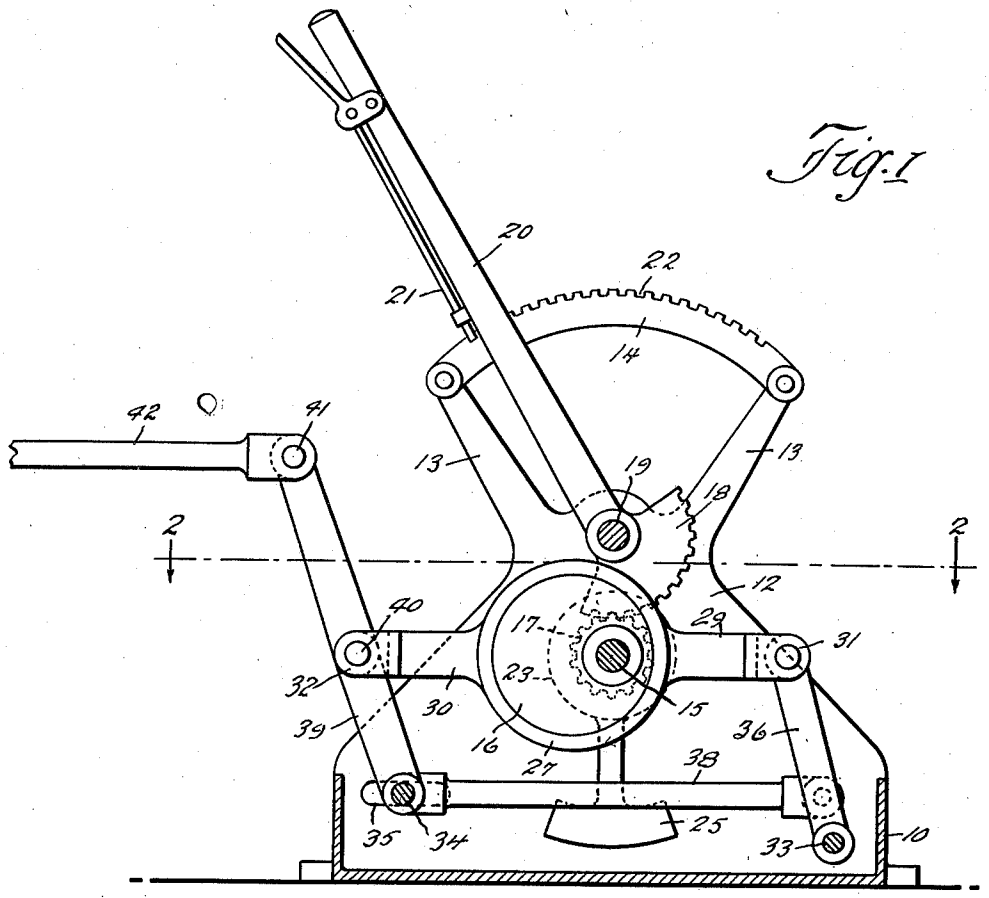
May 10, 1938. T. STEVENSON ET AL 2,117,109

VALVE CONTROL AND REVERSING MECHANISM

Filed July 25, 1935 3 Sheets-Sheet 1

Fig. 1



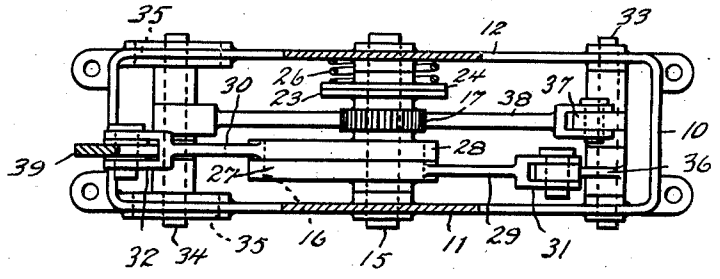


Fig. 2

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VALVE CONTROL AND REVERSING MECHANISM

