No. 803,564. PATENTED NOV. 7, 1905.

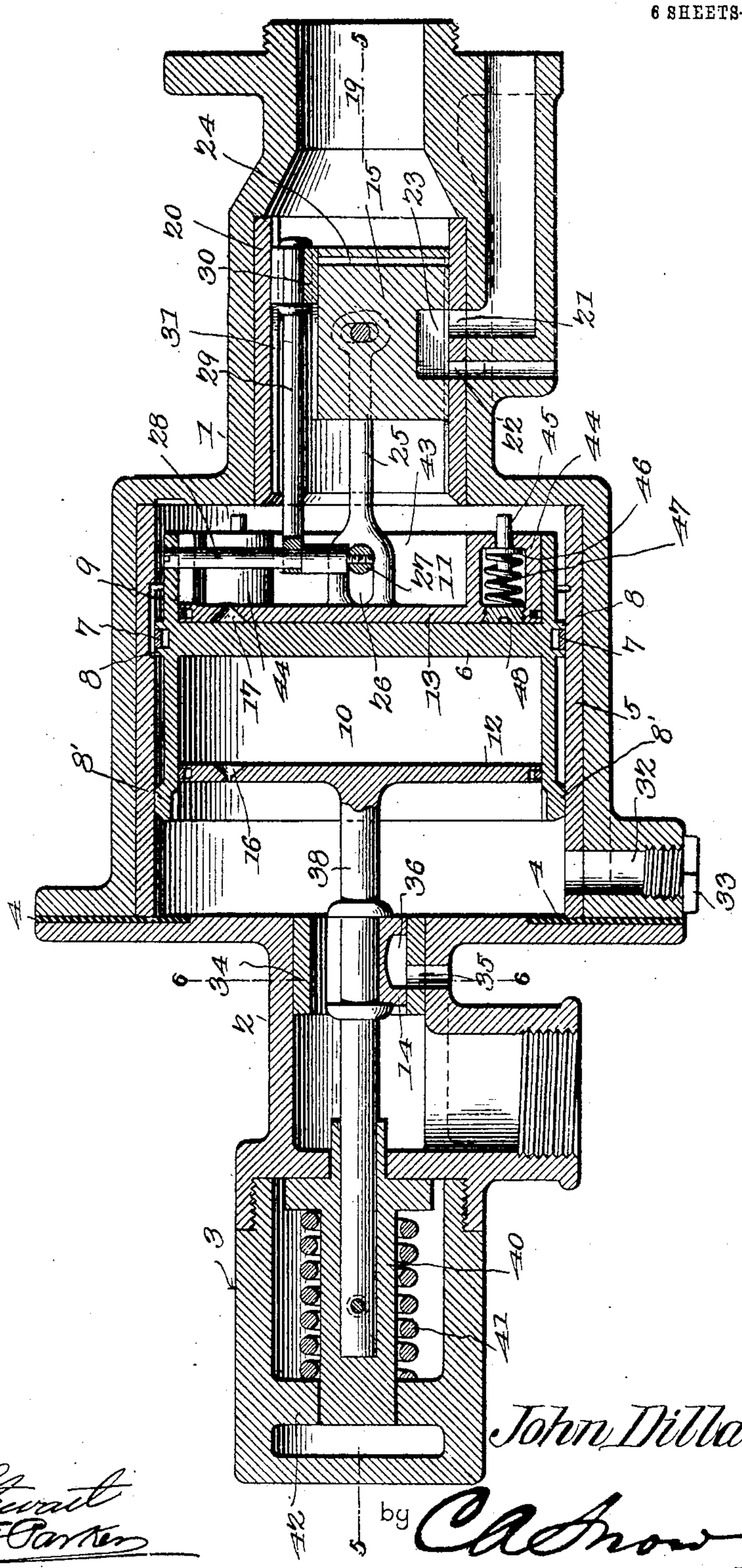
J. DILLANDER.

AIR BRAKE MECHANISM.

APPLICATION FILED OCT. 6, 1904.

6 SHEETS—SHEET 1.

Fig. 1.



Witnesses
E. F. Stewart
Jno. E. Parker

John Dillander,
Inventor,
by Church & Co
Attorneys

No. 803,564. PATENTED NOV. 7, 1905.

