W. F. J. CASEY & G. CAVIN.

REVERSING GEAR FOR LOCOMOTIVES AND THE LIKE.

APPLICATION FILED JULY 16, 1913.

1,082,733.

Patented Dec. 30, 1913.

2 SHEETS—SHEET 1.

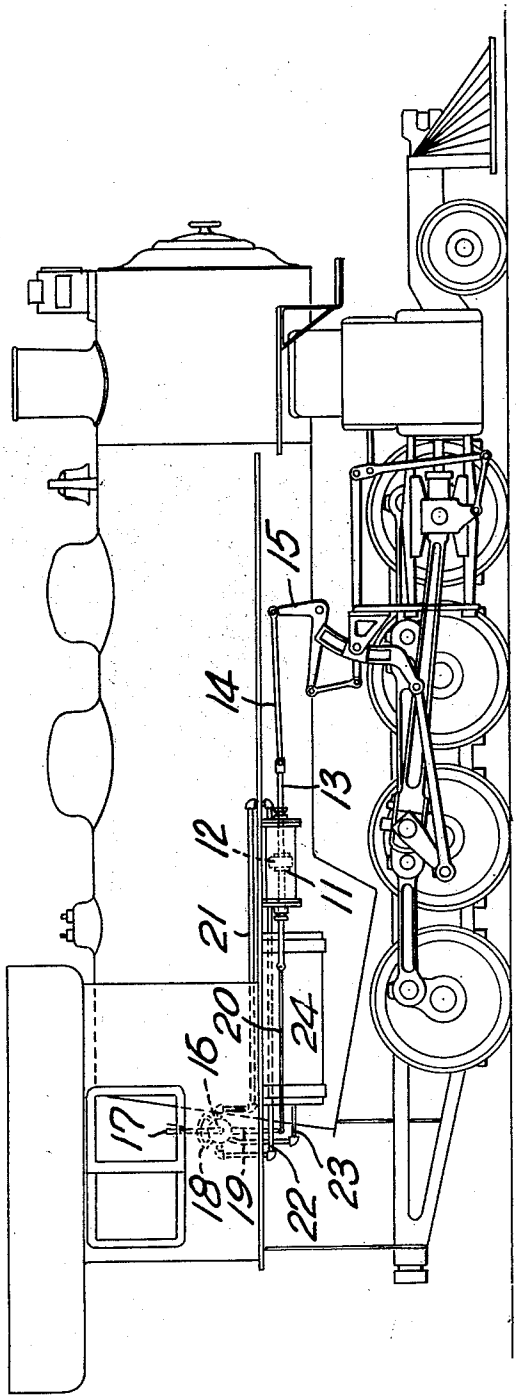


FIG. 1.

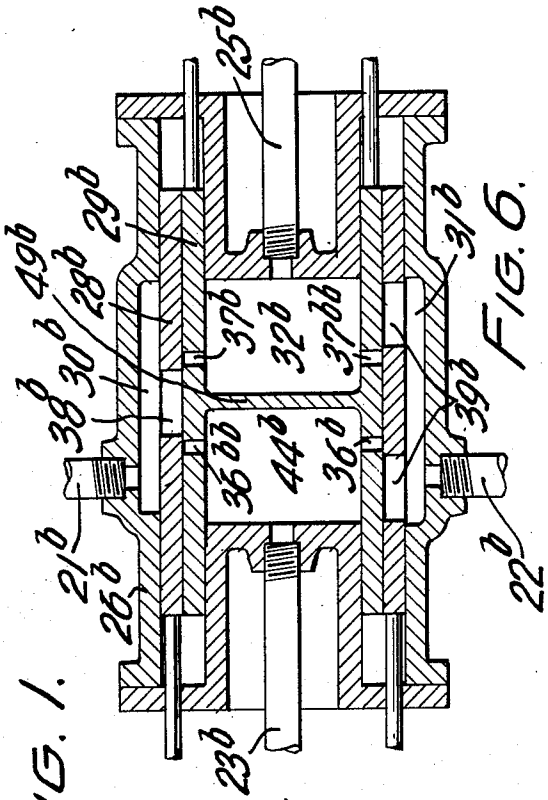


FIG. 6.