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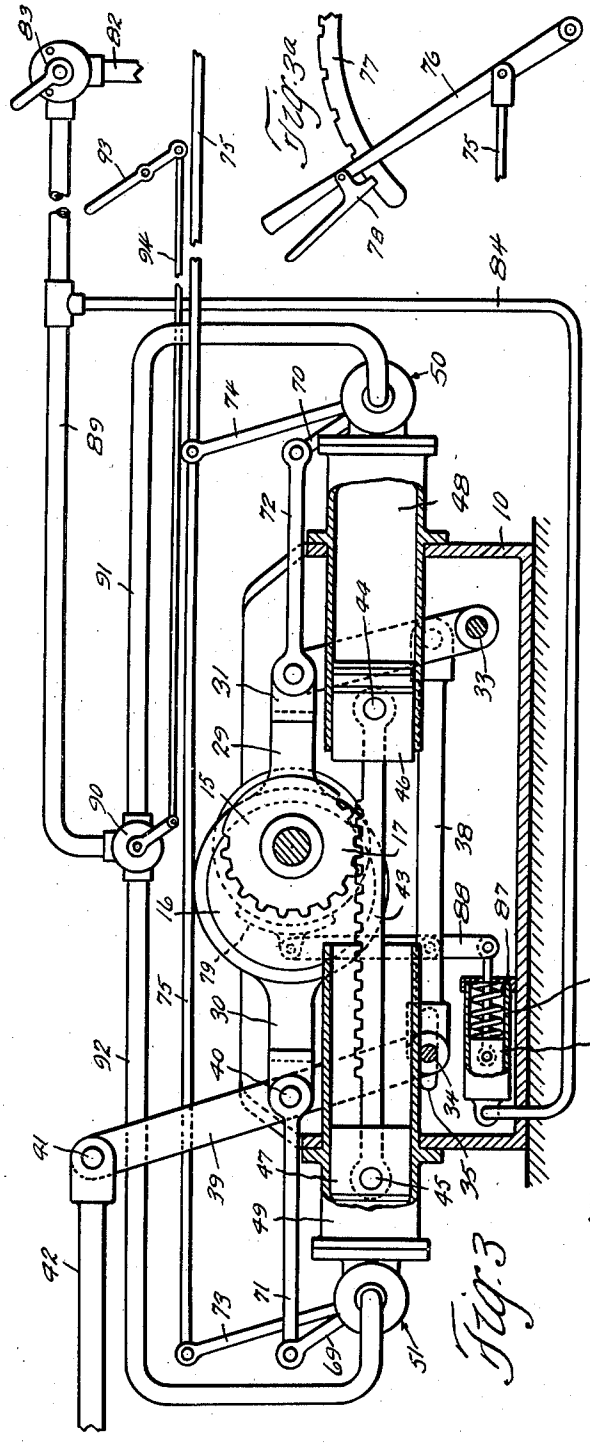


Fig. 3

Fig. 3a

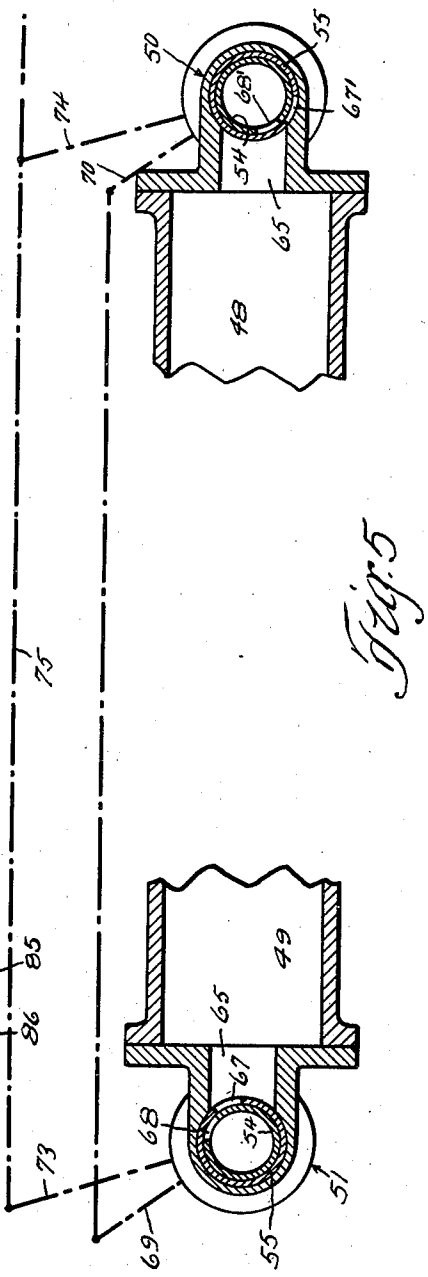


Fig. 5

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VALVE CONTROL AND REVERSING MECHANISM

