No. 646,739. Patented Apr. 3, 1900.

J. N. KING.

AUTOMATIC DEVICE FOR OPENING TRAIN LINE AIR PIPES OF LOCOMOTIVES.

(Application filed Dec. 29, 1899.)

(No Model.) 4 Sheets—Sheet 1.

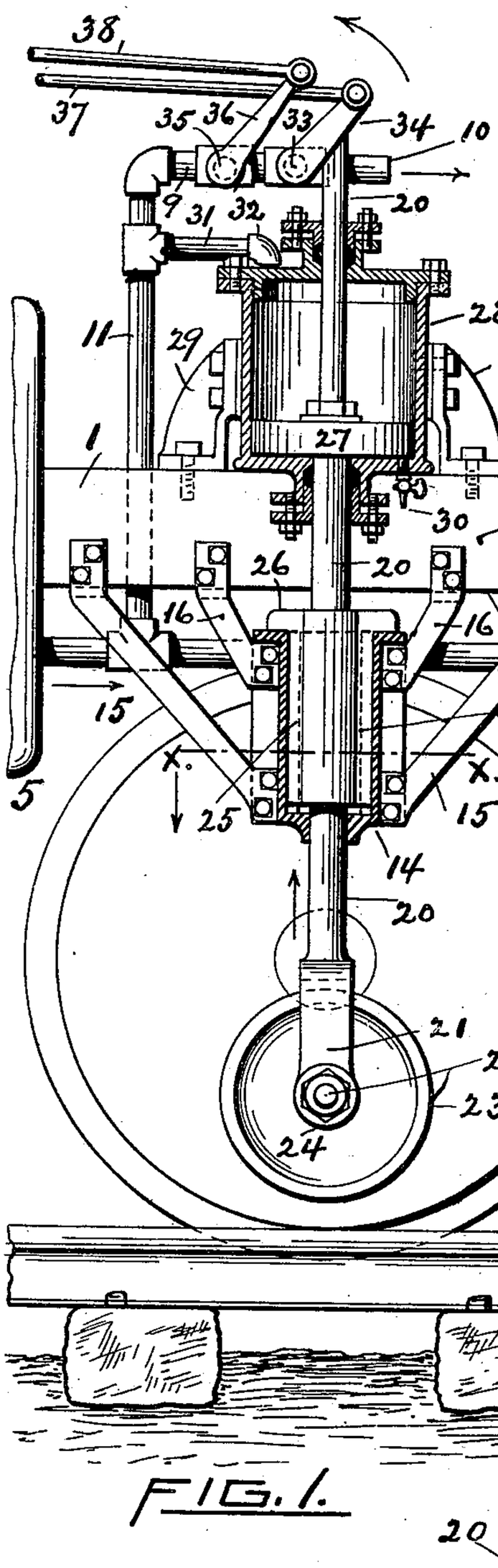

FIG. 1.

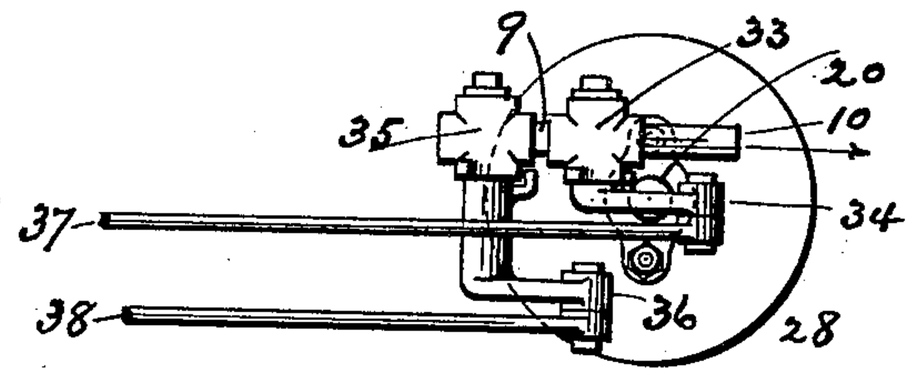

FIG. 2.

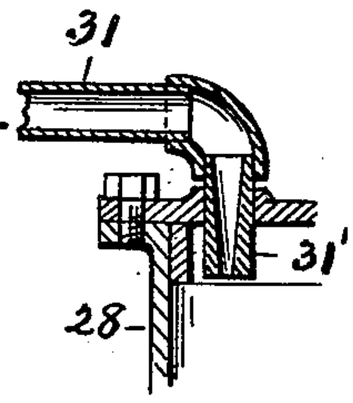

FIG. 3.

