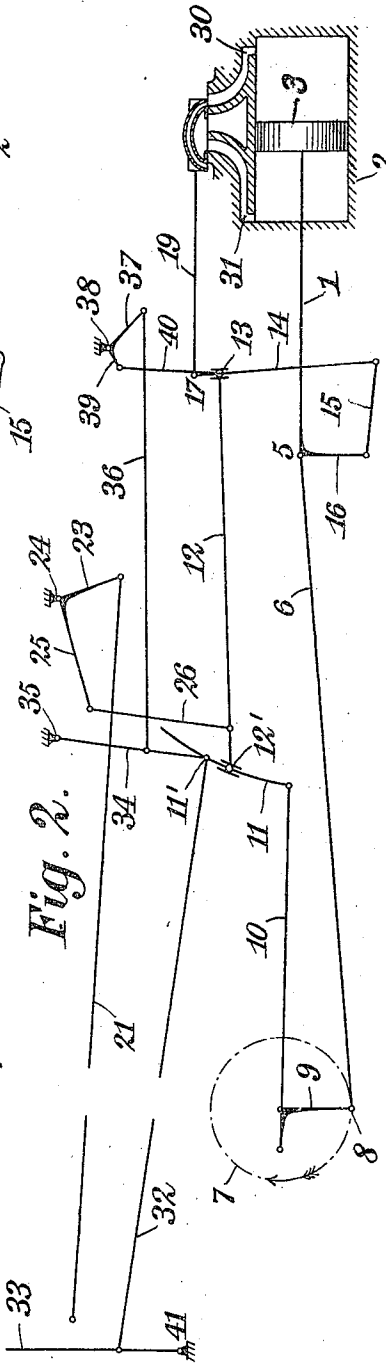
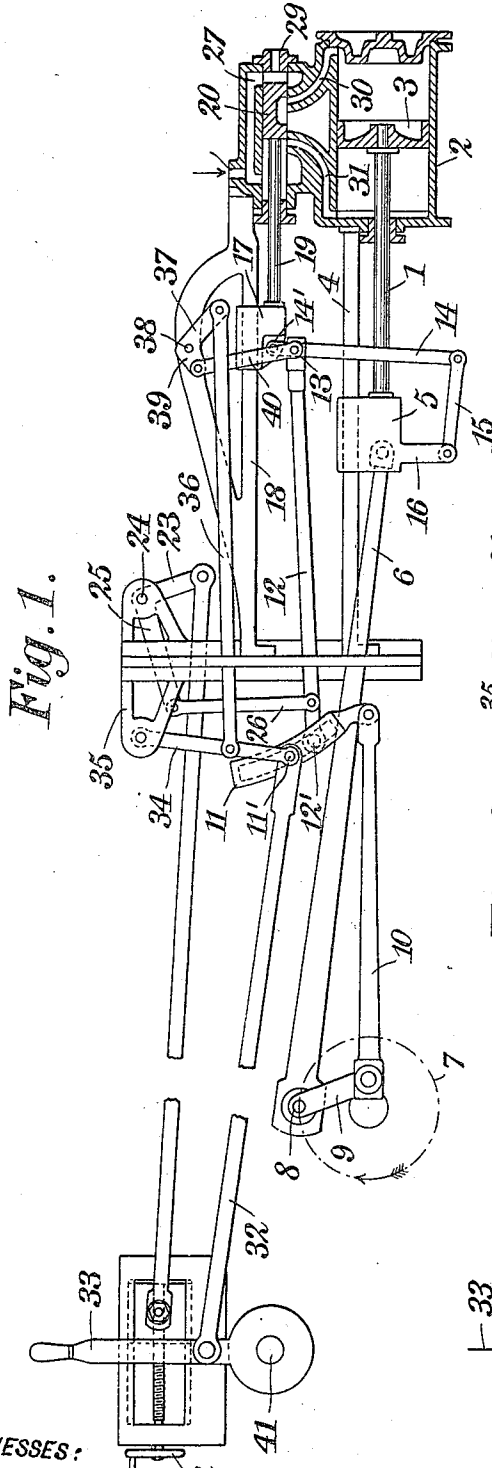


A. JENDRUSIK.
SLIDE VALVE GEAR FOR STEAM LOCOMOTIVES.
APPLICATION FILED NOV. 9, 1908.

961,613.