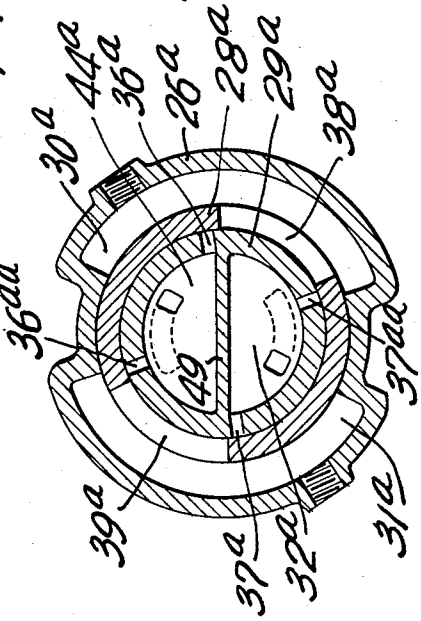


FIG. 5.

Witnesses

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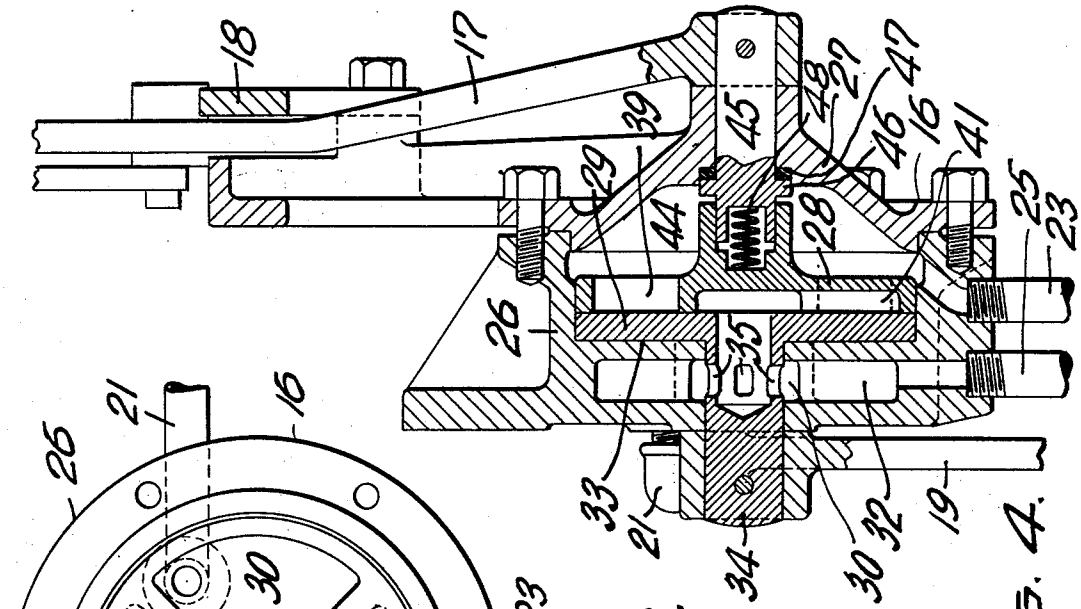


FIG. 4.

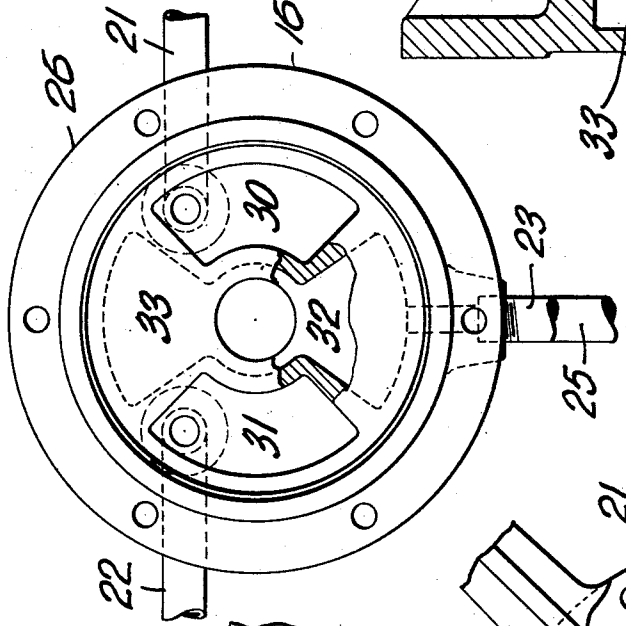


FIG. 3.