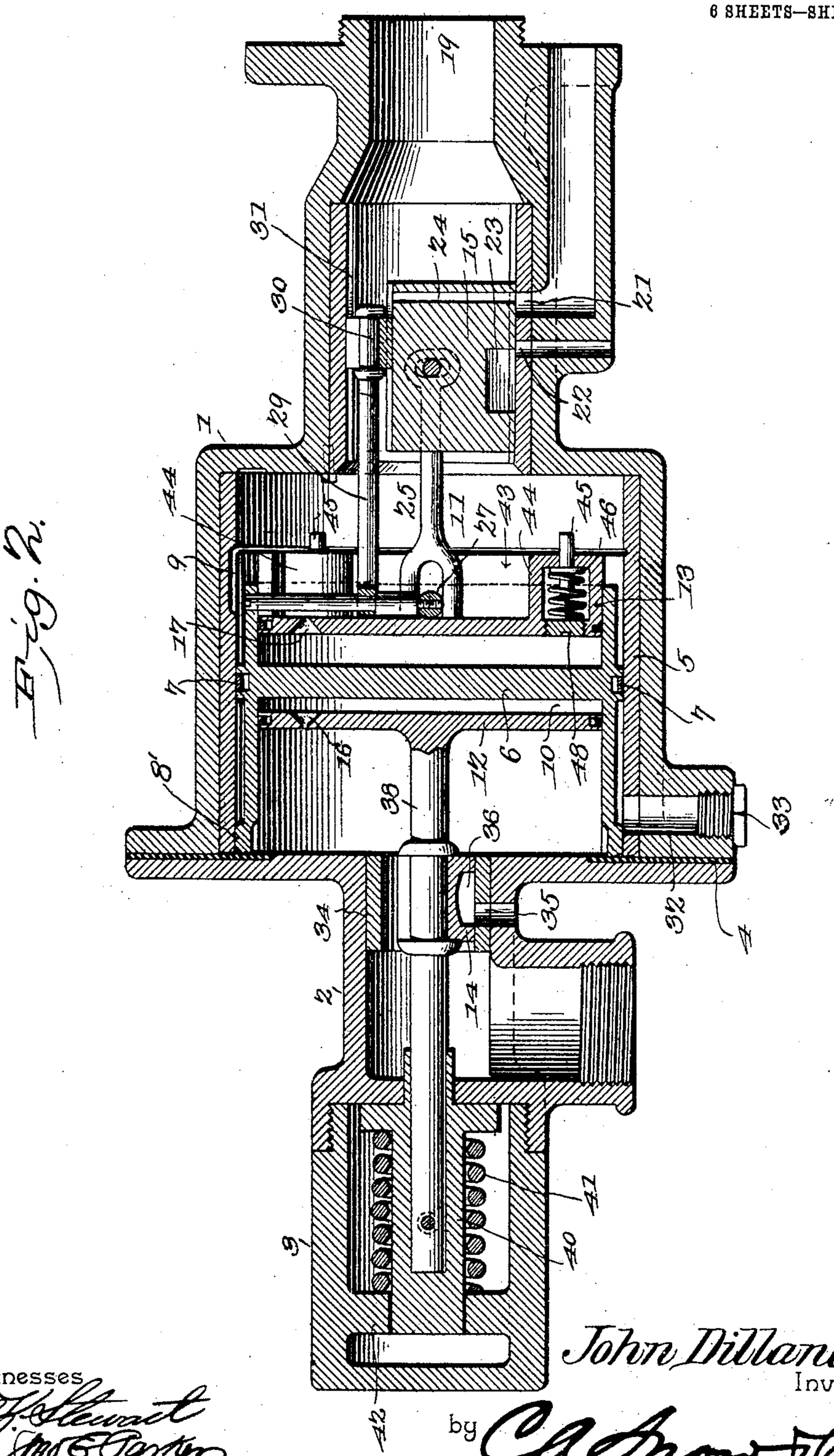
J. DILLANDER.

AIR BRAKE MECHANISM.

APPLICATION FILED OCT. 6, 1904.

6 SHEETS—SHEET 2.

Fig. 2.



Witnesses

E. F. Holcomb

Jno. E. Parker

John Dillander,
Inventor

by C. A. Snow & Co.
Attorneys

No. 803,564. PATENTED NOV. 7, 1905.

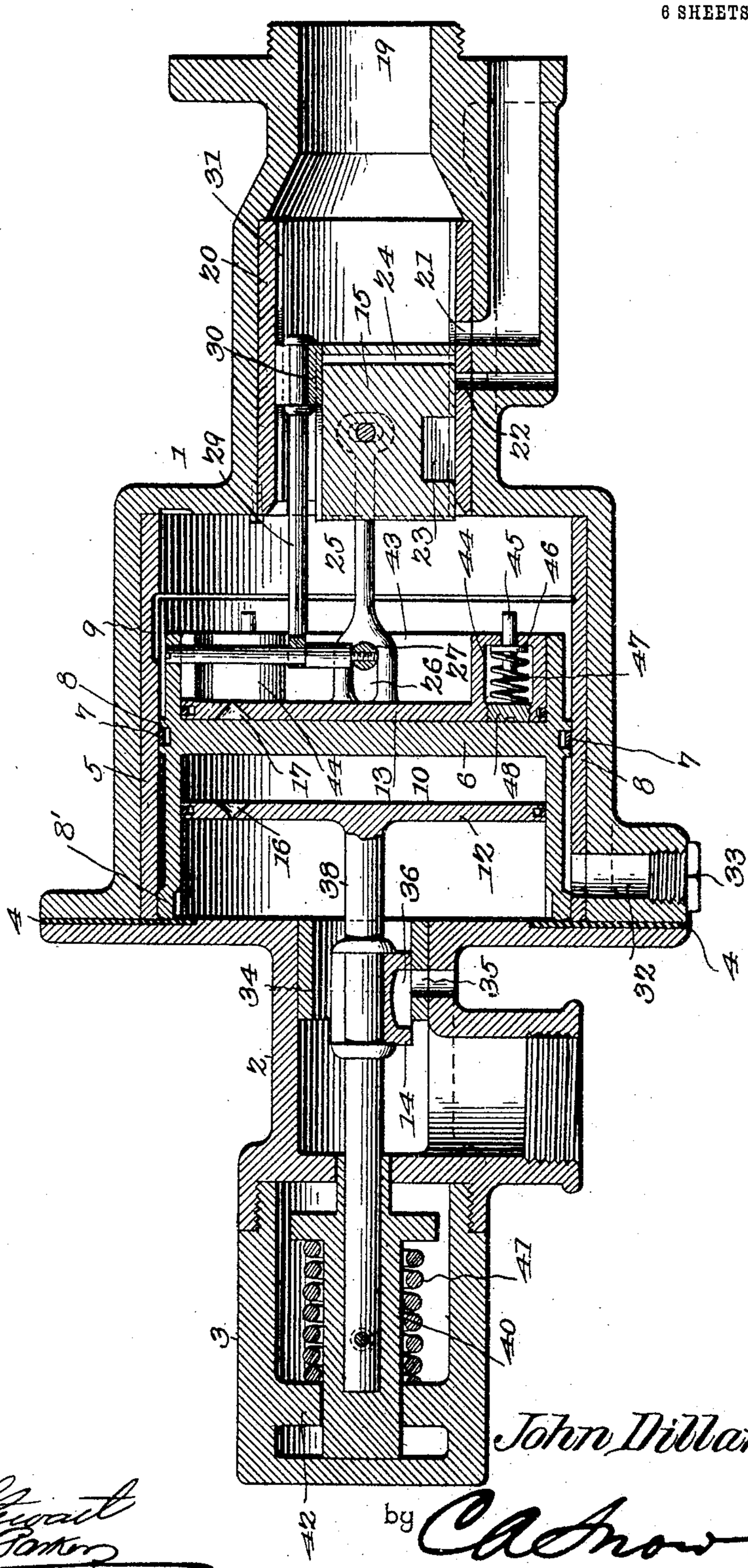
J. DILLANDER.