Filed July 25, 1935 3 Sheets-Sheet 3

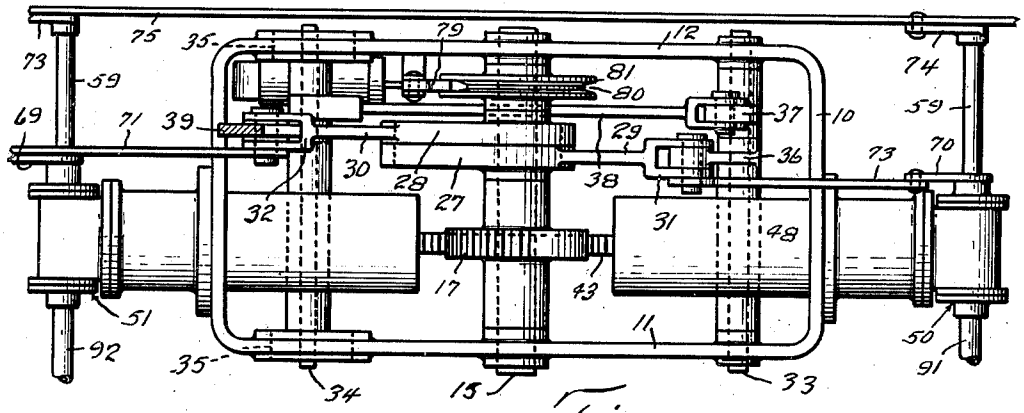


Fig. 4

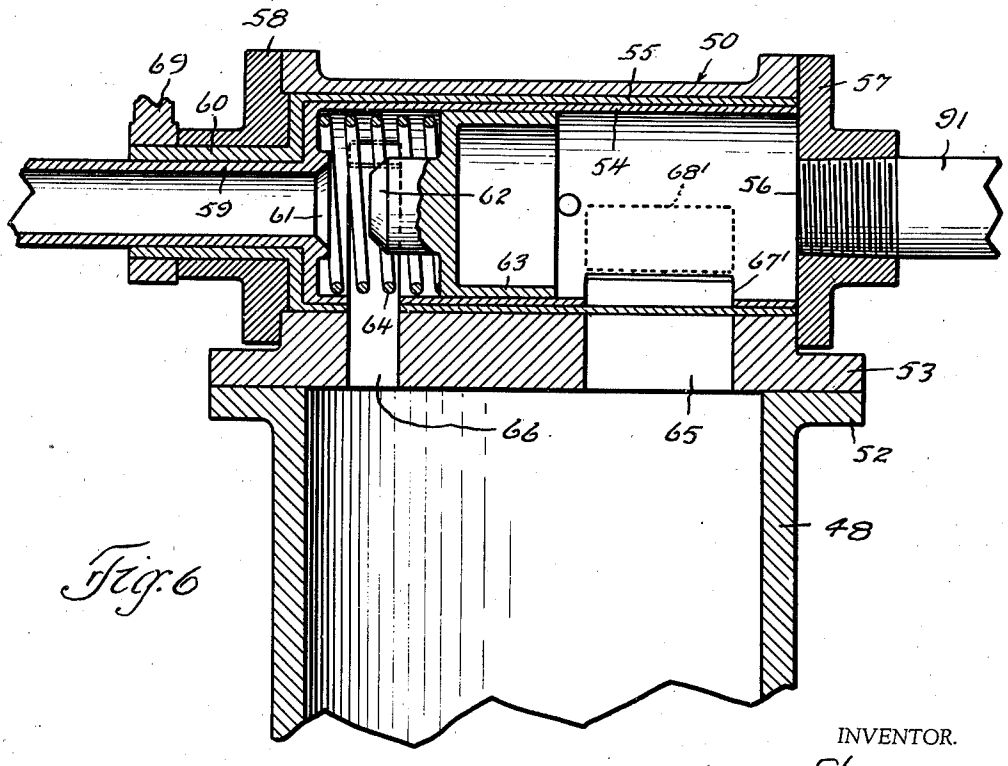


Fig. 6

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Patented May 10, 1938

2,117,109

UNITED STATES PATENT OFFICE

2,117,109

VALVE CONTROL AND REVERSING MECHANISM

Thomas Stevenson, Lakewood, and Clifford S. Goby, Cleveland, Ohio; Mary E. Stevenson executrix of said Thomas Stevenson, deceased