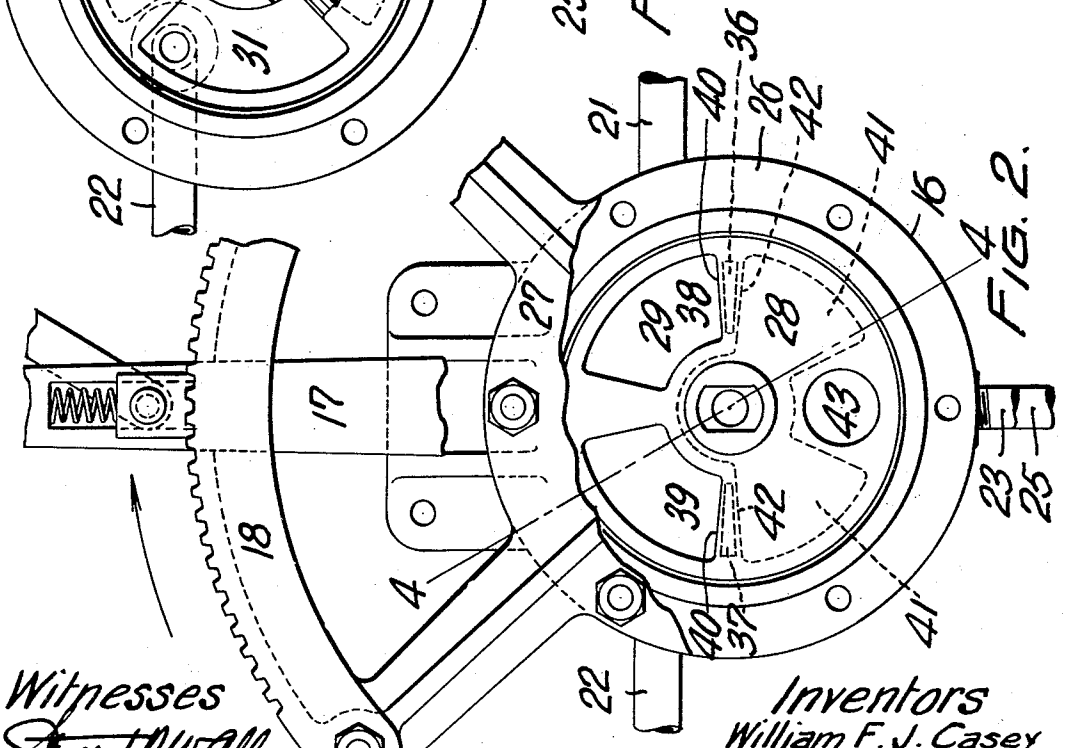


FIG. 2.

Witnesses

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REVERSING-GEAR FOR LOCOMOTIVES AND THE LIKE.

1,082,733. Specification of Letters Patent. Patented Dec. 30, 1913.

Application filed July 16, 1913. Serial No. 779,360.

To all whom it may concern:

Be it known that we, WILLIAM F. J. CASEY and GUSTAVE CAVIN, both subjects of the King of Great Britain, and residents of the city of Kingston, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Reversing-Gear for Locomotives and the like, of which the following is a full, clear, and exact description.

This invention relates to improvements in reversing gear for locomotives and the like, and the object is to provide a simple, inexpensive and reliable mechanism for shifting the valve gear by steam or air pressure to effect reversing of the engine.

A further object is to provide a device of this character which will adjust itself automatically to compensate for any loss of pressure through leakage.

A still further object is to provide a device in which the controlling lever occupies the same position and has the same movement as the ordinary type of hand reversing lever.

Another object is to provide a device which will occupy a very small space in the locomotive cab and which may be operated with the greatest ease.

To accomplish these objects, a cylinder is provided containing a fluid operated piston arranged to shift the links of the valve gear. A valve is provided containing two independently movable disks, one operated by a hand lever and the other operated by the piston. Suitable connections are provided for conveying the fluid pressure to and from the valve and to and from both ends of the cylinder.

In the drawings which illustrate the invention:—Figure 1 is a side elevation of a locomotive showing the device in position thereon. Fig. 2 is a side elevation of the valve with the cover of the casing removed. Fig. 3 is a view similar to Fig. 2, showing both disks removed. Fig. 4 is a vertical section on the line 4—4, Fig. 2. Fig. 5 is a sectional view showing an alternative form of valve structure. Fig. 6 is a sectional view showing a further alternative form of valve structure.

Referring more particularly to the drawings, 11 designates a cylinder having therein a piston 12 normally occupying a position midway between the ends of the cylinder and mounted on a rod 13 extending through both ends of the cylinder. One end of the piston rod 13 is connected by a tension bar 14 with one extremity of a bell-crank lever 15, the opposite extremity of which is connected to the valve gear. Within the cap, a valve 16 is provided having a manually operated lever 17 coöperating with the quadrant 18, and an independently movable lever 19 connected by a light tension bar 20 with the opposite end of the piston rod 13 from the tension bar 14. Pipes 21 and 22 convey fluid between the two sides of the valve and the ends of the cylinder, as is clearly shown. The valve receives fluid under pressure through a pipe 23 either from the air reservoir 24 or from the boiler. The fluid is exhausted from the valve through a pipe 25 into the outer air.