AIR BRAKE MECHANISM.

APPLICATION FILED OCT. 6, 1904.

6 SHEETS—SHEET 3.

Fig. 3.



Witnesses

E. F. Stewart

Jno. E. Parker

John Dillander,
Inventor,

by Cachow & Co.
Attorneys

No. 803,564. PATENTED NOV. 7, 1905.

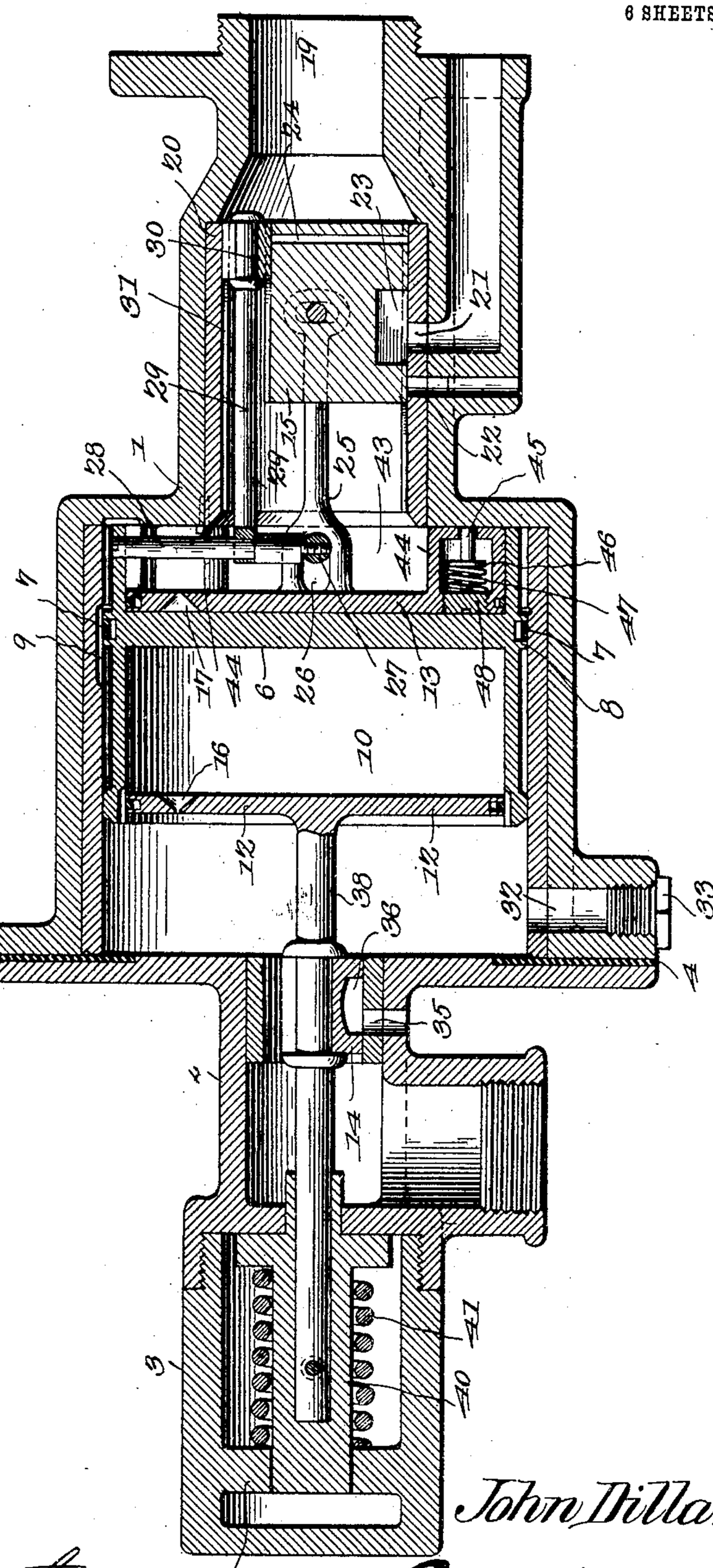
J. DILLANDER.

AIR BRAKE MECHANISM.

APPLICATION FILED OCT. 6, 1904.

6 SHEETS—SHEET 4.

Fig. 4.



Witnesses

E. F. Stewart

Jno. E. Parker

John Dillander,
Inventor,

by C. A. Snow & Co.
Attorneys

No. 803,564. PATENTED NOV. 7, 1905.

J. DILLANDER.

AIR BRAKE MECHANISM.

APPLICATION FILED OCT. 6, 1904.