Application July 25, 1935, Serial No. 33,112

10 Claims. (Cl. 121—162)

This invention relates to a valve control and reversing mechanism for locomotives. It may be used in connection with any standard valve mechanism, such, for example, as that shown in U. S. patent to Harden No. 505,764. It is to be understood that so-called reversing mechanisms have also the function of cutting off the steam at certain desired positions of the main piston.

It is known that manual valve control and reversing mechanisms now in common use are difficult to manipulate, dangerous to engine drivers and, in view of the difficulty of manipulation and the tendency of the hand lever to "kick back", likely to be run at inefficient cut-off positions; while existing power valve control and reverse mechanisms are inefficient as a result of "creeping" (change in valve position due to failure to hold the reach rod in adjusted position) and are uncertain in operation and consequently dangerous to other employees as well as engine drivers. It is the general object of our invention to overcome the difficulties noted and to do so by the use of simple, safe and sturdy mechanism in keeping with the general character of locomotive construction.

More specifically, objects of our invention are: to provide mechanism which neutralizes the "reach-rod" forces at a point remote from the control lever and absorbs the pounding of the reach rod thus preventing forces transmitted thereby from moving the reach rod control means; to provide an eccentric for absorbing such pounding; to distribute the force of such pounding to opposed surfaces of the eccentric, and to provide improved manual and power means for controlling the position of said eccentric.

With the foregoing and other objects in view, our invention consists in all the novel features of construction and arrangements of parts hereinafter described and illustrated in the accompanying drawings, in which Fig. 1 is a vertical sectional view taken through a hand-operated device embodying our invention; Fig. 2 is a horizontal section corresponding substantially to the line 2—2 of Fig. 1; Figs. 3 and 3ª make up a central vertical section through a power operated form of our invention; Fig. 4 is a plan view of the device of Fig. 3; Fig. 5 is a fragmentary horizontal section showing a portion of the valve construction and indicating diagrammatically the operating means therefor and Fig. 6 is a fragmentary horizontal section through one end of the power cylinder further illustrating the valve mechanism.

Referring first to the hand operated form of our invention, illustrated in Figs. 1 and 2, the numeral 10 indicates a suitable base having upwardly extending side members 11 and 12. The member 12 is provided with upstanding arms 13 through the upper ends of which is secured a notched arcuate member 14. Journaled in the walls 11 and 12 is a shaft 15 upon which is non-rotatably mounted an eccentric 16. Also non-rotatably mounted on the shaft 15 is a gear 17 which meshes with a sector gear 18 journaled on a transverse shaft 19 also carried by the plates 11 and 12. Keyed to the shaft 19 is a hand lever 20 which is provided with an ordinary latch mechanism 21 adapted to engage in notches 22 of the notched arcuate member 14 whereby to cause rotation of the eccentric 16. A disk 23 is keyed or otherwise non-rotatably secured to the shaft 15 and frictionally engages a plate 24 from which depends a weight 25. The spring 26 is provided for causing a predetermined frictional contact pressure between the elements 23 and 24.

Surrounding the eccentric 16 are eccentric followers 27 and 28 which are provided with arms 29 and 30 respectively terminating in yokes 31 and 32. The followers 27 and 28 should have a close working fit with the eccentric but should not fit so tightly as to offer substantial resistance to rotation of the eccentric.

The side walls 11 and 12 are provided with a transversely extending fixed shaft 33 and a transversely extending movable shaft 34. The movable shaft 34 works in slots 35 in walls 11 and 12. A lever 36 is mounted on the shaft 33 and connected to the yoke 31. An arm 37 which may be regarded as forming part of the lever 36 non-rotatably mounted on the shaft 33 is pivoted to a link 38 which at its other end is journaled on the sliding shaft 34. A lever 39 is journaled on the shaft 34 which amounts to a pivotal connection with the link 38, and is pivoted at 40 to the arm 30. The lever 39 extends beyond the point 40 and is connected at 41 to reach rod 42.

