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MECHANISM FOR ACTUATING THE REVERSING MECHANISM OF LOCOMOTIVES.

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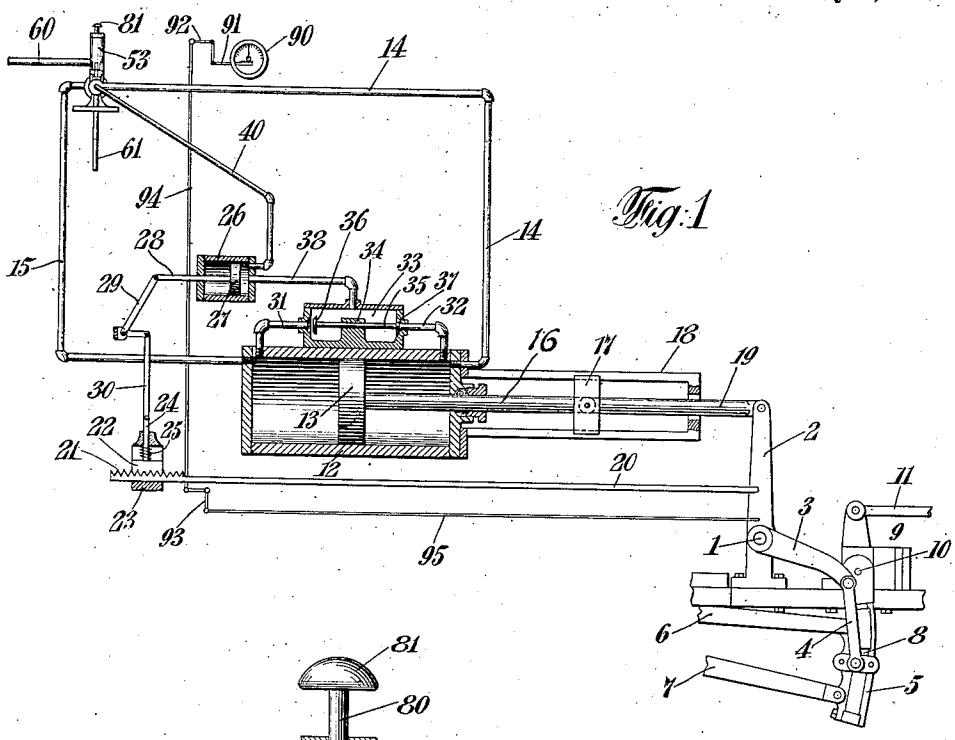


Fig. 1

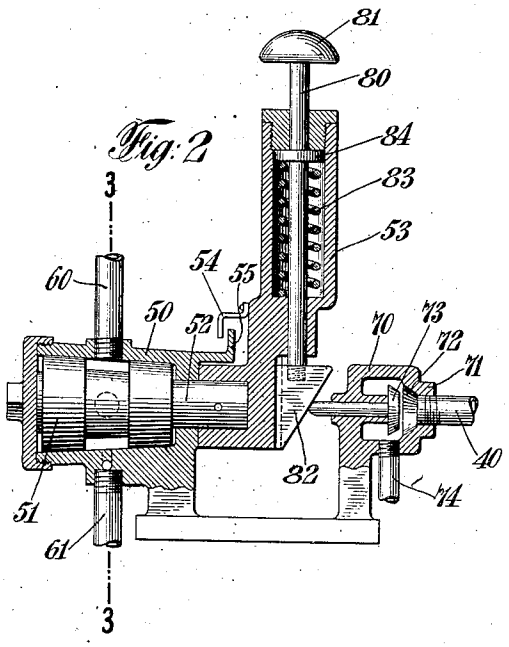


Fig. 2

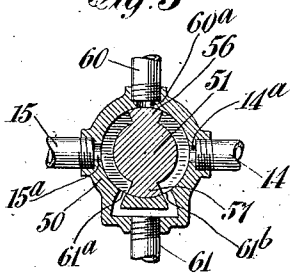


Fig. 3

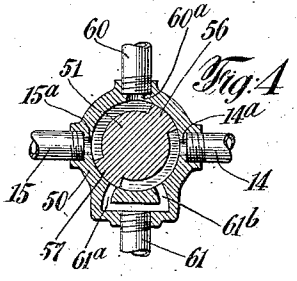


Fig. 4

WITNESSES

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MECHANISM FOR ACTUATING THE REVERSING MECHANISM OF LOCOMOTIVES.

1,189,251. Specification of Letters Patent. Patented July 4, 1916.