6 SHEETS—SHEET 5.

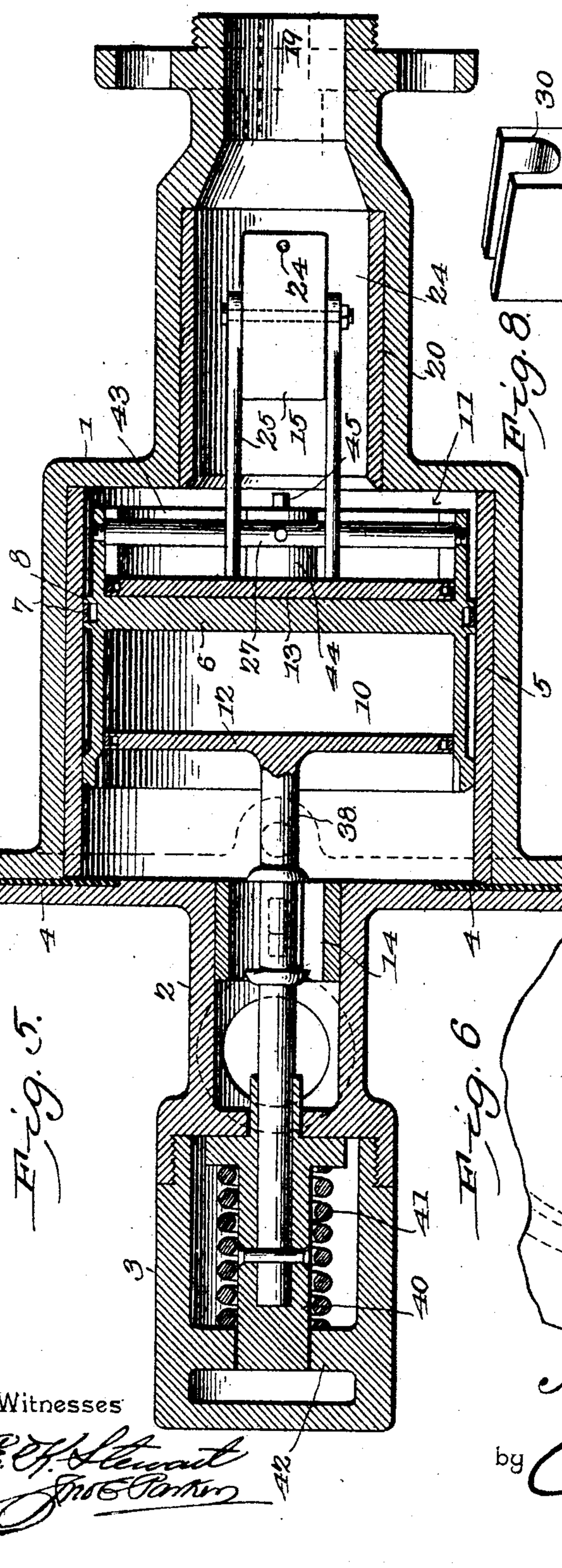


Fig. 5.

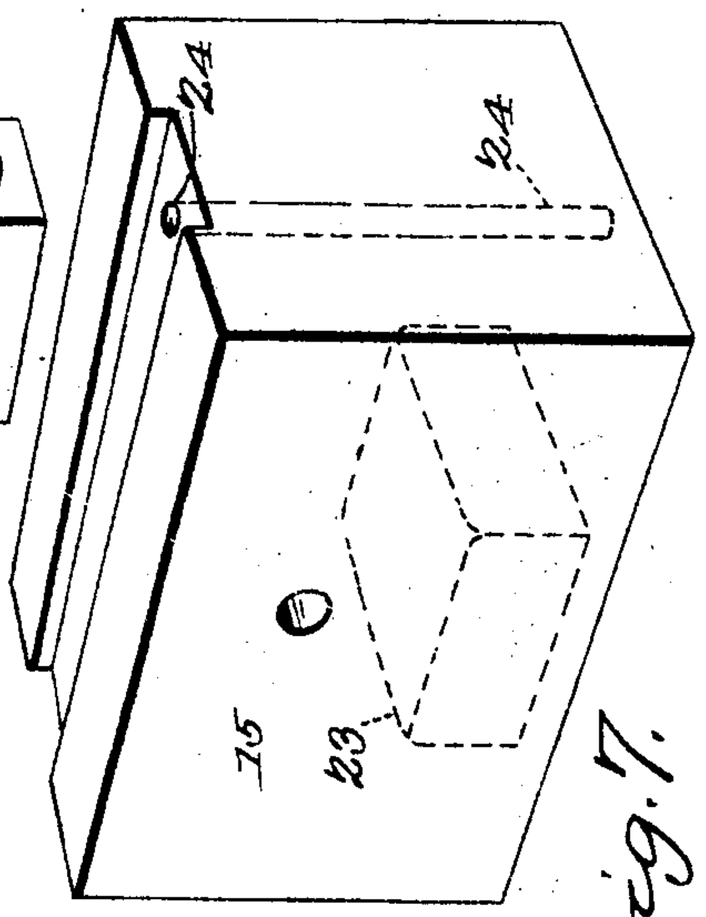


Fig. 8.

Fig. 7.