It will be clear from the foregoing that in order to manipulate the reach rod 42, the operator may rotate the eccentric 16 by moving the hand lever 20 to a suitable position. The weight 25 will offer a sufficient resistance to rotation of the shaft 15 that the same cannot become accidentally displaced. Furthermore, this weight will, by reason of its inertia, offer a large resistance to sudden motion of the eccentric responsive to pounding of the reach rod 42 at the same time tending to assume a vertical position under the vibration applied through such reach rod. The

major force of the rapid motion of the reach rod, however, will be absorbed by the eccentric surface and related linkage, the inertia of the eccentric itself and the friction between the eccentric and the straps 27 and 28. A force on the reach rod 42 toward the left will cause the straps 28 to place a binding force against the right surface of the eccentric and, by reason of the possibility of motion of the shaft 34 in the slot 35 and the transmission through the link 38 of a force to the link 36 and arm 29, a balancing frictional force will be applied to the left surface of the eccentric through the strap 27. The above described forces tending to prevent rotation of the eccentric 16 under the pounding of the reach rod are in effect in all positions of the eccentric, but when the weight is in the position shown in Fig. 1, the eccentric is on dead center and there is no tendency for the reach rod to cause rotation thereof. It is contemplated that full forward motion will be secured when the elements are in the position shown in Fig. 1 and that full reverse motion will be secured when the eccentric is located 180° from this position. It is, however, to be understood that our invention is not limited to such relation of the reverse gear and the valve mechanism. In addition to the above enumerated forces tending to prevent rotation of the eccentric 16 may be mentioned the holding effect of the operating handle 20 working through the sector 18 and the gear 17. Since the reach rod forces are neutralized before reaching the gear sector, the possibility of hand lever (20) "kickback" when unlatched is removed. The notches in the arcuate member 14 serve to indicate the position of steam cut-off and prevent accidental movement of lever 20.

Referring now to Figs. 3 to 6 inclusive, it will be seen that with the exception of the operating lever 20 and sector gear 18, the above described mechanism is substantially common to the two forms. The common elements, therefore, will be given the same numerals as applied to them in the first described form of the invention and further description of their construction, relations and operations will be omitted.

The gear 17 is operated, in this form, by means of a rack bar 43 meshing therewith (preferably with some play) and connected as indicated at 44 and 45 to pistons 46 and 47 respectively working in cylinders 48 and 49. At the ends of the cylinders 48 and 49 are valve mechanisms 50 and 51 which are adapted to admit a suitable fluid, preferably compressed air, for moving the pistons predetermined distances in the cylinders 48 and 49. Inasmuch as the two valve mechanisms are of substantially identical construction, the details of one only of them are shown. By reference to Fig. 6 it will be seen that the cylinder 48 is provided with a flange 52 to which is secured a flange 53 of the valve cylinder 50. Flange 53 is integral with the body portion of the valve which latter has a cylindrical bore extending transversely of the bore of the cylinder 48 and receiving inner and outer sleeve valves 54 and 55 respectively. The fluid inlet 56 communicates through a suitable end cap 57 to the interior of the valve 50 and to the interior of the sleeve valves. At the other end of the valve body is a second end cap 58 through which the operating extensions 59 and 60 of said sleeve valves pass. The innermost sleeve 54 has a passage through its operating extension 59 for allowing exhausting of the operating fluid. The extension 59 at its junction with sleeve 54 is provided with a valve seat 61 adapted to cooperate with a movable valve element 62 carried by a piston 63 working within the inner valve 54. A spring 64 is provided for normally urging the valve elements 62 to open position. The valve body is provided with a passage 65 for admission of operating fluid from the inlet 56 to the interior of the cylinder 48 and is provided with a smaller passage 66 (always open) providing for the escape of the exhaust operating fluid when the valve element 62 is in open position.

