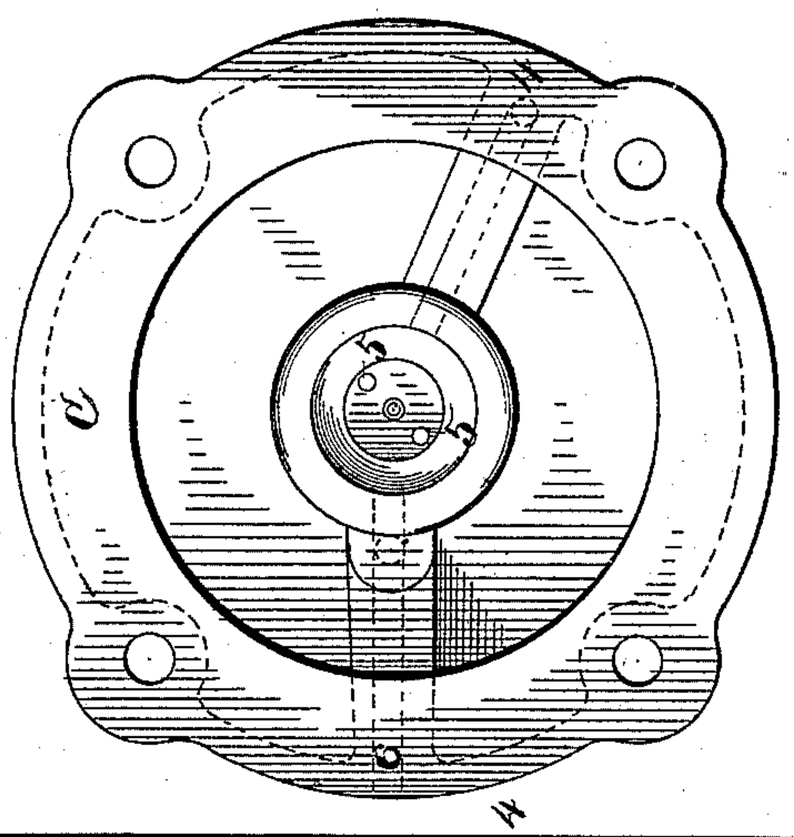


Fig 5

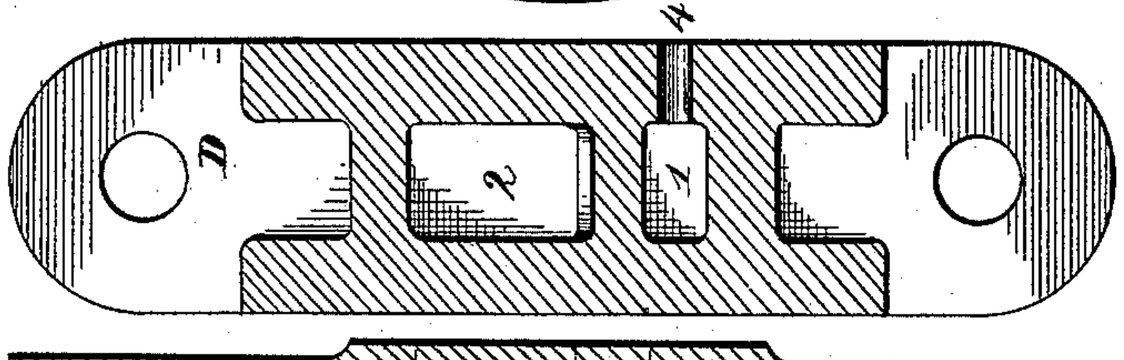
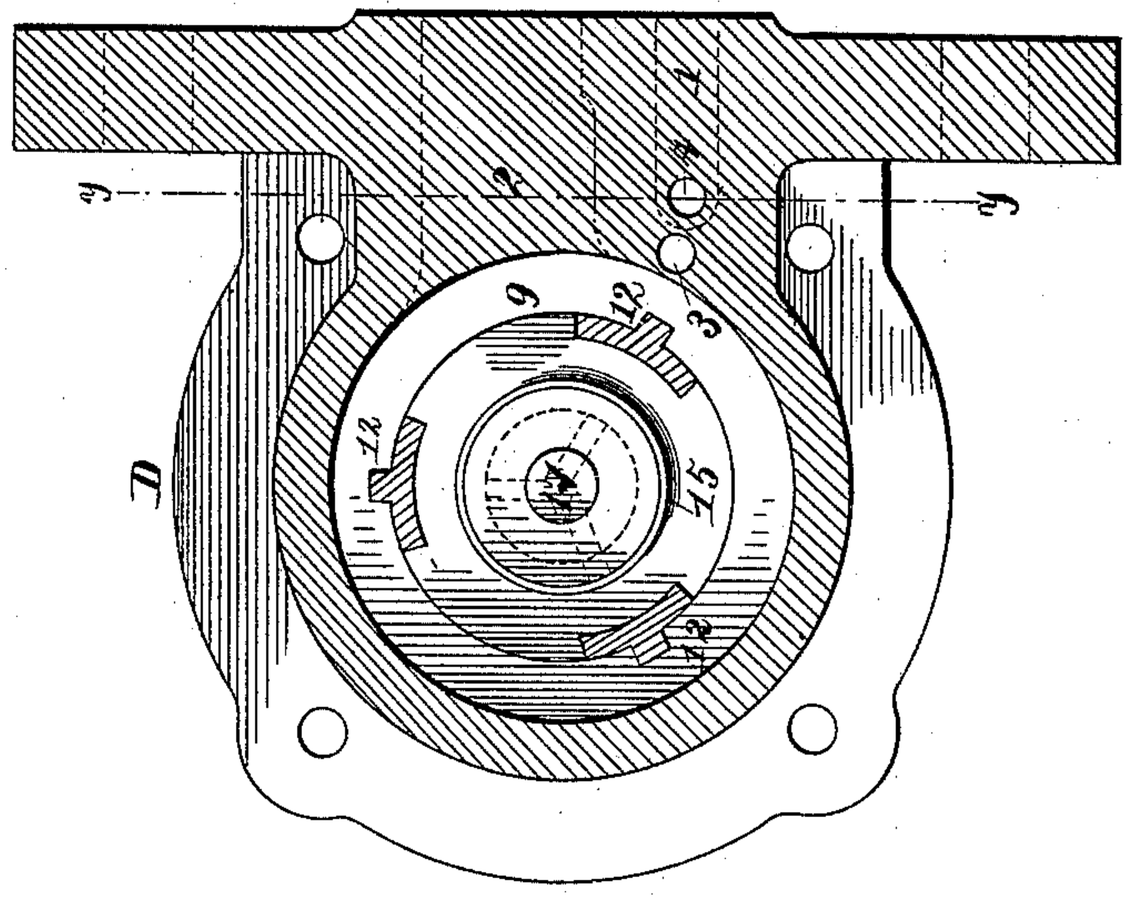


Fig 6



Witnesses,

G. A. Tauberschmidt.

E. W. Baker.

Inventor,

Herman Guels.

By his Attorney F. W. Ritter Jr.

UNITED STATES PATENT OFFICE.

HERMAN GUELS, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE AMERICAN BRAKE COMPANY, OF SAME PLACE.

FLUID-PRESSURE BRAKE.

SPECIFICATION forming part of Letters Patent No. 391,962, dated October 30, 1888.

Application filed February 18, 1888. Serial No. 264,492. (No model.)