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To all whom it may concern:

Be it known that I, GILBERT A. HARDEN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Mechanism for Actuating the Reversing Mechanism of Locomotives; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention consists in the novel features hereinafter described, reference being had to the accompanying drawing which illustrates one embodiment of my invention selected by me for purposes of illustration, and said invention is fully disclosed in the following description and claims.

Referring to the accompanying drawing, Figure 1 is a diagrammatic view illustrating an embodiment of my invention as applied to the link lifting arm of an ordinary locomotive, and illustrating the parts sufficiently to enable my invention to be understood therefrom. Fig. 2 is a detail sectional view of one form of controlling valve for use in connection with my invention. Fig. 3 is a sectional view through the main controlling valve on line 3—3 of Fig. 2, showing the valve in neutral position. Fig. 4 is a similar view showing the valve in one of the open positions for moving the link lifting arm forward and lowering the link.

With the development of the railway locomotive, increasing difficulty is experienced on the part of the engineer in shifting the reversing link which is interposed between the eccentrics for actuating the steam valve, and said valve.

The object of my invention is to provide mechanism whereby the power necessary for shifting the reversing mechanism is furnished by fluid pressure, either steam or compressed air, in which perfect control of the reversing mechanism may be secured by the engineer, and in which locking mechanism for the reversing mechanism is provided which is released before the compressed fluid can exert any pressure to actuate the reversing mechanism, and whereby the actuating cylinder or cylinders, as well as the mechanism controlling the locking device, is or are normally maintained in communication with the atmosphere, independent of the controlling valve, so that an inadvertent operation of the hand lever of the control valve will not effect a change of adjustment of the reversing mechanism.

In the drawing, Fig. 1, I have shown so much of the well known link motion of a locomotive as is necessary to a clear understanding of the invention. These parts consist of the lifting shaft 1 provided with arms 2 and 3, forming a bell crank, the arm 3 being connected by hanger 4 with the shifting link 5, the latter being operatively connected with the eccentric rods 6 and 7, and movable vertically with respect to the link block 8, which is pivotally connected to the lower arm of the rocker 9, said rocker being pivotally supported on the rocker shaft 10, and the upper arm of the rocker 9 being connected to the valve stem 11. My improved devices are intended to control and operate the vertically extending lifting arm 2 so that it may be applied with as little change as possible to the locomotive structure now in ordinary use. For actuating the lifting arm, I employ an actuating pressure cylinder and a reciprocating piston therein. It will be understood that either two single actuating cylinders having their pistons operating in reverse directions may be employed, or a double acting cylinder, which is my preferred construction and which is illustrated in Fig. 1, and in the following description and claims I use the terms "cylinder" and "piston" with the understanding that they may apply to either structure. 12 represents a double acting cylinder which I term the actuating cylinder, having therein a reciprocating piston 13, which I term the actuating piston. Pressure fluid, which may be either compressed air or steam, is supplied to the cylinder at opposite sides of the piston by means of the pipes 14 and 15 respectively. The piston is provided with piston rod 16, cross head 17, cross head slide 18, the latter being connected by a connecting rod 19 with the upper end of the lifting arm 2.

In order to lock the reversing mechanism in any position to which it may be adjusted, I prefer to connect therewith, and preferably with the arm 2, a locking rod 20 which is provided with a series of ratchet teeth 21 engaged by a pawl 22 moving vertically a suitable stationarily supported housing 23, and provided with a stem 24, the pawl 22 being normally held in engaged position by spring 25. For the purpose of releasing the

locking pawl from the locking rod, I employ an auxiliary unlocking cylinder 26 and piston 27 operating therein, the piston being connected by piston rod or connecting rod 28 with a bell crank lever 29, one arm of which is connected by a link 30 with the pawl 22, so that the outward motion of the piston 27 will lift the pawl and release the locking rod. The unlocking cylinder is placed in communication alternately and preferably automatically with which ever end of the cylinder is receiving fluid pressure in order that when pressure is admitted to either end of the cylinder, it shall immediately partially exhaust into the unlocking cylinder. This may be accomplished in various ways, but I have shown in the drawing pipes 31 and 32 (or passages), leading from the opposite ends of the cylinder to a valve chest 33 provided with a valve seat at each end concentrically with and forming the inlets for the pipes 31 and 32. The valve chest is provided with a boss 34 to receive a longitudinally sliding valve stem 35 carrying at its opposite ends the valves 36 and 37, one of which is closed when the other is open, as shown in the drawings, and the valve chest 33 is connected by a pipe 38 with the unlocking cylinder 26. The valve chest is also provided with an auxiliary exhaust pipe or passage 40 normally open, but adapted to be closed by an auxiliary valve separate from the control valve which admits fluid pressure to the supply pipes 14 and 15 and preferably closed by the thumb of the engineer or operator when he places his hand upon the handle of the control valve, as hereinafter described.