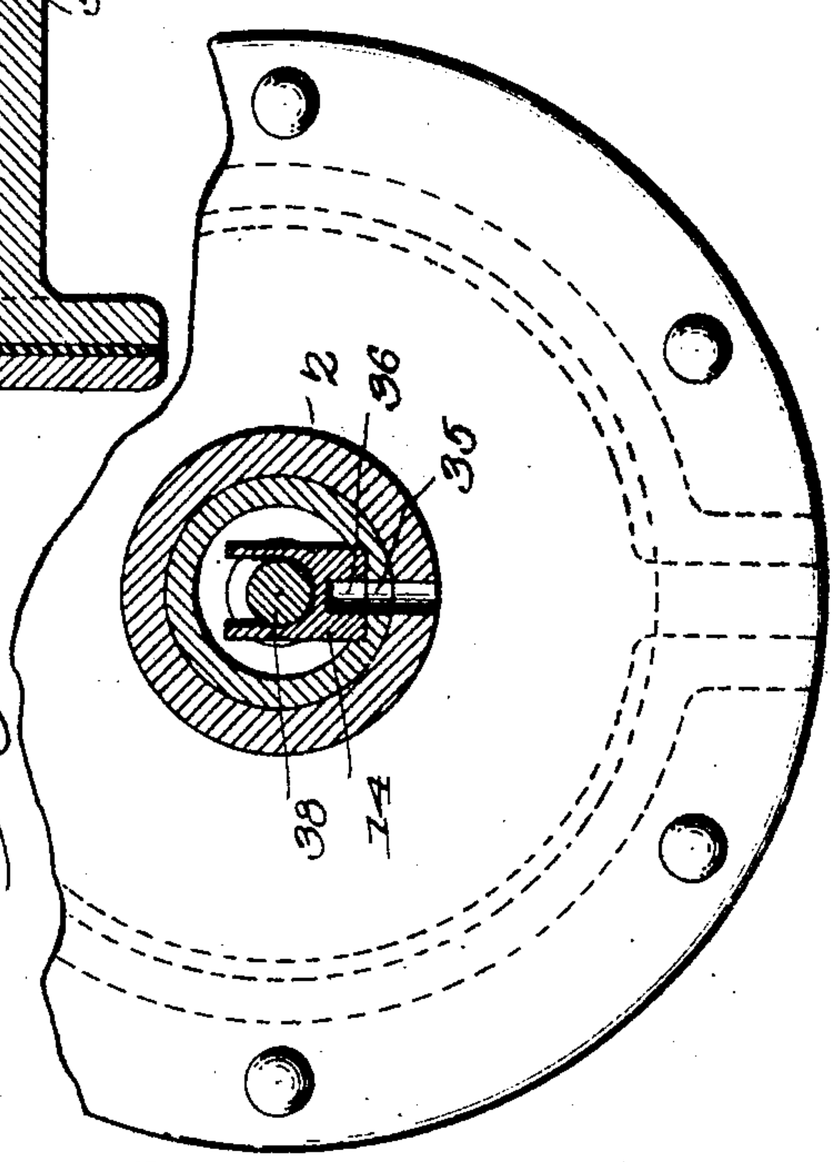


Fig. 6

Witnesses

E. F. Stewart

Jno. E. Parker

John Dillander,

Inventor

by Church & Co.

Attorneys

No. 803,564. PATENTED NOV. 7, 1905.

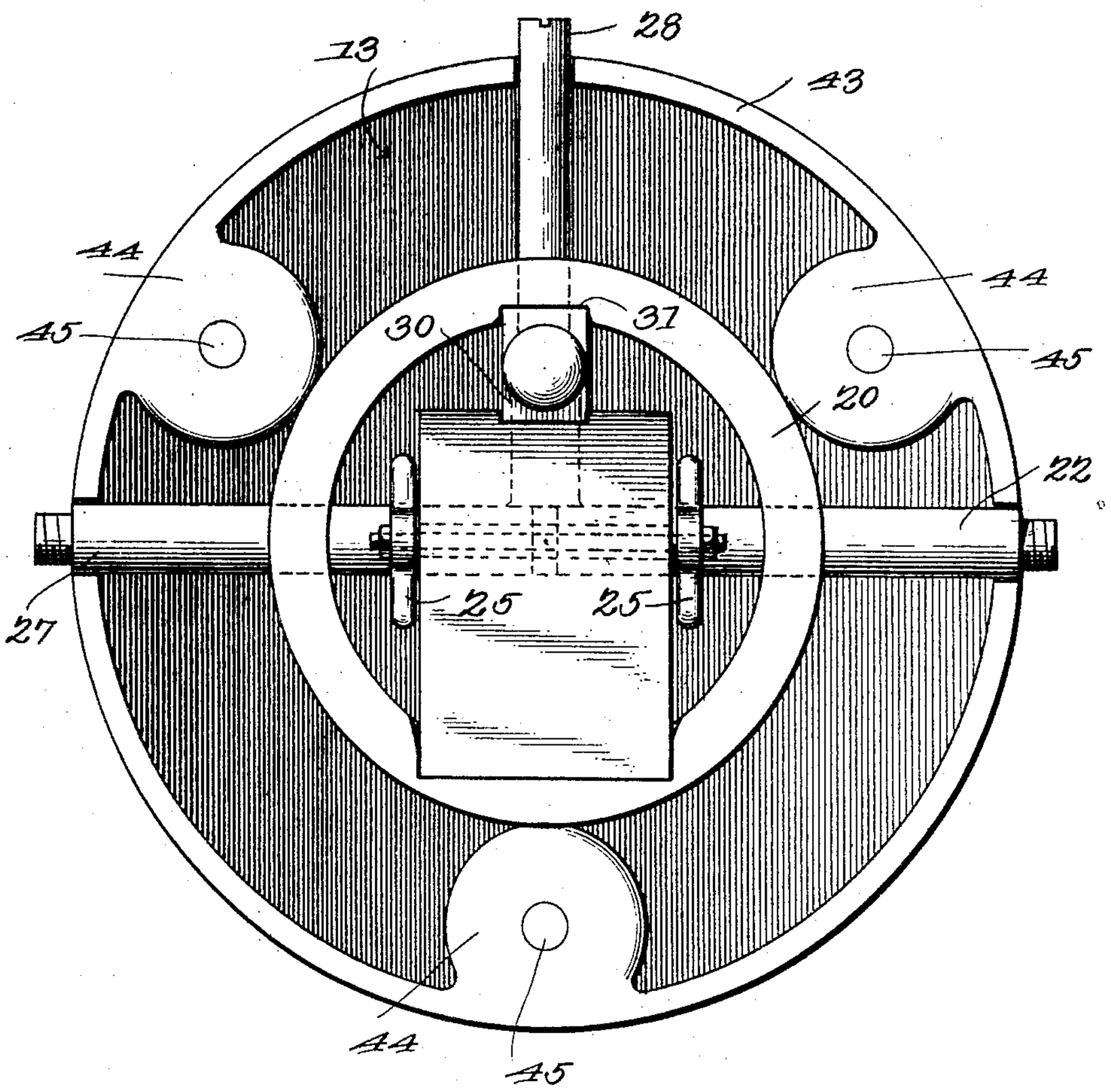
J. DILLANDER.

AIR BRAKE MECHANISM.