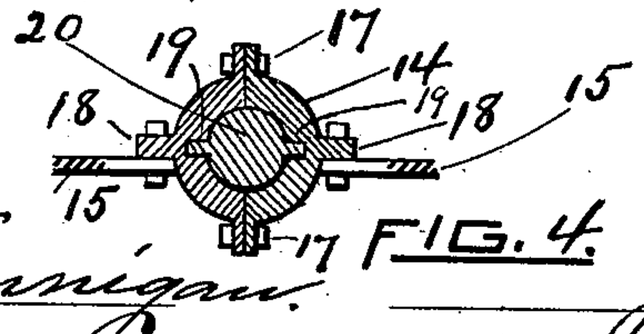

FIG. 4.

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(Application filed Dec. 29, 1899.)

(No Model.) 4 Sheets—Sheet 2.

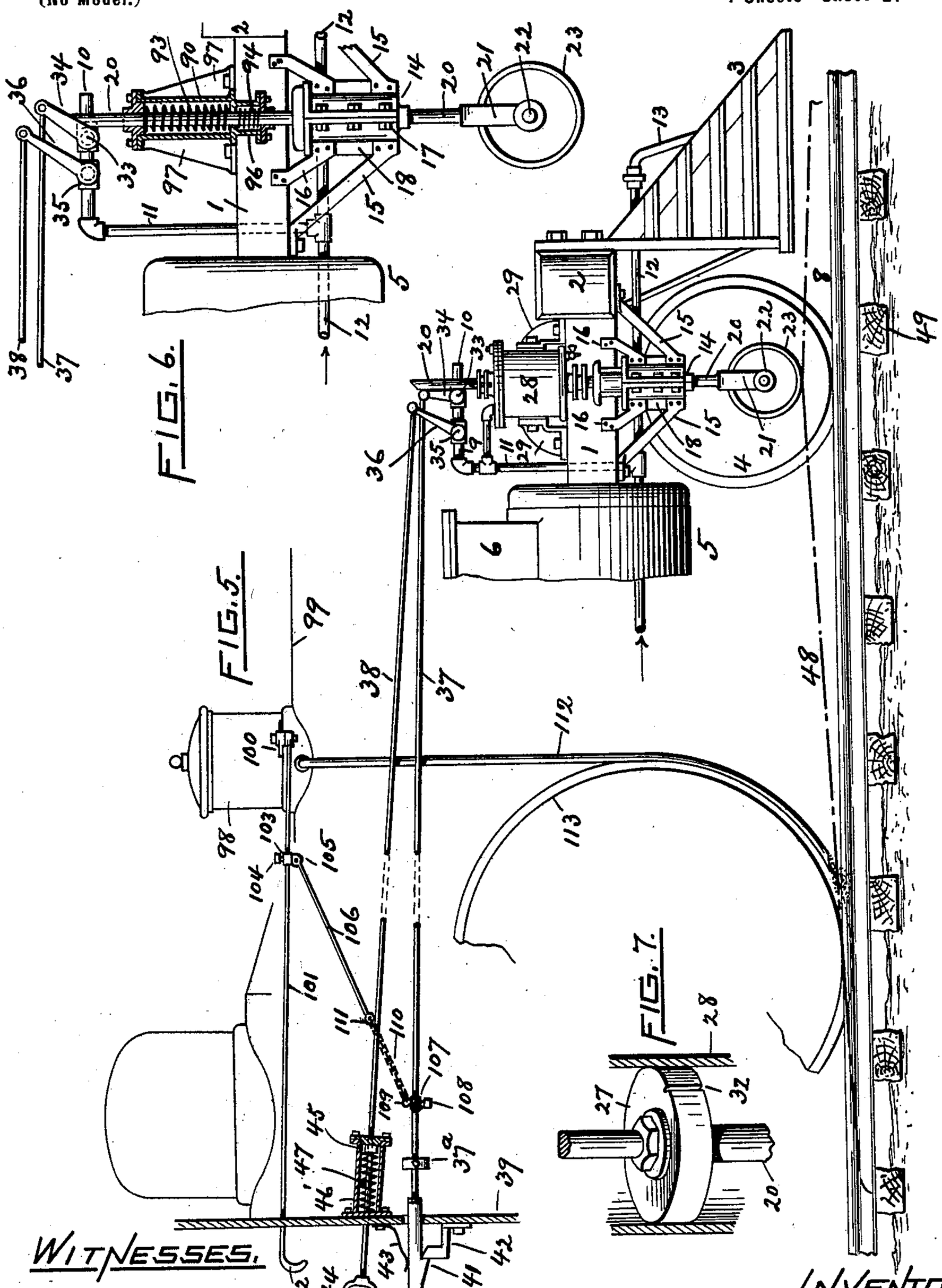

FIG. 6.