Patented June 14, 1910.

2 SHEETS—SHEET 1.



WITNESSES:

Edw. S. Shepard.
H. J. Subrier.

INVENTOR

Alexander Jendrusik
BY *James C. Taylor*
ATTORNEYS.

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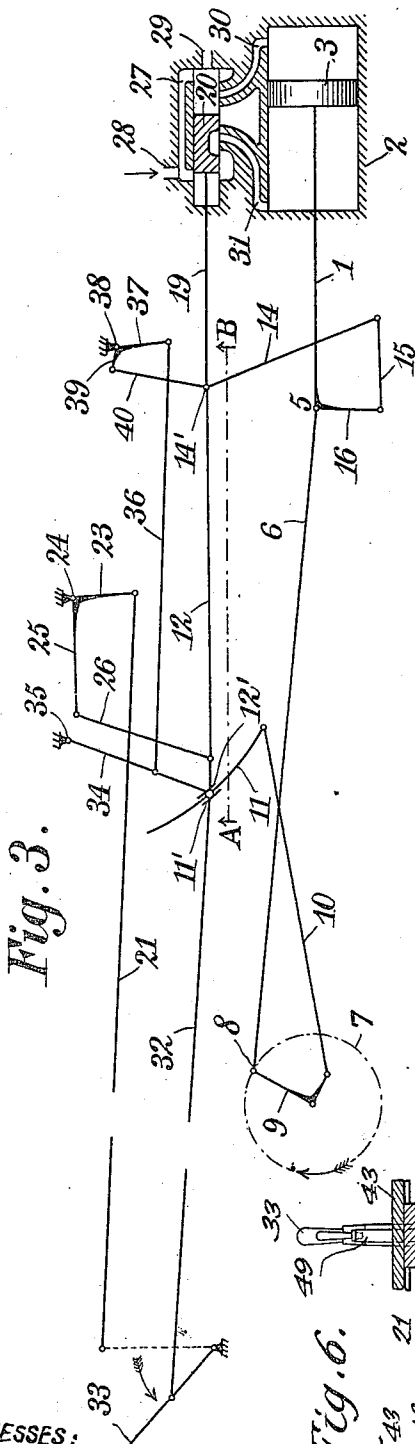


Fig. 3.

Fig. 5.

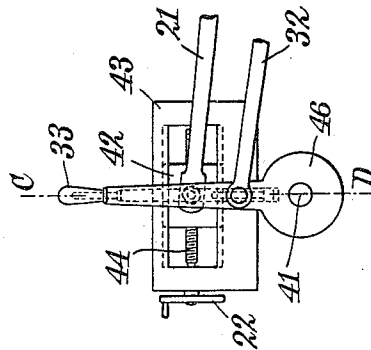


Fig. 7.

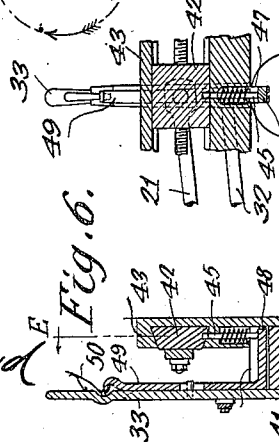
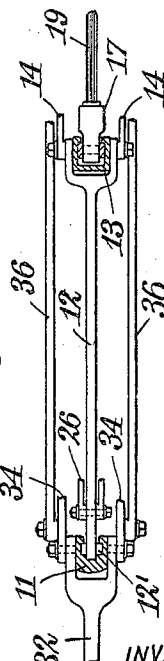


Fig. 6.

Fig. 4.



WITNESSES:

Edw. S. Shepherd
A. J. Subrier

INVENTOR

Audijus Jendrusik
BY *James Cooper*
ATTORNEYS.