APPLICATION FILED OCT. 6, 1904.

6 SHEETS—SHEET 6.

Fig. 9.



Witnesses
E. C. Stewart
Jno E. Parker

John Dillander,
Inventor
by Church & Co
Attorneys.

UNITED STATES PATENT OFFICE.

JOHN DILLANDER, OF SAN FRANCISCO, CALIFORNIA.

AIR-BRAKE MECHANISM.

No. 803,564. Specification of Letters Patent. Patented Nov. 7, 1905.

Application filed October 6, 1904. Serial No. 227,432.

To all whom it may concern:

Be it known that I, JOHN DILLANDER, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Air-Brake Mechanism, of which the following is a specification.

This invention relates to air-brake mechanism, and particularly to the construction of a triple valve.

One object of the invention is to provide a triple valve in which the valve is movable to auxiliary-reservoir-recharging position under excess train-pipe pressure and automatically movable to brake-releasing position under reduction of such pressure.

A further object of the invention is to provide a triple valve, including a plurality of members and operating means connected to such members, the operating means being movable both successively and simultaneously.

A still further object of the invention is to provide a triple-valve mechanism capable of use on a single train-pipe line and which may be further used in connection with existing triple valves—that is to say, a portion of the train may be provided with triple valves of the ordinary construction without interfering with the use of the present valve on other cars of the train.

A still further object of the invention is to provide a triple-valve mechanism of such character as to provide for a local reduction of the train-pipe pressure at each car, so that the act of setting the brake on the first car of a train will reduce the pressure in the train-pipe and set the brakes on the next succeeding car, the action being serial throughout the entire length of the train.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in the novel construction and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a longitudinal sectional elevation of a triple-valve mechanism constructed in accordance with the invention, the parts being shown in running position and the brake-cylinder open to the exhaust. Fig. 2 is a similar view showing the parts adjusted to position for a graduated application of the brakes. Fig. 3 is a similar view showing the position assumed by the parts for an emergency application. Fig. 4 shows the parts in position for recharging the auxiliary reservoir while retaining the pressure in the brake-cylinder. Fig. 5 is a sectional plan view of the valve on the line 5 5 of Fig. 1. Fig. 6 is a transverse sectional elevation of a portion of the valve on the line 6 6 of Fig. 1. Fig. 7 is a detail perspective view of the main valve inverted. Fig. 8 is a similar view of the graduating-valve. Fig. 9 is an end elevation of some of the parts detached, illustrating particularly the bushing in which the valves slide, the main and graduating valves, and the main-valve-operating piston.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The casing of the valve is formed of three main sections 1, 2, and 3, the parts 1 and 2 being provided with bolting-flanges between which is a cushioning-ring 4 for the seating of the main piston. The parts 2 and 3 have a threaded connection.

Within the section 1 of the casing is a cylindrical lining 5, within which fits a main piston 6, provided with a suitable packing-ring 7, the ring being disposed in a peripheral groove formed in a slightly-enlarged annular flange 8, that forms a part of the piston, and at one end of the piston is a projecting annular flange 8′, serving as an additional guide therefor. In the inner wall of the cylinder 5 is a leakage-groove 9, through which the air passes from the train-pipe to the auxiliary reservoir in the ordinary manner when the parts are in the position shown in Fig. 1. The main piston 6 is provided with a pair of oppositely-disposed annular flanges, forming a pair of cylinders 10 and 11. Within the cylinders are pistons 12 and 13, respectively, the piston 10 being connected to a train-pipe valve 14 and the piston 11 being connected to the main valve 15. In the piston 12 is formed a contracted opening 16, through which the air may equalize into the cylinder 10, and this piston fits rather loosely within its cylinder, so that there will be comparatively little frictional resistance to the independent movement of either the piston or the cylinder.

In the piston 13 is formed a contracted opening 17, through which the air-pressure may equalize into the cylinder 11, and this open-

ing, as well as the opening 16, is of such small area that in the event of sudden reduction of train-pipe pressure, such as an emergency reduction, the air will not have time to equalize through the small openings, but all three of the pistons will move simultaneously and as though forming a unitary structure. Should the air-pressure be gradually reduced, the air will have time to equalize through these small openings, and then the pistons are allowed to move independently of each other.

Immediately in advance of the auxiliary-reservoir connection 19 the portion 1 of the casing is provided with a lining 20, the edge of which is chamfered or beveled to facilitate the introduction of the valves. In this lining are formed two ports 21 and 22, the port 21 being connected to the brake-cylinder and the port 22 leading direct to the outer air. The lining 20 forms a valve-seat for the reception of the main valve 15, and said main valve is provided with an exhaust-port 23, which normally assumes the position shown in Fig. 1, and it is further provided with a small graduating-port 24, which may be adjusted to the position shown in Fig. 2 in order to effect a graduated application of the brake. The valve 15 is connected to the piston 13 by means of a pair of bars 25, having vertically-elongated openings for the passage of a connecting-bolt. These bars are in the same horizontal plane with the center of the piston 13, so that in operation there will be a direct pull or push at the center of the piston without danger of the latter sticking in the cylinder. The two bars are provided with longitudinal slots 26, through which extends a transversely-disposed bar 27 extending diametrically across the cylinder 11, and to the wall of the cylinder 11 is secured a radial bar 28. The radial bar 28 is connected to the stem 29 of the graduating-valve 30, the latter being mounted on the main valve and serving to control the opening and closing of the graduating-port 24. The graduating-valve is further guided by a longitudinal slot 31, formed in the upper portion of the lining 20. The train-pipe connection leads directly into the section 2 of the casing, the usual drip-chamber being dispensed with in order to avoid the tortuous passages through which the air usually flows in devices of this class, it being found that such passages materially interfere with the effectiveness of ordinary brakes. Provision is made for draining the main cylinder direct, the casing being provided with a threaded opening 32, which may be closed by a small threaded plug 33 when the device is in operation.