FIG. 5.

FIG. 7.

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(No Model.) 4 Sheets—Sheet 3.

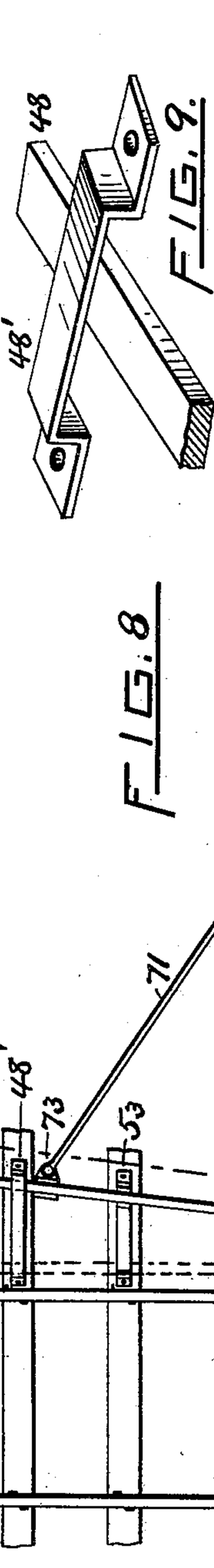

FIG. 9.

FIG. 8

FIG. 10.

FIG. 11.

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(No Model.) 4 Sheets—Sheet 4.