To all whom it may concern:

Be it known that I, HERMAN GUELS, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Fluid-Pressure Brakes; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional view of a cylinder and piston, expansion-chamber or auxiliary reservoir, and a brake-valve embodying my invention, together with the train-pipe and branch pipe in elevation. Fig. 2 is an elevation of the valve-shell. Fig. 3 is a longitudinal central section of the air-brake valve, similar to what is shown in Fig. 1, but enlarged, in order to render the construction more apparent; Fig. 4, a face or plan view of the section C of the valve-shell, showing the valve-seat of the equilibrium-valve and the ports leading thereto. Fig. 5 is a transverse section of section D of the valve-shell on the line *y y*, Fig. 6, showing the port leading from the expansion-chamber or auxiliary reservoir, the air-valve chamber, and the exhaust-valve. Fig. 6 is a section of the section D of the valve-shell on the line *x x*, Fig. 3. Fig. 7 is a transverse section of the cylinder and valve-shell on the line *z z*, Fig. 1, showing the port or passage leading from the expansion-chamber or auxiliary reservoir R to the air-brake-valve chamber, and also the port connecting the valve-chamber with the cylinder S.

Like letters and figures refer to like parts wherever they occur.

My present invention relates to the construction of air-brake valves for fluid-pressure brakes of the character generally termed the "equilibrio system," or that wherein the piston is held in equilibrium by fluid-pressure on both sides, an expansion-chamber or auxiliary reservoir is used, and the brakes applied and released by reducing and restoring the pressure in the train-pipe or destroying and restoring the equilibrium of the piston.

The object I have in view is to obtain a quick-acting air-valve to be actuated by the air or pressure in the auxiliary reservoir or expansion-chamber and controlled by a secondary valve not subjected to the air-pressure in the auxiliary reservoir, so that the movement of the air-valve shall not be dependent on the relation existing between the air-pressure in the auxiliary reservoir and that in the train-pipe, as is now the case with all automatic fluid-pressure valves for brake systems so far as I am aware.

To this end my invention consists, first, in the combination, with a cylinder and expansion-chamber or auxiliary reservoir, of a double-diaphragm air-valve having an exhaust-port and puppet-valve in one of its diaphragms, an exhaust port or passage communicating with the opposite side of the other diaphragm, and a valve for controlling said exhaust-port; second, in a double-diaphragm valve for air-brake systems having a valve-seat arranged between the diaphragms and an exhaust port and valve arranged in one of said diaphragms; and, finally, in details of construction, which will hereinafter more fully appear.

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

The well-known or any approved form of pump, main air-reservoir, engineer's valve, &c., may be used, and are not here described, because they are well known and form no part of the present invention.

It is to be understood that each car of the train is to be equipped with substantially the devices shown in Fig. 1 of the drawings.

T indicates the train-pipe; M, a branch provided with the usual valve, *v*, for cutting off the expansion-chamber or auxiliary reservoir from the train-pipe, and also a check-valve, *r*, for preventing the return-flow of air when the pressure is greater in the reservoir than in the train-pipe, which branch pipe M delivers directly into the expansion-chamber or auxiliary reservoir, and not through the air or triple valve, as heretofore.

N indicates a branch pipe leading to an independent air-chamber, 39, wherein is an "equilibrium-valve," said air-chamber having no connection with the expansion-chamber or auxiliary reservoir.

R indicates an expansion-chamber or auxiliary reservoir, and 1 a channel or passage leading from the auxiliary reservoir to the valve-chamber of the air-valve, which passage

1 may be an inside or an outside pipe, if desired, but is preferably formed in casting the cylinder, as shown in the drawings.

S indicates the cylinder; K, the piston, having the piston-rod *k*, which actuates the brake-lever and piston-spring L to retract the brake-shoe.

The air-valve shell, as shown, is composed of five sections, A, B, C, D, and E, though any desired number of sections may be used. The mechanism contained within said shell comprises, first, a balanced valve for admitting air from the expansion-chamber to the cylinder, for holding the piston *in equilibrio* and exhausting the air from the cylinder to apply the brakes, or, in other words, an automatic air-brake valve for an equilibrio system, which is the subject-matter of the present application, and which I will next describe; and, second, an equilibrium-valve for controlling this or any other automatic air-brake valve from the pressure in the train-pipe, and which latter, while it is herein described as the best means known to me for controlling the valve which is the subject-matter of the present application, is not herein claimed, because it has been made the subject of another application, Serial No. 264,493, filed of even date herewith.