From the foregoing description, it will be obvious that when fluid pressure is admitted to either end of the cylinder 12 it will pass by one of the pipes 31—32 into the valve chest 33, pushing open one of the valves 36—37 if the particular valve controlling the opening should be closed, and thereby closing the other passage communicating with the other end of the cylinder, the pressure within the valve casing tending to hold said valve in closed position, and the pressure fluid will pass through pipe 38 to the unlocking cylinder 26 and thence by the exhaust pipes 40 to the atmosphere, unless the engineer has properly grasped the hand lever of the controlling valve and has closed the auxiliary valve controlling the exhaust passage 40, so that no action will take place unless the auxiliary valve controlling the exhaust passage 40 has been previously closed, in which case the pressure will accumulate in the actuating cylinder 12 and in the unlocking cylinder 26, and as soon as it is sufficient to overcome the spring 25, the piston 27 in the latter cylinder will be actuated so as to unlock the pawl 22 and release the locking rod 20. The spring 25 is made sufficiently stiff so that a pressure must have been accumulated in the cylinder 12 sufficient to assume immediate control of the actuating piston 13 before the piston 27 will move to release the locking pawl, thus precluding any accidental movement of the reversing mechanism, the latter being ordinarily counterbalanced by a spring drum or other means (not shown) in a well known way, so that under ordinary circumstances, it will remain in any position to which it is adjusted, except for the effect of jarring, etc., which might tend to cause a movement of the link if the locking device were released prematurely. The by pass connection 38 communicating with both ends of the cylinder also precludes any possibility of exerting actuating pressure on the piston before the locking mechanism is released, which might in some instances result in breaking the locking mechanism.

It will also be seen that the instant the auxiliary valve controlling the exhaust passage 40 is opened, the pressure is released in the unlocking cylinder 26 as well as in the operating end of the actuating cylinder, so that the locking pawl immediately seats and the pressure fluid will exhaust through the passage 40 and prevent the piston from working against the locking mechanism and injuri g the same, and as the auxiliary valve is preferably controlled by the thumb of the operator, as hereinafter more fully set forth, the reversing mechanism can be instantaneously set by the operator as soon as the desired movement has been secured, by simply raising his thumb regardless of whether he restores the control valve to its neutral position or not.

In Figs. 2, 3, and 4, I have shown one form of valve mechanism which may be advantageously employed for controlling the pressure supply pipes 14 and 15 and the exhaust pipe 40, but I do not limit myself to this particular form of control valve, as obviously it may be considerably varied without departing from my invention, and while I have shown independent valves, one controlled by the actuating handle, and the other by a thumb rod extending therethrough, which parts are maintained in separate valve casings, it is also obvious that a valve mechanism can be constructed in which all the working parts may be retained within a single casing.

In Figs. 2, 3, and 4, 50 represents the valve casing in which is mounted a rotary plug valve 51, the stem 52 of which is provided with an actuating handle or hand lever 53, which preferably sets vertically, and I prefer to support the valve in such a manner that the handle is moved forwardly and backwardly to shift the reversing mechanism forwardly and backwardly in substantially the same manner as the hand op-

erated shifting lever now employed in locomotive cabs. The handle 53 is also preferably provided with a pointer 54 moving over a segment 55 secured to the valve casing, and provided with any usual indications which will indicate the "neutral," "forward" and the "reverse" positions of the lever. The valve and casing are shown in section in Figs. 3 and 4, in which Fig. 3 shows the parts in the neutral position of the valve, in which a solid portion 56 of the plug will close the fluid pressure inlet passage 60^a to which steam or compressed air is supplied, by means of a pipe 60. Both of the supply pipes 14 and 15 communicate with the valve casing by ports 14^a and 15^a which are normally placed in communication with the exhaust pipe 61 by means of ports 61^a and 61^b. The valve 51 is also provided with a solid portion 57 adapted to close one or other of the exhaust ports 61^a and 61^b according to the position into which the valve is moved. 70 represents the casing of the auxiliary valve, supported adjacent to and preferably on the same base as the valve casing 50. The valve casing is provided with an aperture 71 to receive the auxiliary exhaust pipe 40 from the unlocking cylinder, and said aperture is provided with a valve seat 72 adapted to be closed by a valve 73 having its axis in alinement with the axis of the plug valve 51. The valve casing 70 is also provided with an exhaust outlet 74. In order to enable the auxiliary valve 73 to be actuated by the thumb of the operator, I provide the handle 53 of the main valve with a longitudinally movable rod 80 provided with a thumb piece 81 at its upper end, and with a wedge shaped block 82 at its lower end, adapted to engage the stem of the valve 73 and operate it. I also prefer to provide a spring 83 within the handle 53 operating against a collar 84 on the rod normally holding the rod 80 in its raised position, and returning it to such position when released by the thumb of the operator.