The valve, which has been designated as a whole by the numeral 16, comprises a circular body 26 having a cap 27 and containing two superposed valve disks 28 and 29, the upper disk 28 being connected with the manual lever 17 and the lower disk 29 with the lever 19, as is clearly shown in Fig. 4. The bottom of the body is flat and provided with a pair of diametrically opposite recesses or chambers 30 and 31, which are connected respectively to the pipes 21 and 22, as shown in Fig. 3. Between these chambers, the body is cored out to form an exhaust chamber 32 extending diametrically across the body at right angles to the arrangement of the chambers 30 and 31. This exhaust chamber 32 is formed under the bottom 33 of the body, which forms a seat for the valve 29. This exhaust chamber 32 communicates with the exhaust pipe 25.

The valve 29 consists of a thin flat disk mounted on a hollow spindle 34, which passes out of the body through the exhaust chamber 32. Ports 35 are formed in the spindle connecting the hollow interior thereof with the exhaust chamber 32. Passing through the body of the valve 29 from top to bottom, two diametrically opposite and radially disposed ports 36 and 37 are formed in position to register with the chambers 30 and 31.

The upper valve 28 consists of a disk having two large ports 38 and 39 formed therethrough on one side of a diameter. These ports occupy between them approximately one-third of the surface of the valve, and their remote edges 40 are formed in such a position that the upper valve may be set to

cover body ports 36 and 37 of the lower valve with a very narrow margin of lap. The remainder of the valve is hollowed out on the underside to form an exhaust chamber 41. The opposite edges 42 of this chamber are so arranged that when the upper valve is set to connect either of its ports with the ports of the lower valve, the exhaust chamber 41 will also be out of communication with these lower valve ports by a narrow margin of lap, as will be clearly seen from Fig. 2. This position is the normal condition of the valve. For the more perfect seating of the lower valve 29, an aperture 43 may be formed through the upper valve separated from the exhaust chamber 41, so that fluid pressure against the valve 29 through the ports 38 and 39 will be to some extent equalized by pressure through the opening 43. The motive fluid used enters the casing through the pipe 23 and occupies all the space 44 between the upper valve 28 and the cap 27, thus holding the valve to its seat. This upper valve 28 is connected to the manual lever 17 by means of a spindle 45 rigidly secured at one end to the lever and polygonally formed at the opposite end, so as to have axial but not rotative movement with respect to the valve. A collar 46 is formed on this spindle and the packing 47 is compressed between the valve and spindle, and also by fluid pressure against the bottom of the spindle.

When the device is set to the neutral position all the parts are as shown in the drawings. If the manual lever is moved in the direction of the arrow, Fig. 2, the disk 28 is rotated relatively to the disk 29, so that the ports 36 and 38 communicate on one side of the center and the port 37 and the exhaust chamber 41 communicate on the other side of the center. The fluid pressure on top of the valve 28 passes through the port 36 into the chamber 30 in the valve body, and escapes through the pipe 21 to one end of the cylinder 11. At the same time, the fluid in the opposite end of the cylinder escapes through the pipe 22 into the chamber 31, through the port 37 into the exhaust chamber 41 of the upper valve, and from thence through the hollow spindle of the lower valve into the exhaust chamber 32 and out through the pipe 25. In this way, as will be clearly seen, pressure is applied to one side of the piston and released on the opposite side, so that the piston moves and by reason of the connections shifts the valve gear. When the upper disk 28 was rotated by means of the hand lever 17, this lever was locked in a certain position by coöperation with the quadrant 18 in the usual manner, so that the valve disk was locked against rotary motion. As the piston moves in the cylinder, it rotates the lower valve disk 28 through the medium of the lever 19 and tension rod 20, causing the lower disk to follow the upper disk until the two disks assume their original relation, that is, with the ports 36 and 37 of the lower disk out of register with the ports and exhaust chamber of the upper disk. This movement of the lower disk cuts off the fluid pressure from the cylinder and also prevents the escape of fluid from the opposite side of the piston, so that the piston is locked at a point in the cylinder corresponding to the position of the lever 17 on the quadrant 18. If by reason of the weight of the valve gear, impetus of the piston or unequal pressures in the cylinder, the piston should travel sufficiently to reverse the communication of the valve ports, fluid will be admitted where previously exhausted and exhausted where previously admitted, so that the piston will retrace its path until the cut off is again effected and the disk 29 brought into its normal register with respect to the disk 28. The pressures on opposite sides being then equalized, the pistons would be held practically immovable. If by reason of extreme loads on the device or extraordinary vibration, the piston traveled too far on the return movement, the valves would be arranged as first described and the piston driven a short distance in the direction first named. It will be readily seen, however, that these excess movements of the piston would rapidly diminish so that the device would come to rest very soon at the desired point. It will also be seen that the sensitiveness of the device depends largely on the fluid tightness of the joints in the valves and on the narrowness of the lap on each side of the ports 36 and 37. Should there be any leakage of fluid pressure from either end of the cylinder or the connecting pipes or valve, an unbalanced pressure will result in the cylinder causing a shifting of the piston, which will correspondingly move the valve disk 29 and admit sufficient fluid to restore the device to proper position.