UNITED STATES PATENT OFFICE.

AURELIJUSZ JENDRUSIK, OF STRZEMIESZYCE, RUSSIA.

SLIDE-VALVE GEAR FOR STEAM-LOCOMOTIVES.

961,613.

Specification of Letters Patent. Patented June 14, 1910.

Application filed November 9, 1908. Serial No. 461,726.

To all whom it may concern:

Be it known that I, AURELIJUSZ JENDRUSIK, a citizen of the Empire of Russia, residing in Strzemieszyce, in the Government of Petrikau, Russia, have invented certain new and useful Improvements in Slide-Valve Gears for Steam-Locomotives, of which the following is a specification.

In locomotives fitted with the valve gears hitherto known, it is necessary when steam is shut off in traveling down a gradient or otherwise, to set the gear to cut off the steam as late as possible in order to avoid the great compression and expansion of the air contained in the cylinders, and the consequent loss of power. But even when the point of cut off is set back to the fullest extent, considerable disadvantage is experienced on account of the resistance of the valve gear and the wear on the slide valves, the port faces and other parts of the gear. These difficulties are obviated by the present invention, which consists essentially in so arranging the parts of the gear that on shutting off steam, the motion of the slide valves and the whole of the gear, with the exception of the parts connected directly to the eccentric rods and the crossheads, is arrested, although the pistons continue their movement, the slide valves being shifted so as to fully open the admission ports of the cylinder. By this means the ends of the cylinder are put into direct communication, whereby the pistons do not perform any work on the air contained in the cylinders. In this manner the locomotive is enabled to run without steam very easily and the operative parts of the cylinders and slide valves are not injuriously affected. Since no suction and compression of air take place in the cylinders, no increase of the chimney draft will take place when running with the steam shut off.

The accompanying drawings illustrate by way of example one form of this invention applied to the Heusinger type of locomotive slide valve gear.

Figure 1 is a side elevation of the improved gear, the cylinder and slide valve being shown in vertical longitudinal section and the valve being set to give the latest cut off, Fig. 2 is a diagrammatic side elevation of the improved gear, in which the crank of the driving wheel is shown shifted through 180 degrees from the position shown in Fig. 1, Fig. 3 is a diagrammatic

side elevation of the improved gear in which the slide valve is shown in a position in which communication is established between the ends of the cylinder, Fig. 4 is a part horizontal section on the line A—B of Fig. 3, illustrating a detail, Fig. 5 is a side elevation of the mechanism for adjusting the shifting rod and the reversing rod, Fig. 6 is a vertical cross section on the line C—D of Fig. 5. Fig. 7 is a sectional view taken on the line E F of Fig. 6.

In the form of gear shown, 1 is the piston rod of the piston 3 working in the cylinder 2. A cross-head 5 sliding on the guide 4 is driven by the piston rod. The crank rod 6 connects the cross-head with the crank 8 of the usual driving wheel 7 (indicated by a small dotted circle).

A short arm 9 extending from the pin center of the connecting rod 6, serves to actuate an eccentric rod 10 which engages one end of an oscillating link 11 which is pivoted on a center 11'. One end of a radius rod 12 pivotally slides in this link, and the other end of said rod forms with a link 13 a center for a combination lever 14, one arm of which is connected by a rod 15 to a fixed arm 16 of the cross-head 5. The other arm of the combination lever is jointed at 14' to a slide block 17 adapted to move to and fro along the guide 18. This slide block is fixed to the rod 19 of the slide valve 20.

The reversing rod 21 for controlling the cut off, which may be operated from the engine footplate, for instance, by means of a handwheel 22, is connected at its forward end to one arm 23 of a bell crank lever fulcrumed on the center 24. The other arm of this lever is connected by means of a link 26 to the radius rod 12 near to the slide block of said rod.