The balanced valve first above referred to is contained within the shell-sections C, D, and E, of which D is the principal section, and has a central valve-chamber, 9, within which is an annular valve-seat, 8, which may be formed on the shell or in a bushing seated thereon, as preferred. This valve-chamber 9 is connected above the valve-seat 8 with the channel, port, or passage 1, leading from the expansion-chamber or auxiliary reservoir R by a port or passage, 3, and with the cylinder S below said valve-seat 8 by the port or passage 2.

G and H indicate two diaphragms, which are secured, the one between the sections C and D of the shell and the other between the sections D and E. The diaphragm G carries an open or slotted cup-shaped frame, 12, having an annular valve-disk, 13, which has its seat 8, before specified, and which is secured to the diaphragm by the threaded plug-washer 14. The lower part or bottom of slotted or open frame 12 is also an annular disk, 15, forming a seat, 16, for a puppet exhaust-valve, 17, said annular disk 15 terminating in a hollow threaded tube or stub, 18, through which the winged stem of puppet-valve 17 passes, and by means of which threaded stub 18 and a threaded washer, 19, the lower part of open frame 12 is secured to diaphragm H.

20 indicates a spring, which may be used, if desired, to insure a positive seating of the puppet-valve; but said spring is not essential, as the air-pressure will of itself seat the valve. This spring 20 also serves to keep the valve 13 off its seat; but in case the spring is omitted the same result can be accomplished by increasing the area of valve-disk 13.

The lower section, E, of the valve-shell is simply a cap-section provided with exhaust-ports 21, and, if desired, with a stop, 22, or rest for the winged or grooved stem of puppet-valve 17.

The foregoing devices constitute a balanced and an exhaust valve, which are operated by the air in the auxiliary reservoir to admit air to and exhaust the same from the cylinder. Said valve is controlled by a secondary valve, 28, which governs a port or passage, 4, leading from the passage 1 to valve-chamber 24 and by means of ports 5 to chamber 27 over the balanced valve. An exhaust-port, 6, also controlled by secondary valve 28, permits the air which has been admitted from the auxiliary reservoir to the top of diaphragm G to move the valve-disk 13 in one direction or force it down on its seat 8 to escape from chamber 27 and permit the valve 13 to rise off its seat. This valve 28 may be actuated by means of the air in the train-pipe and by what I term an "equilibrium-valve." This equilibrium-valve is contained within the sections A and B of the shell, of which A is a cap-section, having a port or ports, 23, by which it communicates through branch N with the train-pipe T, and B is a cylinder or air-chamber and contains a diaphragm, (a piston may be used,) F, which divides the air-chamber into two compartments, 38 and 39.

The valve 28, hereinbefore referred to, has a stem which passes through the gland 25, which gland is held by nut 26, and the stem of valve 28, after passing through the gland, is secured to one end of a coiled spring, 29, that is in turn secured at its other end to a hollow tube, 30, having a disk or flange, 31, by means of which and a washer or disk-nut, 32, it is secured to the diaphragm F, which in turn is held between the sections A and B of the shell. The tube 30 is turned out to form a seat for a slight spring, 33, and below to form a valve-seat, 34, for a valve, 35, whose stem passes through the tube 30 and is secured by a nut, 37, the whole forming a check and reduction valve through which the compartments 38 and 39 may communicate. It will be seen that the compartment 39 is in direct communication with the train-pipe, (but not with the auxiliary reservoir,) and that the pressure in said compartment 39 will be the same as that in compartment 38 and train-pipe T, less the power of spring 33, when the system is charged, and will contain air at the maximum pressure when the brakes are off, so that a slight variation of pressure in the train-pipe will actuate valve 28, as diaphragm F must respond to any variation in the train-pipe, and the movement of secondary valve 28 causes the movement of balanced valve 13 either by admitting the auxiliary-reservoir air to or exhausting the air from chamber 27.