The section 2 of the casing is provided with a lining 34, having a port 35 leading directly to the outer air, and this lining is faced to form a seat for the train-pipe-opening valve 14, the latter having a cavity 36, which at times may be moved to the position shown in Fig. 3 in order to allow the train-pipe pressure to exhaust to the outer air, and thus secure a local air reduction at each triple valve. This results in a serial action of the brakes throughout the length of the train and avoids the danger usually incurred in long trains by the movement of the brakes at the forward end of the train to release position by the air surging through the train-pipe to the engineer's brake-valve and other difficulties which are well known to exist in the use of triple-valve mechanisms of the usual construction.

The piston 12 is connected to a stem 38, that extends through the wall of the section 2 of the casing, and its opposite end within the section 2 of the casing is rigidly secured to a flanged sleeve 40. Around the sleeve is arranged a compression-spring 41, one end of which bears against the flanged sleeve, while the opposite end bears against a small partition 42, formed integral with the section 3 of the casing. This spring serves to retard movement of the piston 12, and especially to prevent such movement of the piston and valve 14 as will result in the lowering of train-pipe pressure through said valve on ordinary applications of the brake.

In order to prevent binding of the piston 13, said piston is preferably provided with a peripheral flange 43, which is cut away at points for the passage of the bars 27 and 28. Near the periphery of the pistons are arranged a series of pockets 44, in which are placed pins 45, one end of each of the pins projecting out through a guiding-opening formed in the rear wall of the pocket and adapted to engage against a vertical portion of the casing when the valve is moved to retaining position shown in Fig. 4. On each of the pins is an enlarged flange 46, between which and the front wall of the pocket extends a spring 47, tending normally to project the end of the pin in the direction of the main valve. The spring-pockets are closed by plugs 48, which may be readily removed when repairs are necessary.

In operation, the parts being in the position shown in Fig. 1 and it being desired to make an ordinary graduated application of the brakes, the train-pipe pressure is gradually reduced in the usual manner and the pressure equalizes from cylinder 10 through the port 16 to the train-pipe. At the same time the auxiliary-reservoir pressure equalizes through opening 17 into the cylinder 11. The main piston thereupon moves slowly away from the auxiliary reservoir, carrying with it the graduating-valve and exposing the upper end of the graduating-port 24. As the movement continues the cross-bar 27 will engage against the face of piston 13 at the inner ends of the slots 26, and then the two pistons 6 and 13 will travel together to the position shown in Fig. 2, the main piston being cushioned by the ring 4, which is preferably formed o f

leather or similar material, and the graduating-port 24 being moved into alinement with the brake-cylinder 21 and allowing the air to flow from the auxiliary reservoir to the brake-cylinder. When the reduction of auxiliary-reservoir pressure is sufficient, the train-pipe will again equalize through opening 16, and the main piston will be moved in the opposite direction, closing the graduating-valve and retaining the pressure in the brake-cylinder. During this movement the frictional resistance to the movement of the main valve 15 causes the latter to remain in the position shown in Fig. 2. Should a second application be required, the main piston will again move to the left on suitable reduction of the train-pipe pressure.

For an emergency application of the brakes the train-pipe reduction is initially accomplished by movement of the engineer's brake-valve to emergency position, and the pistons 6, 12, and 13 on the first car of the train will all move bodily toward the left until they assume the position shown in Fig. 3. This opens the port 21 and the air rapidly equalizes into the brake-cylinder from the auxiliary reservoir. This movement of all of the pistons simultaneously is due to the fact that when a sudden reduction is made there is not sufficient time for the air to equalize through the comparatively small openings 16 and 17, and all of the pistons are therefore compelled to move as one, and the brakes are quickly applied. During movement of the pistons to the left end on emergency reduction air cannot quickly escape from the cylinder 10, and the resultant movement of the piston 12 to the left compresses the spring 41 and results in movement of the train-pipe valve 14 to the position shown in Fig. 3, whereupon the train-pipe is open to the outer air through the port 35, and a local reduction of train-pipe pressure results at the first car. This local reduction is sufficient to start the brake on the next succeeding car, and the operation of the second triple valve will result in a second local reduction of train-pipe pressure and will set the brake on the third car, there being a serial action throughout the train with no surging of the air from the rear end of the train toward the usual exhaust-port at the engineer's brake-valve. The spring 41 again expanding to its initial position forces the valve 14 and the piston 12 to the position shown in Fig. 1, the air slowly escaping through the port 16 to permit its movement, so that the opening of the train-pipe is merely momentary, and the pipe may therefore be quickly charged from the main reservoir. It will be seen that under all circumstances either for gradual or for emergency reductions the main piston 6 has a uniform stroke, the stroke being completed when it seats against the cushioning-ring 4, while the extent of movement of the remaining pistons is governed entirely by the extent of reduction of train-pipe pressure and the quickness with which such reduction is accomplished.

Should the engineer desire to retain the pressure in the brake-cylinder and at the same time recharge the auxiliary reservoir whether the train-cylinder is charged from one or more applications, either graduated or emergency, he moves his engineer's brake-valve to full-release position, and the sudden and heavy recharging of the train-pipe forces the parts to the position shown in Fig. 4, the ported main valve quickly passing over the exhaust-port 22 and permitting only a slight and immaterial reduction of brake-cylinder pressure. At this time the leakage-groove is open and air may pass from the train-pipe to the auxiliary reservoir. The projecting ends of the pins 45 engage against the fixed wall of the casing, and the springs 47 are all compressed and are held compressed and the parts remaining in the position shown in Fig. 4 so long as the engineer's brake-valve is in the full-release position, inasmuch as the air cannot pass through the leakage-groove to the auxiliary reservoir as fast as the train-pipe can be recharged. To release the brake, the engineer places his brake-valve on lap or in running position, and the reduction from the release pressure is such that the springs 47 will immediately move the parts to the position shown in Fig. 1 and permit the air to pass from the brake-cylinder.