The oscillating link 11 is operated by the eccentric rod 10 and the motion therefrom is transmitted through the radius rod 12 to the slide valve 20. The sliding and pivoted connection at 12' between the rod 12 and the link 11 is quickly adjusted by the reversing rod 21 similar to the Heusinger gear, while, when the gear is adjusted to its said position, the slide valve is substantially stationary.

Fig. 2 shows the same parts diagrammatically after the crank of the driving wheel has been shifted through 180 degrees. As shown, the slide valve chest is provided

in the usual manner with a by-pass 27 which connects the two ends of the valve-chest together and to which live steam is supplied for instance at 28.

5 When the engine is to run with the steam shut off, the steam supply to the valve-chest is shut off, and then by the working of the slide valve the piston 3 draws in air through a valve 29 (shown provided in the back end
10 of the valve-chest) and forces the air out again through the same valve.

The air which is drawn in while the locomotive is running on the track is always very dusty so that this drawing in and forcing
15 out of the air at every stroke, causes a rapid wear on the valve and port faces. For obviating this objection the slide-valve is according to the present invention moved by suitable means and retained in position
20 beyond its normal limit of movement whereby the ends of the cylinder are placed in connection with each other and the piston forces the steam on one side of the piston directly to the other side, so that neither
25 compression nor suction takes place in the cylinder. For retaining the slide-valve in this position, the mechanism which moves the slide-valve is so adjusted that neither from the cross-head 5, nor from the link 11
30 any motion is transmitted to the valve rod 19 and slide-valve 20. To enable such a circulation to take place past the slide valve from one side of the piston to the other, the slide valve must be in a position in
35 which the two admission ports 30 and 31 are in communication. The slide valve must therefore assume the position shown in Fig. 3 in which, if the crank is assumed to be rotating in the direction indicated by
40 the arrow, the air on the right hand of the piston will flow through port 30, slide-valve chest, by-pass 27, slide-valve chest, through the cavity of the slide valve, and port 31 to the other side of the piston. If the piston
45 is moving in the opposite direction the air will flow along the same path but in the opposite direction.

For the purpose of shifting and holding the slide-valve in the desired position, while
50 the piston is moving, the reversing rod 21 is set to mid-position whereby the sliding block 12' of the rod 12 is caused to coincide with the center 11' of the link 11 (Figs. 3 and 4). Now according to this invention
55 the center 11' of the link 11 is located in the forward end of a shifting rod 32 the rear end of which is attached to a lever arm 33. The center 11' is fixed relative to the link 11 and is pivoted to the lower end of the lever 34 the upper end of which is pivoted
60 to the fixed frame 35. From the lever 34 there extends a rod 36 which is connected to one arm 37 of a two-armed lever fulcrumed at 38, the other arm 39 of which is connected
65 by a link 40 to the link center 13 of the

combination lever 14. With this arrangement, if the lever 33 be rotated on its pivot
41, for instance from the position shown in Fig. 1, into the position shown in Fig. 3, then by means of the shifting rod 32 the
70 center 11' of the link 11 is shifted to the rear, and the lever 34 is caused to make a corresponding movement. Since however the lever 34 is connected by means of the rod 36, the lever 37, 39 and the link 40 to the link
75 center 13, the above described movement of the link center 11' to the rear, causes the lever 37, 39, to rock on its center 38 (Figs. 1 and 3) in such a manner that the arm 39 of this lever moves up, and carries upwardly with
80 it the link 40 and by means of the latter to such an extent that the link center 13 falls together with the pivot pin 14' of the lever 14. If now while the parts are in this position the piston is moved to and fro in the
85 usual manner, the oscillating link 11 which is connected by rods 10 and 9 with the crank, will oscillate in the usual manner, but since the slide-block 12' of the rod 12 is coincident with the center of the link 11, this link
90 will not transmit any motion to the rod 12 and will therefore not have any influence upon the slide valve. Therefore no motion can be transmitted from the cross-head 5 to the slide valve as the link center 13 coincides with the pivot point 14' and the lever
95 14. Consequently the slide valve 20 remains at a fixed determined position (Fig. 3) irrespectively of the position of the eccentric while the piston is moving to and fro in the
100 usual manner.