The operation of the apparatus hereinbefore described will be clear from the drawing and the foregoing description and may be recapitulated as follows. Assuming that the parts are in the position shown in Fig. 1, the reversing link being in central position and the handle 53 of the controlling valve being in neutral position, if the engineer desires to throw the reversing mechanism into forward position, he grasps the handle 53 and at the same time with his thumb depresses the thumb piece 81, thereby closing the auxiliary exhaust valve 40, and moves the handle 53 into forward position, thus turning the plug valve into the position shown in Fig. 4. This places the pipe 15 in communication with the inlet pipe 60 from the tank or source of compressed fluid, and simultaneously closes the exhaust port 61^a, and leaves the pipe 14 in communication with the exhaust passage 61^b. The compressed fluid passes through pipe 15 to the rear end of the cylinder 12, thence by pipe 31 to the small valve chest 33, and by by-pass 38 to the unlocking cylinder 26. The exhaust pipe 40 being closed at the auxiliary valve 73, as before stated, pressure accumulates in the unlocking cylinder and also in the cylinder 12, and as soon as the pressure in the unlocking cylinder is sufficient to overcome the spring 25, the pawl 22 is raised and the reversing mechanism unlocked, when the pressure in the cylinder 12 will move the piston 13 in the forward direction, and adjust the reversing mechanism, the contents of the forward end of the cylinder 12 escaping through the pipe 14 and the exhaust passage 61^b.

I prefer to provide means for enabling the engineer to know exactly at all times the position of the reversing mechanism and the extent to which it is moved. Any suitable means may be employed for this purpose, as for example, the simple form of mechanism shown in the drawing, which consists of an indicator 90 provided with a segmental scale and pointer operated by a pinion on the pointer shaft and a sliding rack bar 91, which is connected by bell cranks 92—93 and links 94, 95 with some part of the reversing mechanism as the arm 2, so that the engineer by observing the dial can tell exactly how far he has thrown the reversing mechanism in either direction. As soon as the reversing mechanism has been adjusted as far as desired, its movement can be stopped instantly by simply lifting the thumb from the thumb piece 81 and permitting the auxiliary exhaust valve 73 to open, the reduction of pressure in the unlocking cylinder instantly causing the locking pawl 22 to reëngage the locking portion 21 of the locking bar, and the corresponding reduction of pressure in the cylinder 12 preventing any strain on the locking mechanism. The engineer will then move the hand lever 53 back to neutral position, placing the pipe in communication with the exhaust passage 61^a of the main valve and permitting the cylinder 12 to exhaust to atmospheric pressure.

Should the engineer neglect to restore the hand lever after securing the proper adjustment of the reversing mechanism, the continued escape of compressed fluid through the auxiliary exhaust passage 74 will warn him audibly that the hand lever has not been returned so that he will be certain to restore it to neutral position. No damage, however, could occur if he did not, as the reduction of pressure in the cylinders 26 and 12 would continue until they reached

atmospheric pressure, whether the hand lever is returned to normal position or not. The operation in moving the reversing mechanism to the back position will be similar, except that the hand lever 53 is moved backwardly so as to bring the inlet pipe 60 in communication with the supply pipe 14 for the forward end of the cylinder, and permit pressure to accumulate therein and through the pipes 32 and 38 in the unlocking cylinder. This movement of the main control valve closes the exhaust passage 61^b, leaving the pipe 15 in communication with the exhaust passage 61^a so that the contents of the rear end of the cylinder 12 can exhaust through the pipe 15 and through the exhaust passage 61^a. It will be noted that in both these operations, when the piston is operated in either direction, provision is made for permitting the exhaust of the other end of the cylinder back through the exhaust passage of the main control valve, so as not to retard the operation of the piston or compress the fluid in the end of the cylinder which is not working.

What I claim and desire to secure by Letters Patent is:—

1. In a device for moving and holding the reversing mechanism of a locomotive, the combination of an actuating cylinder, an actuating piston, connections from the piston to the reversing mechanism, means independent of the actuating piston for locking the reversing mechanism, a separate cylinder and piston for unlocking the said locking means, a fluid pressure connection between said unlocking cylinder and the actuating cylinder, means for supplying compressed fluid to said cylinder, a controlling valve therefor, a fluid pressure connection from said controlling valve to the actuating cylinder, a normally open exhaust valve for the unlocking cylinder, means for closing the said exhaust valve, whereby no pressure can be applied to the actuating cylinder or the unlocking cylinder without closing said exhaust valve, and whereby the locking means can be instantly reset by opening said exhaust valve.