One of the principal difficulties found in ordinary triple valves is that in the event of the valve being sticky it will cling to its seat and will not move under a light reduction of train-pipe pressure and at times the valve will hold all of the parts from movement, until a second and sometimes a third reduction is made, whereupon the excess pressure on the storage-reservoir side of the equalizing-piston is so great that when the slide-valve moves the piston and all attached parts fly to the emergency position, and the result is that the brakes are all set, or probably only one, and if an emergency application is made at only one point in the train the latter is generally parted. In the present case there are no springs or other devices to resist movement of the main valve, and if a slight reduction is made and the main valve be dirty the valve will of course be held to its seat; but the main piston and the graduating-valve will be moved and the piston 6 will therefore be separated from the piston 13, and if these two pistons are separated it becomes impossible for the valves to move to the emergency position, as in an emergency application the two pistons must retain the relation shown in Fig. 1 and move simultaneously. This construction therefore positively prevents an unintentional emergency application of the brakes.

The main or equalizing piston is moved to the end of its stroke under all reductions,

while the main valve has two different extents of travel. The movement for an emergency application is obtained without the employment of any momentary check-valve, as usually practiced, and when the emergency-port is opened it stays open, and while this port is large enough to allow instant equalization of storage-reservoir and brake-cylinder the equalization of pressure will not close the main port, but will remain open until the main or equalizing piston and attached parts are restored to initial position

When the brakes are applied for a graduated application, the left end of the main piston gently seats against the cushioning-ring 4, and when the brakes are applied in the emergency application the air in the cylinder 10 is caught between the pistons 6 and 12, so that spring 41 acts as a cushion and allows the piston 6 to seat gently on the cushion 4. The latter seat further prevents auxiliary-reservoir pressure from escaping to the atmosphere should the train-pipe become defective or the train part while the brakes are applied. Should the train part while the brakes are off, the reduction due to the opening of the train-pipe will automatically set the brakes and the seating of the pistons on the cushion 4 will prevent the escape of pressure to the open train-pipe, or should the packing-ring 7 leak when the brakes are set from any cause this leather seat will still retain the auxiliary-reservoir pressure.

If in applying the brakes the train-line is not reduced faster than storage-reservoir pressure can equalize through the passage 17 into the cylinder 11, the brakes cannot be set in an emergency application, as the pistons 6 and 13 will be separated to the extent shown in Fig. 2, and in this case the main valve falls short of the travel of the piston 6 to the extent that the pistons 6 and 13 are separated, so that the graduating-port 24 only can admit air to the brake-cylinder. However, after the auxiliary-reservoir pressure has partly equalized into the brake-cylinder sufficient to allow the piston 6 to lap the graduating-valve the emergency application of the brakes can be made by making an emergency reduction in the usual way.

One of the principal advantages of the present valve is that it may be employed without interfering with the working of the triple valves now in use and can be operated with the ordinary engineer's brake-valve. It is further of such construction as to be wholly under the control of the engineer, and the latter requires no assistance from other members of the train crew in effecting any desired application of the brakes or obtaining the release of brake-cylinder pressure.

Having thus described my invention, what is claimed is—

1. In air-brake mechanism, a triple valve movable to auxiliary-reservoir-recharging and brake-cylinder-pressure-retaining position under full-release pressure, and an auxiliary means having a fixed limit of operative movement for automatically moving the valve to brake-cylinder-exhaust position under reduction of said pressure.

2. In air-brake mechanism, a recharging triple valve having a main valve movable beyond brake-cylinder-exhaust position under full-release pressure, and an auxiliary means having a fixed limit of operative movement for returning said valve to brake-cylinder-exhaust position when the pressure is reduced.

3. In air-brake systems, a main valve movable under full-release pressure to a position beyond brake-cylinder exhaust, a main piston movable under the same pressure to auxiliary-reservoir-recharging position, and means for returning the valve to brake-cylinder-exhaust position on equalization of the pressure, while the piston still maintains feed position.

4. A recharging triple valve movable under excess pressure to blank the brake-cylinder port, and an auxiliary means having a fixed limit of operative movement for moving the valve to brake-cylinder-exhaust position on reduction of such pressure.

5. In air-brake mechanism of that type in which the brakes are set by the reduction of train-pipe pressure and equalization of auxiliary-reservoir pressure into the brake-cylinder, a main valve having an excess movement beyond brake-cylinder-exhaust position, and returnable to brake-cylinder-exhaust position on reduction of train-pipe pressure, and an auxiliary means for insuring such return movement.

6. In a recharging triple valve, a main valve movable to auxiliary-reservoir-recharging and brake-cylinder-pressure-retaining position under full-release pressure, and a spring for restoring the valve to brake-cylinder-release position, said spring being placed under stress when the parts are subjected to full-release pressure.

7. In a triple valve, a main valve, a graduating-valve, means for moving the main valve to brake-cylinder blanking, and auxiliary-reservoir-recharging position when subjected to full-release pressure, and a spring for restoring the main valve to brake-cylinder-exhaust position when relieved from full-release pressure.

8. In triple-valve mechanism, a casing having a valve-guiding groove and provided with a valve-seat, a main valve disposed in said seat, a graduating-valve carried by the main valve, and guided partly by said groove, and independent operating mechanisms for the two valves.

9. In a triple-valve mechanism, a main valve, a graduating-valve, a piston connected to the graduating-valve and provided with a cylinder, a second piston arranged within the cylinder and connected to the main valve,

pockets arranged within the second piston, spring-pressed pins disposed in said pockets and adapted to engage against portions of the fixed casing when the parts are moved to re-charging position, said springs serving to move the pistons and valves to release position on the reduction of train-pipe pressure.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN DILLANDER.

Witnesses:

FRANK J. BURKE,

RICHARD DEMINGS.