From the foregoing it is readily seen that for accomplishing the object of the invention, two requirements are necessary, first the shifting of the slide block 12' and the
105 center 13 to the zero point by means of the rods 21 and 36 and moving to the rear the oscillating link 11 by the rod 32. When the link 11 is drawn back before the slide-block 12' and center 13 have been placed in their
110 proper positions, it is obvious that the slide valve 20 will not take and remain in correct position. In the position which it would take under such circumstances, one channel, for instance channel 31 would be permanently
115 closed, so that expansion and compression would take place in the cylinder and the disadvantages stated in the beginning would be caused thereby. Therefore the lever 33 should only be moved into or
120 out of the position shown in Fig. 1, when the slide-block 12' and the center 13 are set to their zero points or when the reversing rod 21 assumes the position shown in Fig. 3. As soon as the lever 33 assumes the position
125 shown in Fig. 3, the rod 21 should not be shifted until the lever 33 has been returned into its normal position.

Now in order to avoid wrongly operating the gear, it is advisable to couple the revers- 130

ing rod 21 and the operating lever 33 together positively in such a manner that for instance the lever 33 can be reversed only when the reversing rod 21 is held in the mid-position, and also that the reversing rod can be shifted only when the operating lever 33 is in the normal position shown in Figs. 1 and 2. For this purpose the locking mechanism shown in Figs. 5 and 6 is provided. The reversing rod 21 terminated as usual in a slide-block 42 working in a fixed frame 43. This block can be shifted by means of the handwheel 22 and screw 44. In the frame 43 is a pin 45 which is pressed downwardly by a spring. A recess provided in the slide-block 42 is adapted to register with the pin 45 when the block 42 is in its mid-position. When the parts are in this position, means presently to be described, can be operated to cause the pin 45 to enter the recess in the block 42 against the action of the spring and thus lock the slide-block 42 in said mid-position.

The operating lever 33 is formed at its lower end into a hub 46 which can be rotated with the lever 33 on the pin 41. In a slot 47 of the hub 46 is an arm 48 of a slide piece 49 which is guided by means of a tongue and groove on the lever 33. 50 is a spring-pressed lever mounted on the hand lever 33 and so arranged that on grasping the hand lever 33 and pressing the lever 50, the slide piece 49 is pushed radially outward from the center 41.

If the lever 33 is in its normal position (Figs. 1 and 2), the slot 47 of the hub 46 is situated opposite the pin 45 so that the pin 45 by forcing back the arm 48 can enter the slot 47 and thus lock the hub 46 and with it the lever 33. In this position the slide block 42 of the reversing rod 21 is free and can be shifted in the usual manner for the purpose of determining the point of cut off. If now during the running of the engine with the steam shut off, the slide block 42 is moved into the zero or mid-position, and the slide valve 20 is held stationary, as hereinbefore described, then on grasping the lever 33 and drawing back the slide piece 49 by means of the lever 50, the spring pin 45 will be moved by the arm 48 in the frame 43 in opposition to the action of the spring in such a manner that the spring pin 45 will enter the oppositely situated recess in the slide block 42 and thus lock the latter, at the same time allowing the hub 46 to rotate. The hub may then be rotated and its periphery will bear upon and hold the pin 45 in its upper position, and thus keep the slide block 42 locked. This movement of the hand lever 33 will bring the slide valve to the position of Fig. 3. By returning the lever 33 into its normal position shown in Figs. 1 and 2, so that the slot 47 is again opposite the pin 45, the latter will be pushed by its spring

into the slot 47, thus releasing the slide block 42, after which the hand lever 33 will be locked by the slide block 42 and reversing lever 21 may be moved as desired.