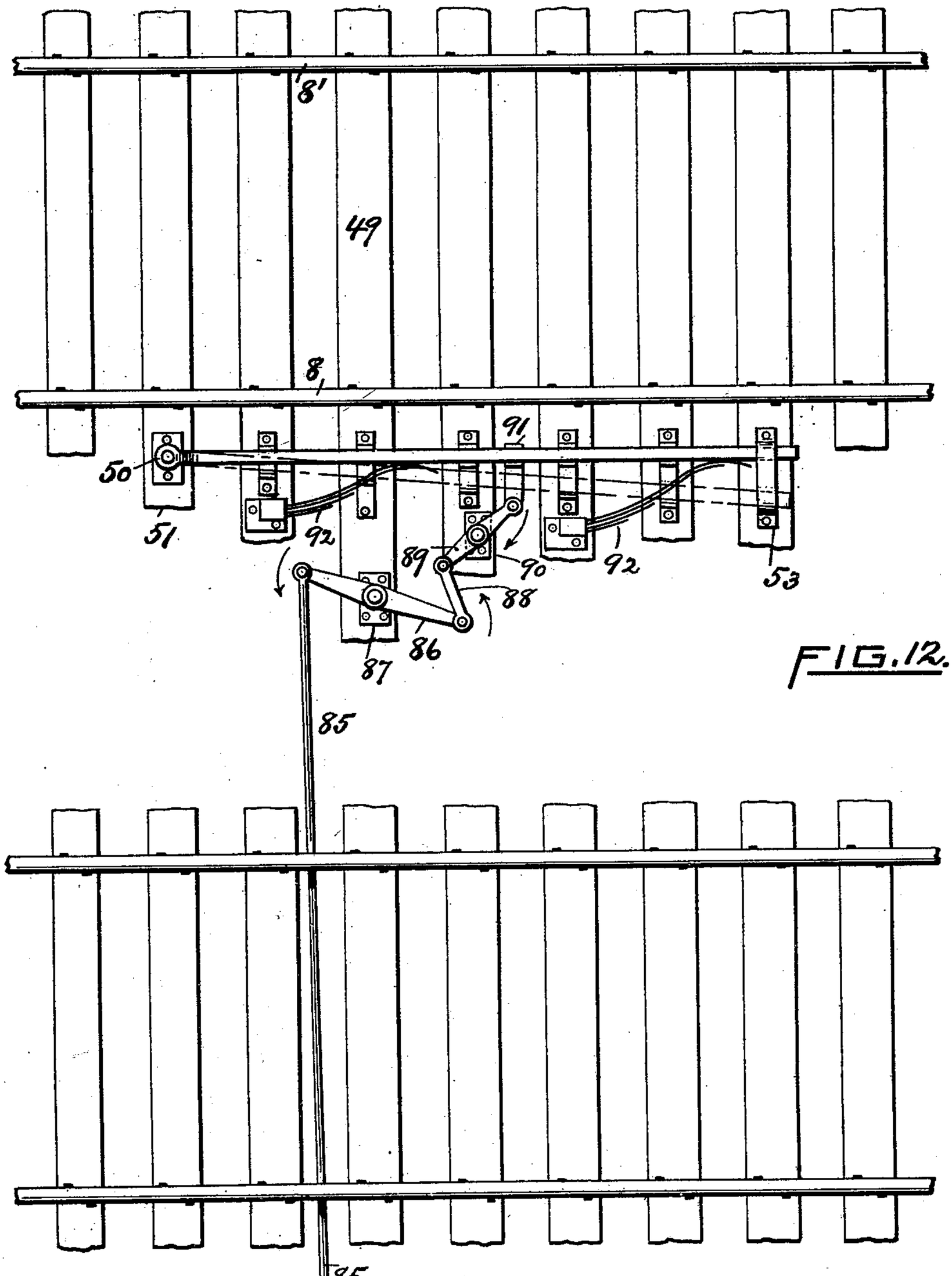

FIG. 12.

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UNITED STATES PATENT OFFICE.

JOSEPH N. KING, OF PROVIDENCE, RHODE ISLAND.

AUTOMATIC DEVICE FOR OPENING TRAIN-LINE AIR-PIPES OF LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 646,739, dated April 3, 1900.

Application filed December 29, 1899. Serial No. 741,967. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH N. KING, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Automatic Devices for Opening the Train-Line Air-Pipes of Locomotives, of which the following is a specification, reference being had therein to the accompanying drawings.

Like numerals indicate like parts.

Figure 1 is a side elevation of my invention, together with those parts of a locomotive which are adjacent thereto. Fig. 2 is a top plan of the compressed-air chamber of my said device and the several pipes, valves, and rods thereof. Fig. 3 is a detail view. Fig. 4 is a sectional view of the guide-cylinder and of the supporting-rod movable therein, on which the safety-wheel is mounted, said view being on section-line $x\ x$ of Fig. 1. Fig. 5 is a side elevation of the invention as in Fig. 1, except that the safety-wheel and its connected parts are shown in their operative position and the rods for the valves are also represented. Fig. 6 is a side elevation of a modified form of the device. Fig. 7 is a detail view. Fig. 8 is a top plan of the main-track and supplemental safety rail, together with the mechanism for moving the latter. Fig. 9 is a detail view. Fig. 10 is an enlarged view of one of the main-track rails and of the supplemental rail, as seen on section-line $z\ z$ of Fig. 8. Fig. 11 shows in side elevation the supplemental safety-rail as seen on line $w\ w$ of Fig. 8. Fig. 12 is a top plan of double main tracks, one of which has the supplemental safety-rail, together with means for moving the latter.

My invention is a safety device for railroads for the purpose of automatically stopping a railway-train when it is approaching a drawbridge, fouling-point, or place where the track is crossed by another track, and for other similar purposes; and it consists in the novel construction and combination of the several elements hereinafter particularly described, and as specifically set forth in the claims.

In the drawings, 1 is the frame of a locomotive-engine, and 2 the breast-beam thereof.

3 is the pilot, and 4 is one of the engine truck-wheels.

The steam-cylinder is shown at 5 and the steam-chest at 6.

The pilot 3 is supported by the brace 7.

The rail of the main track is designated as 8.

A branch air-pipe 9 has its forward end 10 open. A branch pipe 11 connects the said pipe 9 with the usual train-line air-pipe 12, at the forward end of which the hose 13 is coupled. Said train-line air-pipe 12 is connected, as usual, with a reservoir. (Not shown.)

A cylindrical guide 14 is supported by braces 15 16 from the frame 1, bolted as shown. Said cylindrical guide is made in two longitudinal halves, Fig. 4, with flanges bolted together, as shown at 17. Each section of said guide also has the flange 18, to which said braces 15 16 are bolted. On the interior of each of said sections is a longitudinal groove 19, Fig. 4.

A sliding rod 20, which is preferably cylindrical, has bifurcated parallel ends 21 at the bottom thereof, in which ends is mounted an axle 22, whereon a steel-pressed wheel 23, hereinafter called the "safety-wheel," is rotatably mounted. Said axle 22 has nuts 24 on its ends. The rod 20 has integral therewith the flanges or splines 25, diametrically opposite and of a thickness to fit loosely in the grooves 19 of the cylindrical guide 14. Said rod 20 also has integral therewith the cross-head 26 of a length exceeding the diameter of the cylinder 14. The rod 20 also has a piston 27, which fits movably in an air-chest 28, and the rod 20 extends upwardly through and above said air-chest 28, as shown, but is preferably of a reduced diameter.