The devices, being of substantially the character hereinbefore specified, will operate as follows: Supposing the secondary valve 28 to be in the position shown in Fig. 3, the air from the expansion-chamber or auxiliary reservoir R

will pass through passages or ports 1 and 3 into valve-chamber 9, holding valve 13 off its seat and puppet exhaust-valve 17 closed, and by port 2 into cylinder S, and the piston K will be held in equilibrium and the brakes will be off. If, now, the valve 28 be raised or allowed to rise and close port 6, at the same time opening port 4 and admitting the auxiliary-reservoir air to the chamber 27 on the opposite side of balanced valve 13, said valve 13 will drop on its seat 8, and, the puppet-valve 17 striking the shell or stop 22, the cylinder will be cut off from the auxiliary reservoir, the exhaust opened, and the brakes applied. If the valve 28 be then allowed to fall, the exhaust 6 will be opened and the port 4 closed, so that the balanced valve 13 can rise, which will open port 3 and close exhaust-valve 17, and re-establish communication between the auxiliary reservoir and the cylinder and release the brakes. As before pointed out, this secondary valve is operated from the air in the train-pipe by the equilibrium-valve mechanism shown, or its equivalent, in which case a slight reduction of the air in the train-pipe would, owing to the expansion of the air in chamber 39, cause the outward movement of diaphragm F, which would lift the valve 28, close exhaust 6, open port 4, and apply the brakes, and an increase of the pressure of air in the train-pipe will seat the valve 28 on port 4 and release the brakes, because valve 28 is not subjected to the pressure of the air in auxiliary reservoir R in antagonism to the pressure in the train-pipe. If the train-pipe should part, or if the pressure therein should from any cause fall far below the pressure of the air in chamber 39, the expansion of the air in said chamber, after seating valve 28, so as to close exhaust-port 6 and hold the brakes on, will overcome the force of spring 29 and move the diaphragm F out until the stem of valve 35 strikes the shell-section A, which will force open valve 35 and permit the escape of the excess of pressure in chamber 39, until it and the train-pipe air have nearly equalized, when the spring 29 will react and restore the diaphragm F to its normal position, at which time the pressure of the air and that in the train-pipe will be so nearly equal that a slight increase of pressure in the train-pipe will seat the valve 28 on port 4 and release the brakes. The engineer can avail himself of this operation of the devices by suddenly lowering the pressure in the train-pipe at will, and thus gain complete control of the brakes to release the same under all conditions where it is now found necessary to bleed the auxiliary reservoirs.

I do not herein broadly claim the method or means for actuating valve 28 from the air in the train-pipe, as the same is the subject-matter of a separate application; but,

Having thus described the nature, operation, and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. In an air-brake system, the combination, with a cylinder and an expansion-chamber or auxiliary reservoir, of a double-diaphragm valve having an exhaust-port and puppet-valve in one of its diaphragms, and an exhaust-port and secondary valve on the opposite side of the other diaphragm, substantially as and for the purposes specified.

2. A double diaphragm valve for air-brake systems, having a valve-seat between the diaphragms, and an exhaust port and valve in one of said diaphragms, substantially as and for the purposes specified.

3. In an air-brake system, the combination, with a cylinder and an expansion-chamber or auxiliary reservoir, of a double-diaphragm valve having a valve-seat between the diaphragms, an exhaust-valve in one of said diaphragms, an air-port leading from the auxiliary reservoir to the opposite side of the other diaphragm, and a secondary valve for controlling said ports, said secondary valve arranged to be actuated by the air-pressure in the train-pipe, substantially as and for the purposes specified.

4. In an equilibrio air-brake system, the combination of a cylinder, an auxiliary reservoir, and a valve-chamber, 9, connected with each other by the ports 1 2 3 4, and provided with exhaust-ports 6, a balanced valve, 13, puppet exhaust-valve 17, and secondary valve 28, substantially as and for the purposes specified.

In testimony whereof I affix my signature, in presence of two witnesses, this 15th day of February, 1888.

HERMAN GUELS.

Witnesses:
F. W. RITTER, Jr.,
EDWIN S. CLARKSON.