By reference to Fig. 5 the relation of the ports 55 and the ports 67 and 68 will be readily apparent. The outer sleeve valves 55 are connected to suitable operating arms 69 and 70 which in turn are connected by links 71 and 72 to the arms 29 and 30. The inner sleeves 54 are connected to suitable arms 73 and 74 which in turn are connected together by rod 75 which is controlled by a hand lever 76 operating with a suitable arcuate notched member 77 and having any suitable latch 78. Assuming that the valve elements are in the position shown in Fig. 5, and it is desired to admit operating fluid to the cylinder 49 whereby to move the rack 43 a predetermined distance toward the right, the operating lever 76 will be moved clockwise a predetermined desired distance which will result in rotating the elements 73 and 74 a corresponding distance clockwise and thereby bringing the slot 68 into registry with the slot 67, at the same time moving the slot 68' a corresponding distance further out of registry with the slot 67'. The compressed air valves 83 and 90 may then be manipulated to admit compressed air to the cylinder 49. The pistons and the rack bar will then move toward the right which will result in a counterclockwise rotation of the gear 17 and a consequent motion of the arm 30 toward the right, thus manipulating the reach rod 42 and at the same time operating the link 71 to rotate the arm 69 clockwise to bring the outer sleeve valve to a cut-off position, thus limiting the motion of the pistons to an amount proportionate to the rotation of the operating rod 76.

It will be noted that rotation of the gear 17 and the shaft 15 is normally opposed by a brake 79 operating in a groove 80 formed in a brake drum 81 non-rotatably carried by the shaft 15. However, when the operating fluid is admitted from the supply line 82 through the valve 83, it will pass through a pipe 84 to a cylinder 85 where it will force a slightly loose-fitting piston 86 to the right against the action of a spring 87 thereby operating against the action of a spring 87 and operating the brake arm to release the brake. As soon as the valve 83 is moved to closed position, the spring 87 will restore the brake to operative position. The supply of operating fluid passes also through the pipe 89 to a selector valve 90 which may be an ordinary three-way valve adapted to open a selected one of the pipes 91 and 92 while closing the other. The supply pipes 91 and 92 communicate to the interior of the valves 50 and 51, as clearly indicated.

From the foregoing, it will be apparent that when it is desired to operate the reach rod 42, the hand lever 76 may be moved a distance corresponding to that to which it is desired to move the reach rod, after which the valve 90 may be set by means of an operating handle 93 working through a link 94 to admit the operating fluid to one of the cylinders 48 and 49 depending upon the direction in which it is desired to rotate the gear 17 and that the operating fluid

supply may then be made active by opening the normally spring closed valve 83.

While we have illustrated and described the present preferred embodiment of our invention, we wish it to be understood that it may be embodied in other structures and that we are limited only in accordance with the appended claims and the prior art.

Having thus described our invention, what we claim is:

1. In combination, in a reversing mechanism for locomotives, a base, a lever adapted to be pivoted to a reach rod, a second lever pivoted to said base, an eccentric journaled on said base, a pair of eccentric followers associated with said eccentric and pivotally connected, on opposite sides thereof, one to each of said levers, a link connected to said second lever intermediate its two said pivot points and connected to said first lever by a pivot connection slidably mounted on said base.

2. In combination, in a reversing mechanism for locomotives, a reach rod, a base, an eccentric journaled on said base, eccentric followers operated by said eccentric, means cooperating with said eccentric and said eccentric followers to form a parallelogram linkage connecting said eccentric in operative relation to said reach rod and means for controlling the position of said eccentric, said last means including a control lever for adjusting the position of said eccentric and means in addition to said control lever for resisting change of position of said eccentric.

3. In combination, in a reversing mechanism for locomotives, a reach rod, a base, an eccentric journaled on said base, eccentric followers operated by said eccentric, means cooperating with said eccentric and said eccentric followers to form a parallelogram linkage connecting said eccentric in operative relation to said reach rod and means for controlling the position of said eccentric, said last means including a control lever for adjusting the position of said eccentric and means in addition to said control lever for offering a resistance to change of position of said eccentric, said last means including a weight whereby to offer a resistance inversely proportional to the duration of the applied force tending to produce motion of said eccentric.