The air chest or chamber 28 is for compressed air and air-cushions. It is mounted upon the frame 1 and secured in position by the braces 29, bolted, as shown, or in any other suitable manner. It is provided with stuffing-boxes and packings at top and bottom, through which the rod 20 passes. A petcock 30 opens through the bottom of the air-chest 28, and the piston 27 has a very small groove 32 from top to bottom on one side thereof, as seen on an enlarged scale in Fig. 7. A pipe 31 extends from the branch pipe 11 to the air-chest 28 and conveys compressed air thereto. Said pipe 31 is united by means of an elbow, Figs. 1 and 3, to a nozzle 31′, which

discharges into the air-chamber 28 at the top thereof.

In the branch air-pipe 9, near the forward end, is a valve 33, having a handle or lever 34. The upper end of the rod 20 is beveled, as shown in Figs. 1 and 5, and lies in the position illustrated in Fig. 1 when my improved automatic device is not in operation. When the valve 33 and valve-handle 34 are in the position shown in Fig. 1, said valve closes the pipe 9 and prevents the compressed air from discharging from the open end 10 of said pipe. In said branch pipe 9 is also a valve 35, having a handle or lever 36. A rod 37 is pivotally connected with the end of the valve-handle 34 and a rod 38 is pivotally connected with the end of the valve-handle 36. These rods 37 and 38 extend into the cab 39. The rod 37 has a handle 40, with a catch 41 thereon which is engageable with a detent 42. A spring 43 normally presses said handle 40 downward. Said rod 37 also has a collar 37^a, secured thereon by a set-screw. The rod 38 has a handle 44 and also a fixed collar 45. The rod 38 passes through a tube or cylinder 46, in which is a spiral spring 47, surrounding said rod, having one end bearing against the collar 45 and the other end bearing against the inner end of said cylinder, Fig. 5. The safety-wheel turns when in frictional moving contact with a supplemental or safety rail, (shown at 48.)

In Fig. 8 the main track is shown, consisting of the parallel rails 8 8', laid and secured, as usual, on the ties 49. These ties, as far as the supplemental safety-rail extends, are of increasing lengths, as shown in Fig. 8. Said safety-rail has two inclines, an upward and downward, the longer incline being that on which the safety-wheel mounts when the engine is advancing and the latter, half as long as the former, being that on which the safety-wheel runs when the engine is receding. The safety-rail 48 is pivotally mounted, as at 50, to a plate 51 on one of the ties. It is mounted on sliding blocks 52, to which it is fastened, Fig. 10, and said blocks are slidable on pillow-blocks 53, having flanges 54, and spiked to the tie 49, respectively. The outer free end of the safety-rail 48 is partially covered and protected by the cross bar or strap 48', which, as seen in Figs. 8, 9, and 11, prevents said end from rising.

A switch-bar 55, pivotally mounted on a standard 56, moves a wire 57 and chain 58, (the latter passing around a pulley 59,) a wire 60, a chain 61, (passing around a pulley 62,) a wire 63, and a bar 64. The bar 64 extends through a standard 65, whereon is a cylinder 66, having a closed flanged inner end and an open outer end. The bar 64 has the fixed collars 67 68 69. A spiral spring 70 surrounds the bar 64 in the cylinder 66, having one end bearing against the inner closed end of the cylinder and the other end bearing against the collar 67. On the collar 68 are pivotally mounted the arms 71 and 72, the former being pivotally connected to an earpiece 73 on the supplemental rail 48. The rail 48 also has the earpieces 74 and 75, to the former of which is pivoted the short bar 76, having the fixed collar 77, and to the latter of which is pivoted the short bar 78, having the fixed collar 79. A spiral spring 80 extends from the collar 69 of the bar 64 to the collar 77 of the bar 76 and is fastened thereto at the ends, respectively, and a spiral spring 81 extends from a collar 82 of the arm 72 to the collar 79 of the bar 78 and is fastened thereto at the ends, respectively. The springs 80 and 81 may be protected and covered by cylinders or tubes, as shown in Fig. 8.

In Fig. 12 I show another manner of moving the supplemental rail 48 in positions where there is a double parallel track. The switch 83 is pivotally mounted on the base-plate 84 and moves a bar 85, which extends beneath the rails of one track to a lever 86, to which it is pivotally connected. This lever 86 is pivoted to a base-plate 87 and has at its opposite end a pivoted link 88. The lever 89, mounted on a base-plate 90, is pivotally connected at one end with the link 88 and at the other end with an earpiece 91, attached to the rail 48. Springs 92 normally crowd the safety-rail 48 to parallel with the main track whenever the switch 83 is unlatched.