As already stated the present invention is shown in the drawings in its application to a certain type of valve gear. It is however to be clearly understood that the present improvements can be applied to all other valve gears by correspondingly modifying the valve gear without departing from the nature of this invention, so long as the essential features are preserved which consist in so holding the slide valve and if necessary so modifying the slide valve chest that when the engine is running without steam, the slide valve will not be moved, and that the air which has been drawn in at first by the movement of the piston is permitted to circulate through the slide valve chest and slide valve from one side of the piston to the other, without any fresh supply of air being drawn in. In particular it is immaterial whether a flat slide valve or a piston is used.

The herein described apparatus has, as already stated, the further advantage that the centers 11' and 13 are quite stationary, so that there is no wear of those parts or of the slide block 17 and guide 18 during the time the engine is running without steam.

With a different type of valve gear, the means for holding the slide valve may be different, but the provision of such means will be obvious to a person skilled in the art.

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

1. In a valve gear, the combination, with the cylinder and slide-valve, of means for holding said slide-valve in abnormal position, channels coöperating with said slide-valve, when in said abnormal position, for establishing communication between both ends of the cylinder, and movable means for abnormally operating said slide-valve.

2. In a valve gear, the combination, with the cylinder and slide-valve, of means for holding said slide-valve in abnormal position, and channels coöperating with said slide-valve, when in said abnormal position, for establishing communication between both ends of the cylinder.

3. In a valve gear, the combination, with the slide-valve of an engine cylinder, of means for moving the slide-valve abnormally beyond the normal limit of movement, whereby one of the cylinder ports is uncovered and the other port registers with the arched cavity of the slide-valve, and a channel establishing communication between said cavity and the steam chest when the slide-valve is in said abnormal position.

4. In a valve gear, the combination, with the slide-valve of an engine cylinder, of means for holding the slide-valve abnormally beyond the normal limit of movement,

whereby one of the cylinder ports is uncovered and the other port registers with the arched cavity of the slide-valve, and a channel establishing communication between said cavity and the steam chest when the slide-valve is in said abnormal position.

5. In a valve gear, the combination, with the slide-valve of an engine cylinder, of means for holding the slide-valve abnormally beyond the normal limit of movement, whereby one of the cylinder ports is uncovered and the other port registers with the arched cavity of the slide-valve, a channel establishing communication between said cavity and the steam chest when the slide-valve is in said abnormal position, and a bypass establishing communication between the ends of the steam chest.

6. In a valve gear, the combination, with the cylinder, the piston rod, slide-valve and the slide-valve rod, of a combination lever pivoted to the slide-valve rod and loosely connected to the piston rod, an oscillating link, a longitudinally movable support to which said link is pivoted, a radius rod having its ends respectively both slidably and pivotally connected to the combination lever and said oscillating link, means for causing one end of said radius rod to coincide with the point to which said oscillating link is pivoted, means for causing the other end of the radius rod to coincide with the point of connection between the combination lever and the slide-valve rod, and for moving said support whereby the slide-valve is held in abnormal position beyond its normal limit of movement, and channels establishing communication between both ends of the cylinder when the slide-valve is held in said abnormal position.

7. In a valve gear, the combination, with the cylinder, the piston rod, the slide-valve and slide-valve rod, of a combination lever pivoted to the slide-valve rod and loosely connected to the piston rod, an oscillating link, a longitudinally movable support to which said link is pivoted, a radius rod having its ends respectively slidably pivotally connected to said combination lever, and said oscillating link, means for causing one end of said radius rod to coincide with the pivot point to which said oscillating link is pivoted, means for causing the other end of said radius rod to coincide with the point of connection between said combination lever and said slide-valve rod and for moving rearwardly said longitudinally movable support whereby the slide-valve is moved abnormally rearwardly, and channels adapted to connect both ends of the cylinder when said valve is thus moved.