Owing to the manifold advantages of compressed air as a motive power and its present use on locomotives, it is probable that this device will be used more often with air than otherwise. It may, however, be used equally well with steam as a motive power, and will maintain its efficiency with this motive fluid as indefinitely as with compressed air. When left a considerable time in one position, the steam would naturally condense in the cylinder 11, but this condensation has no detrimental effect whatever as the vacua produced by condensation are proportionate to the steam pressures, and therefore hold the piston rigid. It is obvious that the device will work equally well with liquid pressure or with any fluid pressure other than those previously mentioned.

While the preferred form of structure has

been described, it is obvious that a large number of changes may be made in the form of the valve without departing from the spirit of the invention. Two such modifications are shown in Figs. 5 and 6. In Fig. 5, concentric cylindrical sleeves relatively revoluble are substituted for the disks and mounted within the casing 26ª. The outer sleeve 28ª corresponds with the upper valve disks 28 and the inner sleeve 29ª with the lower valve disk 29. This inner sleeve is divided by a diaphragm 49 into pressure and exhaust chambers 44ª, and 32ª corresponding with similar parts of the preferred form. The various ports, etc., in this form are numbered to correspond with the form previously described, and will therefore require no further description. The form shown in Fig. 6 consists of two concentric sleeves which may be cylindrical or of any other form, having relative sliding movement in an axial direction but no relative rotary movement. The relation of these parts is substantially the same as in Fig. 5 being all distinguished by the letter "b" and numbered to correspond with similar parts of the preferred form, so that further description will not be required. In this form, the inner sleeve 29ᵇ is provided with a partition 49ᵇ corresponding with the diaphragm 49 of the form shown in Fig. 5. Practically any alteration of this device will be merely an adaption of one form or another, or combination of two or more forms and will therefore fall within the scope of the present invention.

Having thus described our invention, what we claim is:

1. In a device of the character described, the combination with a cylinder, a piston therein, of a casing connected to opposite ends of said cylinder, a manually operated valve member having a pair of admission ports therein and an exhaust port intermediate said admission ports, a piston operated member having a pair of ports therethrough positioned to be normally out of register with the ports of the first member, and either one adapted to register with one admission port of the first member simultaneously with the registering of the other with the exhaust port of the first member.

2. In a device of the character described, the combination with a cylinder and piston therein, of a valve connected with opposite ends of said cylinder, a manually operated admission member in said valve arranged to admit fluid under pressure to one end of said cylinder and release fluid under pressure at the opposite end, and a second member in the valve operated by piston movement in the same direction as the first member and adapted to cut off fluid admission and release when returned to its original relation with the first member.

3. In a device of the character described, the combination with a cylinder and a piston therein, of a casing, a valve seat in the bottom of said casing having a pair of diametrically opposite chambers therein, an exhaust chamber formed under said seat and out of communication with said first mentioned chambers, a connection between each of said chambers and one end of the cylinder, a valve disk on said seat having diametrically opposite ports communicating with said chambers and a central passage communicating with the exhaust chamber, a second valve disk seated on the first having diametrically opposite closure portions normally covering the ports of said first valve, a pair of ports through said second valve on one side of the closure portions thereof, an exhaust passage in the underside of said valve on the opposite side of the closure portions thereof communicating with the exhaust passage of the first valve, means for admitting fluid under pressure above the second valve, manually operated means for shifting the second valve to connect one port thereof with a corresponding port of the first valve, and to simultaneously connect the exhaust passage thereof with the other port of the first valve, a piston operated means for shifting the first valve to return the ports to their original relation and check piston movement at a point predetermined by the positioning of the second valve, substantially as described.

In witness whereof, we have hereunto set our hands in the presence of two witnesses.

WILLIAM F. J. CASEY.
GUSTAVE CAVIN.

Witnesses:
BYRON A. KELLY,
FRED A. HARRIGAN.