In Fig. 6 I show a modified form of my device in which the compressed-air chamber 28 is dispensed with and spiral springs 93 94, surrounding the rod 20, are used instead. These springs are contained in cylinders 95 96, as shown, supported by braces 97 or in any other suitable manner. The spring 93 serves to limit and soften the upward movement of the rod 20 and the spring 94 to soften the downward movement of said rod. As said downward movement is due to gravity the spring 94 is comparatively light.

In Fig. 5 the said box 98 is shown upon the boiler 9 9, as usual, having its sand-valve 100, operated by the rod 101 and handle 102. On the valve-rod 101 is a collar 103, secured thereon by a set-screw 104 and provided with an earpiece 105, to the latter of which a link-rod 106 is pivotally connected. On the valve-rod 37 is a similar collar 107, secured thereon by a set-screw 108 and provided with an earpiece 109. A chain 110 extends from an eye or terminal loop 111 at the end of the link-rod 106 to the earpiece 109 of the rod 37, as shown in said figure. The sand-pipe 112 extends, as usual, from the sand-box 98 to a point just in advance of the driving-wheel 113.

Having thus described the several parts of the invention, I will now proceed to explain its operation.

The supplemental safety-rail 48 is normally in the position indicated by the full lines in Fig. 8, extending at an acute angle with the rail 8 of the main track and outside thereof. When the towerman or other switch-tender knows that a train is in danger of crossing

or approaching a fouling-point, he first operates the switch to make effective my improved safety device, by which the engine and train are automatically stopped before reaching the point of danger, and then also sets the usual cautionary signals to notify the engineer of the approaching train to stop before reaching the fouling-point. If, however, the engineer does not see or disregards such cautionary signals, the said automatic device nevertheless operates and applies the brakes. The safety-rail is moved from the position shown in full lines in Fig. 8 to the position shown in dotted lines in said figure. When in the latter position, said safety-rail is parallel with the rail 8 of the main track, outside thereof, and adapted to operate the safety device which is upon the locomotive. This rail 48 is an inclined elevated rail, as seen in Figs. 5 and 11. The safety-wheel 23, which usually is at a height of a few inches above the plane of the top surfaces of the rails 8 8′ of the main track, soon comes in contact with the safety-rail 48 as the engine advances and mounts the same. The result of the running of the wheel 23 upon the rail 48 is to move the rod 20 upward, the splines 25 of which, engageable in the grooves 19 of the cylindrical guide 14, confining said rod 20 to a direct vertical linear travel. The air-chamber 28 is filled with compressed air through the pipe 31 from the train-line air-pipes 12 11 9, and as the upward movement of the rod 20 carries the piston 27 up into the air-chamber 28 an air-cushion is formed in the upper portion of said chamber, as the opening of the nozzle 31′, Fig. 3, is so small and the upward movement of the piston 27 so rapid that the air cannot be forced in undesirable quantity by said movement into the train-pipe, but is compelled to cushion in the upper portion of the chamber. An ordinary safety-valve may be attached to the upper end of the air-chamber 28, if necessary, to still further relieve the air-chamber of augmented pressure, when the safety-wheel 23 mounts the inclined rail 48. The said upward movement of the rod 20 presses its beveled upper end against the handle 34 of the valve 33, moving said handle from the position shown in Fig. 1 to the position shown in Fig. 5. When the handle 34 is in its usual position, as seen in Fig. 1, the valve 33, which it operates, is closed; but when the said handle is in the position seen in Fig. 5 the valve is open. Whenever the valve 33 is open, the compressed air in the air-pipe 9 rushes out of the open end 10 of the pipe 9, and this results in operating the air-brakes of the engine and cars in the usual and well-known manner and stops the train. At the same time the movement of the rod 37 causes said rod 37 to pull the chain 110, and thereby the rods 106 and 101 are drawn and the sand-valve 100 is opened, thus discharging sand through the sand-pipe 112 in front of the driving-wheels 113. The movement of the handle 34 just described pushes the rod 37 into the position illustrated in Fig. 5, where it is seen that the catch 41 of the handle 40 of said rod is engaged with the detent 42 in the cab 39, being forced and held in that position by the spring 43. The collar 37ª on the valve-rod 37 limits the movement of said rod. The train cannot now advance because the air-brakes hold it. The engineer must close the valve 33 by operating the rod 37 and unlatching the catch 41 from the detent 42 in the cab 39.