8. In a valve gear, the combination, with the cylinder, the piston rod, the slide-valve and slide-valve rod, of a combination lever pivoted to the slide-valve rod and loosely

connected to the piston rod, an oscillating link, a longitudinally movable support to which said link is pivoted, a radius rod having its ends respectively slidably pivotally connected to said combination lever and said oscillating link, means for causing the one end of said radius rod to coincide with the pivot point to which said oscillating link is pivoted, means for causing the other end of said radius rod to coincide with the point of connection between said combination lever and said slide-valve rod and for moving rearwardly said longitudinally movable support whereby the slide-valve is moved abnormally rearwardly, means for preventing the operation of the first named means when the second named means is out of normal position and for preventing the operation of the second named means when the ends of said radius rod are not coincident with said pivot points, and channels adapted to connect both ends of the cylinder when said valve is thus moved.

9. In a valve gear, the combination with the cylinder and slide-valve, means for adjusting the gear to cause the slide-valve to cease reciprocating, means for moving the slide-valve to an abnormal position beyond its normal limit of movement to cause the same to establish communication between both ends of the cylinder, and means for preventing the operation of the first named means when the second named means is out of normal position and for preventing the operation of the second named means when the valve gear is in position to reciprocate the slide-valve.

10. In a valve gear, the combination, with the cylinder and slide-valve, of a reversing rod for adjusting the gears to cause the slide-valve to cease to reciprocate, a shifting rod for cooperating with the valve gear to cause the slide-valve to shift to abnormal position whereby communication may be established between both ends of the cylinder, and means for preventing movement of the reversing rod when the shifting rod is out of normal position and for preventing the movement of the shifting rod when said reversing rod is in position to cause the reciprocation of the slide-valve.

11. In a valve gear, the combination, with the cylinder and slide-valve, of a reversing rod for adjusting the gears to cause the slide-valve to cease to reciprocate, a shifting rod for cooperating with the valve gear to cause the slide-valve to shift to abnormal position whereby communication may be established between both ends of the cylinder, and means for preventing movement of the reversing rod when the shifting rod is out of normal position and for preventing the movement of the shifting rod when said reversing rod is in position to cause the reciprocation of the slide-valve, said means con-

sisting of a fixed support having a perforation, a movable block on said support and connected with said reversing rod and having a recess adapted to register with said perforation when said block is in mid-position, a hand-piece articulated with said support and said shifting rod and having a recess adapted to register with said perforation when the hand piece is in normal position, and means for forcing said pin longitudinally in said perforation.

12. In a steam locomotive, the combination of a slide-valve slide-block, with a combination lever fulcrumed on said slide-block and adapted to be moved by the piston-rod cross-head, a radius rod adjustably pivoted to said lever and adapted to have its point of pivotal connection moved until it coincides with the point of connection between said lever and said slide-block, and means for varying the position of said radius rod on said lever.

13. In a steam locomotive, the combination of a slide-valve slide-block, a lever (14) fulcrumed on the latter and adapted to be moved by the piston guide-block, said lever being formed at its end attached to the slide-block as a link, a rod (12) movably attached in said link, a link (11) adapted to be moved by a reversing arm, a two-armed lever (37, 39), a rod (36) pivotally connecting one arm of the latter with the latter link, and a rod (40) connecting the other arm of said two-armed lever with said former lever (14), said rod (12) being pivotally connected with said latter link (11).

14. In a steam locomotive, the combination, with a frame, a slide block movable therein, and a reversing rod connected with said slide block, of a lever arm pivoted on said frame, locking means on said frame for locking said guide block, and means mounted on said lever arm for controlling said locking means, as set forth.

15. In a steam locomotive, the combination, with a frame, a slide block movable therein, and a reversing rod connected with said slide block, of a lever arm pivoted on said frame, locking means on said frame for locking said lever arm, and means mounted on said lever arm for controlling said locking means, as set forth.

16. In a steam locomotive, the combination, with a frame, a slide block having a recess therein, and a reversing rod connected with said slide block, of a lever arm having an eccentric hub mounted revolvably on said frame, an outwardly spring-pressed pin in said frame, said hub having a cavity and a sliding member movable on said lever arm, said member having an arm normally in said cavity and adapted to push said pin into the recess in said slide-block, substantially as shown.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

AURELIJUSZ JENDRUSIK.

Witnesses:

WITOLD FUCHS,
CYRYL TREDWICKS.