4. In combination, in a reversing mechanism for locomotives, a base, a lever slidably pivoted to said base at one point and adapted to be pivoted to a reach rod at a spaced point, an eccentric journaled on said base and having an eccentric follower associated therewith and pivoted to said lever intermediate said points, a second lever, positioned on the opposite side of said eccentric and pivoted to said base, a link pivoted to said first lever adjacent said sliding pivot point and to said second lever at a point spaced from its pivot connection to the base, a second eccentric follower operated by said eccentric and pivotally connected to said second lever, and means for adjusting the position of said eccentric.

5. In combination, in a reversing mechanism for locomotives, a base, a lever slidably pivoted to said base at one point and adapted to be pivoted to a reach rod at a spaced point, an eccentric journaled on said base and having an eccentric follower associated therewith and pivoted to said lever intermediate said points, a second lever, positioned on the opposite side of said eccentric and pivoted to said base, a link pivoted to said first lever adjacent said sliding pivot point and to said second lever at a point spaced from its pivot connection to the base, a second eccentric follower operated by said eccentric and pivotally connected to said second lever, and means for adjusting the position of said eccentric, said last means including a pinion mounted for rotation with said eccentric, gear means meshing with said pinion and means for operating said gear means a distance sufficient to rotate said pinion through substantially 180° of arc.

6. In combination, in a reversing mechanism for locomotives, a base, a lever slidably pivoted to said base at one point and adapted to be pivoted to a reach rod at a spaced point, an eccentric journaled on said base and having an eccentric follower associated therewith and pivoted to said lever intermediate said points, a second lever, positioned on the opposite side of said eccentric and pivoted to said base, a link pivoted to said first lever adjacent said sliding pivot point and to said second lever at a point spaced from its pivot connection to the base, a second eccentric follower operated by said eccentric and pivotally connected to said second lever, and means for adjusting the position of said eccentric, said last means including a pinion mounted for rotation with said eccentric, gear means meshing with said pinion and means for operating said gear means a distance sufficient to rotate said pinion through substantially 180° of arc, and separate means for opposing motion of said eccentric as a result of forces transmitted thereto through said eccentric followers.

7. In combination, in a reversing mechanism for locomotives, a base, a lever movably carried by said base and adapted to control a reach rod, a second lever pivoted to said base, a link pivoted to both said levers, an eccentric mounted on said base, means for rotating and controlling the position of said eccentric, and means including eccentric followers pivoted to said levers for transmitting motion of said eccentric to said lever and for transmitting forces applied to said lever partly to one portion of said eccentric and partly to an opposed portion thereof.

8. In combination, in a reversing mechanism for locomotives, a base, a lever movably carried by said base and adapted to control a reach rod, a second lever pivoted to said base, a link pivoted to both said levers, an eccentric mounted on said base, means for rotating and controlling the position of said eccentric, means including eccentric followers pivoted to said levers for transmitting motion of said eccentric to said lever and for transmitting forces applied to said lever partly to one portion of said eccentric and partly to an opposed portion thereof, and friction means for opposing motion of said eccentric responsive to pounding of the reach rod.

9. In combination, in a reversing mechanism for locomotives, a base, a lever movably carried by said base and adapted to control a reach rod, a second lever pivoted to said base, a link pivoted to both said levers, an eccentric mounted on said base, means for rotating and controlling the position of said eccentric, and means including eccentric followers pivoted to said levers for transmitting motion of said eccentric to said lever and for transmitting forces applied to said lever partly to one portion of said eccentric and partly to an opposed portion thereof, said first means including a pinion mounted for rotation with said eccentric, a rack movable tangentially of said pinion and meshing therewith, and fluid pressure operated means for moving said rack predetermined selected distances.

10. In combination, in a reversing mechanism for locomotives, a base, a lever movably carried by said base and adapted to control a reach rod, a second lever pivoted to said base, a link pivoted to both said levers, an eccentric mounted on said base, means for rotating and controlling the position of said eccentric, and means including eccentric followers pivoted to said levers for transmitting motion of said eccentric to said lever and for transmitting forces applied to said lever partly to one portion of said eccentric and partly to an opposed portion thereof, said first means including a pinion mounted for rotation with said eccentric, a rack movable tangentially of said pinion and meshing therewith, fluid pressure operated means for moving said rack predetermined selected distances, friction means normally opposing rotation of said eccentric and means automatically operable concomitantly with application of fluid pressure to said fluid pressure operated means for releasing said friction means.

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