In order to prevent unnecessary stopping when moving away from the fouling-point or during switching operations, the engineer seizes the handle 44, and thereby draws the rod 38, which operates the valve 35 in the air-pipe 9. When the handle 36 of said valve 35 is in the position shown in Figs. 1 and 5, it is open, and it is normally held in this open position by the force of the spring 47, which surrounds the rod 38 in the cylinder 46; but when the rod 38 is drawn by the handle 44 the collar 45 on said rod compresses the spring 47 and the handle 36 of the valve 35 is brought to a vertical position and so remains as long as the engineer pulls the handle 44. During the time of such pull the valve 35 is closed, so that the air cannot escape from the open end 10 of the branch pipe 9, whereupon the air-brakes cease to operate on the wheels of the engine and cars and the train is free to move. As soon as the engine has moved far enough to allow the safety-wheel 23 to run down the safety-rail 48 said wheel by gravity resumes its original position, the extent of its descent, however, being limited by means of the cross-head 26, which, as soon as it comes in contact with the top of the cylindrical guide 14, prevents the rod 20, to which it is connected, (and consequently the wheel 23, which is supported by said rod,) from further downward movement. During all this time, however, the valve 33 has remained open and its handle 34 has been vertical, because the rod 37, pivoted thereto and which has been pushed toward the cab, is held in that position by the spring 43, catch 41, and detent 42. It is therefore now necessary to close said valve 33 in the air-pipe 9, which is done by unlatching the catch 41 of the handle 40 of the rod 37 from the detent 42 in the cab and moving said rod 37 forward. Whenever the engineer releases his hold upon the handle 44 of the rod 38, said rod 38 automatically opens the valve 35 in the pipe 9 by force of the spring 47. When the piston 27 is carried up in the chamber 28 by the upward travel of the rod 20, as already described, an air-cushion is formed in the upper portion of said chamber. As soon, however, as the piston 27 has reached the upward limit of its movement in said chamber a portion of the compressed air in the chamber above the piston passes down through the groove in the edge of the piston to the bottom of the chamber beneath the piston, and said air forms another air-cushion in the bottom of the chamber when the piston

descends. Said air beneath the piston afterward escapes through the petcock 30. The purpose of these air-cushions is to soften the stroke of the piston in the chamber at the end of its upward or downward movement. When in its lowest position, the piston 27 serves as a valve to close the inner opening of the petcock 30.

In the modified form of my device shown in Fig. 6 the coiled springs serve the same function as do the air-cushions.

When there is no danger, the switch-tender or towerman by moving the switch 55 in the direction indicated by the arrow in Fig. 8 draws the bar 64, thereby compressing the spring 70 and moving the safety-rail 48 to the position shown in full lines in said figure. The springs 80 and 81 are compensating springs, allowing the one movement of the bar 64 to pull the arms 71 76 78 sufficiently to move the rail 48 to the angular position shown. As said arms have different lengths and angles of movement, the springs 80 and 81 equalize their action.

By unfastening the switch 55 the spring 70 in expanding forces the rail 48 into its operative parallel position. (Indicated by dotted lines in Fig. 8.)

The pillow-blocks 53 are of varying heights on account of the incline of the rail 48; but their upper surfaces are below the plane of the top surfaces of the rails of the main track.

In Fig. 12, there being shown a parallel track, it would not be possible to use the mechanism for moving the supplemental rail illustrated in Fig. 8. In such case the lever system appearing in Fig. 12 is useful. The springs 92 when free to act move the rail into the position indicated in said figure in full lines whenever the switch 83 is unfastened, and when the switch 83 is in the position shown in said figure the springs 92 are relaxed.

I claim as a novel and useful invention and desire to secure by Letters Patent—

1. The combination with a railroad-track and a vertically-inclined safety-rail, of a locomotive-engine, provided with wheels movable on said track and with air-brakes for said wheels and a train-line air-pipe in connection with said brakes and having a branch pipe with its forward end open, a vertical rod having diametrically-arranged longitudinal flanges, a guide properly supported and having grooves or ways in which said flanges are mounted and movable, a cross-head on said rod adapted by its contact with the upper surface of said guide to limit the downward movement of said rod, a vertical safety-wheel rotatably mounted on the lower end of said rod above the safety-rail, a valve in said air-pipe, a handle adapted to move said valve and placed over and in contact with the upper end of said rod so as to be movable thereby, a rod pivotally connected at one end with the outer end of said valve-handle and having at its other end a handle and a catch and detent on a suitable support, on which detent said catch is engageable, substantially as set forth.