2. In a device for moving and holding the reversing mechanism of a locomotive, the combination of an actuating cylinder, an actuating piston, connections from the piston to the reversing mechanism, means independent of the actuating piston for locking the reversing mechanism, a cylinder and piston for unlocking the said locking means, a fluid pressure connection between said unlocking cylinder and the actuating cylinder, means for supplying compressed fluid to said cylinder, a controlling valve therefor, a fluid pressure connection from said controlling valve to the actuating cylinder, a normally open exhaust valve for the unlocking cylinder, and an operating lever for the controlling valve, and an auxiliary actuating device for closing the exhaust valve, adjacent to said lever.

3. In a device for moving and holding the reversing mechanism of a locomotive, the combination of an actuating cylinder, an actuating piston, connections from the piston to the reversing mechanism, means independent of said actuating piston for locking the reversing mechanism, a cylinder and piston for unlocking the said locking means, a fluid pressure connection between said unlocking cylinder and the actuating cylinder, means for supplying compressed fluid to said cylinder, a controlling valve therefor, a fluid pressure connection from said controlling valve to the actuating cylinder, a normally open exhaust valve for the unlocking cylinder, an operating lever for the controlling valve, and an auxiliary actuating device carried by said operating lever for actuating said exhaust valve and adapted to be operated by the hand of the operator in grasping the lever.

4. In a device for moving and holding the reversing mechanism of a locomotive, the combination of an actuating cylinder, an actuating piston, connections from the piston to the reversing mechanism, means independent of said actuating piston for locking the reversing mechanism, a cylinder and piston for unlocking the said locking means, a fluid pressure connection between said unlocking cylinder and the actuating cylinder, means for supplying compressed fluid to said cylinder, a controlling valve therefor, a fluid pressure connection from said controlling valve to the actuating cylinder, a normally open exhaust valve for the unlocking cylinder, an actuating lever for the controlling valve, and a device adapted to be operated by the thumb of the operator operatively connected with the exhaust valve to close said exhaust valve.

5. In a device for moving and holding the reversing mechanism of a locomotive, the combination of a double acting actuating cylinder, a piston reciprocating therein, connections from the piston to the reversing mechanism, means independent of the piston for automatically locking the reversing mechanism in adjusted position, a cylinder and piston for unlocking said locking means, fluid pressure connections between said cylinder and the double acting cylinder extending to both ends of the latter, pressure operated valves controlling said connections to the opposite ends of the cylinder, means for supplying compressed fluid, a controlling valve, a pressure fluid connection from said controlling valve to each end of the actuating cylinder, a normally open exhaust valve for the unlocking cylinder, and manually operable means for closing said exhaust valve.

6. In a device for moving and holding the reversing mechanism of a locomotive, the combination of an actuating cylinder, an actuating piston, connections from the piston to the reversing mechanism, means independent of the piston for locking the reversing mechanism, a cylinder and piston for unlocking the said locking means, a fluid pressure connection between said unlocking cylinder and the actuating cylinder, means for supplying compressed fluid to said cylinder, a controlling valve therefor, provided with an inlet port, outlet ports communicating with the actuating cylinder, on opposite sides of the piston and exhaust ports, said valve being constructed to place said inlet port in communication with one of the outlet ports and simultaneously place the other outlet port in communication with an exhaust port, a normally open exhaust valve for the unlocking cylinder, and an auxiliary normally open valve for closing said exhaust valve.

7. In a device for moving and holding the reversing mechanism of a locomotive, the combination of a double acting actuating cylinder, a piston reciprocating therein, connections from the piston to the reversing mechanism, means independent of said actuating piston for automatically locking the reversing mechanism, a cylinder and piston for unlocking the said locking means, fluid pressure connections extending from the unlocking cylinder to both ends of the actuating cylinder, on opposite sides of the piston therein, valve seats controlling said connections, connected pressure operated valves for engaging said valve seats, one of said valves being open when the other is closed and vice versa, means for supplying fluid pressure to said actuating cylinder on opposite sides of the piston, a controlling valve for said means, a normally open exhaust valve for the unlocking cylinder, and manually operable means for closing said exhaust valve.

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

GILBERT A. HARDEN.

Witnesses:

L. P. WHITAKER,

F. W. WYATT.