2. The combination with a railroad-track and a vertically-inclined safety-rail, of a locomotive-engine, provided with wheels movable on said track and air-brakes for said wheels and a train-line air-pipe in connection with said brakes and having a branch pipe with its forward end open, a vertical rod having diametrically-arranged longitudinal flanges, a guide properly supported and having grooves or ways in which said flanges are mounted and movable, a cross-head on said rod adapted by its contact with the upper surface of said guide to limit the downward movement of said rod, a vertical safety-wheel rotatably mounted on the lower end of said rod above the safety-rail, an air-chamber properly supported, through the center of which said rod is vertically movable, a branch pipe leading from said air-pipe into the top of said chamber, a piston on said rod movable within said chamber and fitting the same, a valve in the pipe first aforesaid and a handle adapted to move said valve and placed over and in contact with the upper end of said rod so as to be movable thereby, substantially as shown.

3. The combination with a railroad-track and a vertically-inclined safety-rail, of a locomotive-engine, provided with wheels movable on said track and air-brakes for said wheels and a train-line air-pipe in connection with said brakes and having a branch pipe with its forward end open, a vertical rod having diametrically-arranged longitudinal flanges, a guide properly supported and having grooves or ways in which said flanges are mounted and movable, a cross-head on said rod and adapted by its contact with the upper surface of said guide to limit the downward movement of said rod, a vertical safety-wheel rotatably mounted on the lower end of said rod above the safety-rail, an air-chamber properly supported, through the center of which said rod is vertically movable, a petcock opening from the bottom of said chamber, a branch pipe leading from said air-pipe into the top of said chamber, a piston having a vertical groove in its edge and mounted on said rod and movable in said chamber and fitting the same, a valve in the pipe first aforesaid and a handle adapted to move said valve and placed over and in contact with the upper end of said rod so as to be movable thereby, substantially as specified.

4. The combination with a railroad-track and a vertically-inclined safety-rail, of a locomotive-engine, provided with wheels movable on said track and with air-brakes for said wheels and a train-line air-pipe in connection with said brakes and having a branch pipe with its forward end open, a vertical rod having diametrically-arranged longitudinal flanges, a guide properly supported and having grooves or ways in which said flanges are

mounted and movable, a cross-head on said rod adapted by its contact with the upper surface of said guide to limit the downward movement of said rod, a vertical safety-wheel rotatably mounted on the lower end of said rod above the safety-rail, a valve in said pipe, a handle adapted to move said valve, a valve-rod pivotally connected at one end with the outer end of said handle, a handle on the opposite end of said valve-rod, a collar on said valve-rod, a spiral spring surrounding said valve-rod, having a fixed bearing at one end thereof and a bearing at its opposite end on said collar, another valve in said air-pipe between the last-named valve and the open end of said pipe, a handle adapted to move said second valve and placed over and in contact with the upper end of the first-named rod so as to be movable thereby, a valve-rod pivotally connected at one end to the outer end of the last-mentioned valve-handle, a handle on the opposite end of said second valve-rod, a catch on the handle of said second valve-rod and a detent upon a fixed support, with which detent said catch is engageable, substantially as described.

5. The combination with a railroad-track and a vertically-inclined safety-rail, of a locomotive-engine, provided with wheels movable on said track and air-brakes for said wheels and a train-line air-pipe in connection with said brakes and having a branch pipe with its forward end open, a rod vertically movable in guides upon said locomotive, a vertical safety-wheel rotatably mounted on the lower end of said rod above the safety-rail, a valve in said air-pipe, a handle adapted to move said valve and placed over and in contact with the upper end of said rod so as to be movable thereby, a valve-rod pivotally connected at one end with the outer end of said valve-handle and its other end entering into the locomotive-cab, a sand-box mounted upon the locomotive and having a sand-valve and a sand-discharge pipe, a rod extending from the sand-valve into the cab, a link-rod pivotally connected with the sand-valve rod and a chain from said link-rod to the valve-rod first aforesaid, substantially as described.

6. The combination with a railroad-track and a vertically-inclined safety-rail, of a locomotive provided with wheels movable on said track, a rod vertically movable in guides upon the locomotive, a vertical safety-wheel rotatably mounted on the lower end of said rod above the safety-rail, a pivotally-mounted lever-arm placed over and in contact with the upper end of said rod and movable thereby, a sand-box upon the locomotive having a sand-valve and a sand-discharge pipe, a sand-valve rod extending into the locomotive-cab, a rod pivotally connected with the outer end of said lever-arm and a flexible connection between the last-named rod and the sand-valve rod, substantially as specified.

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

JOSEPH N. KING.

Witnesses:
WARREN R. PERCE,
HOWARD A. LAMPREY.