No. 770,265. PATENTED SEPT. 20, 1904.

C. J. COLEMAN.

RAILWAY SWITCH AND INTERLOCKING APPARATUS.

APPLICATION FILED OCT. 2, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1,

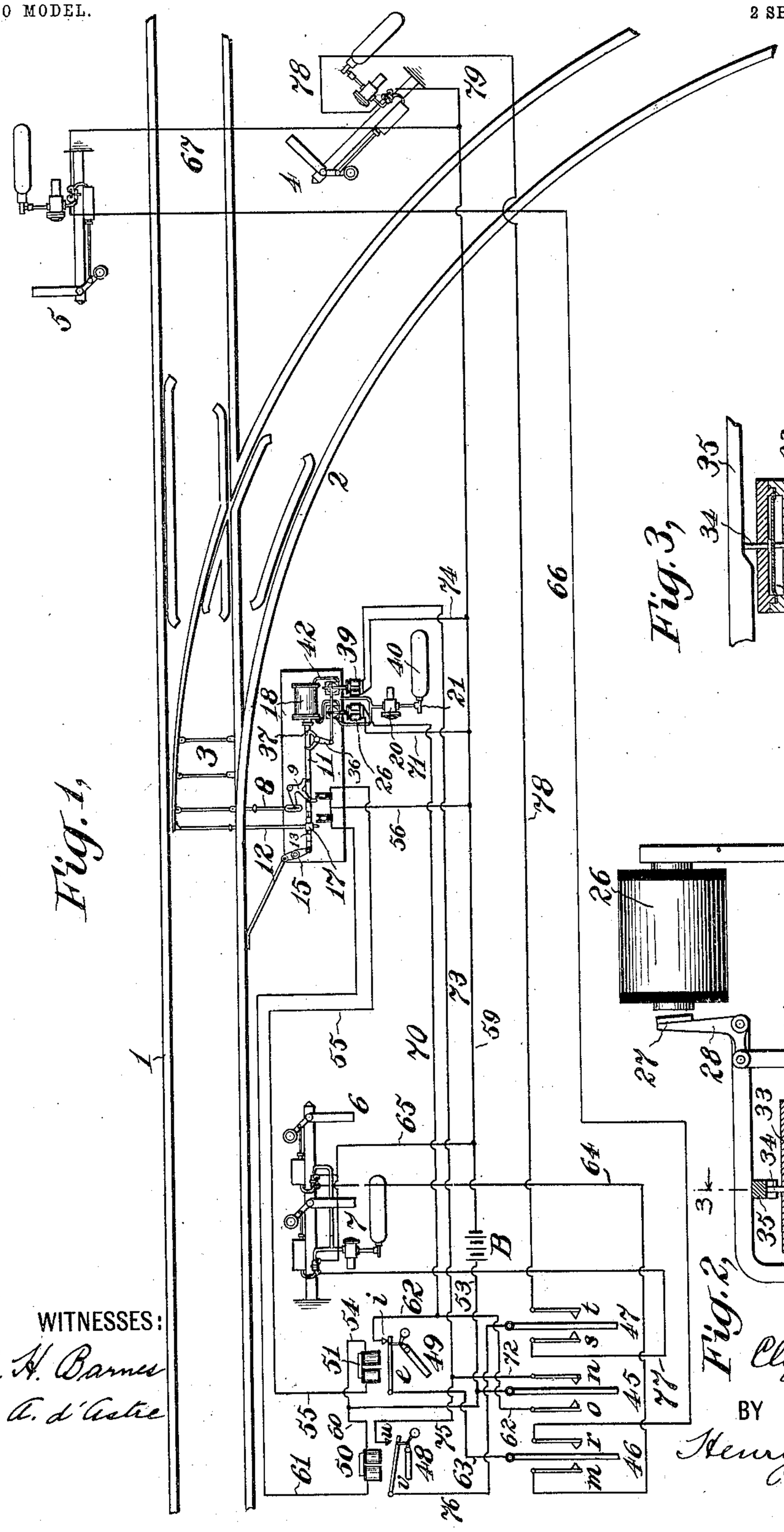


Fig. 3,

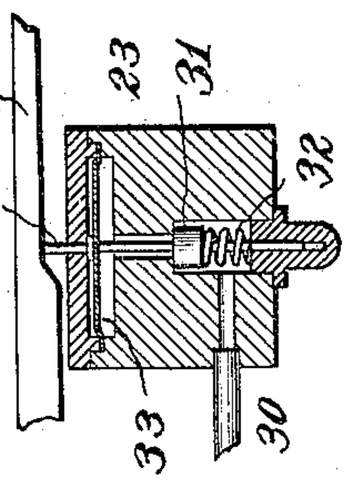
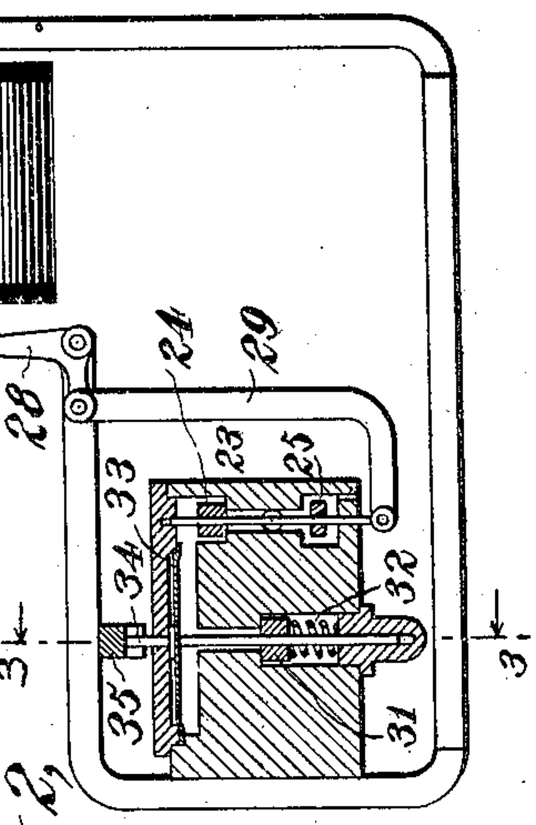


Fig. 2,



WITNESSES:

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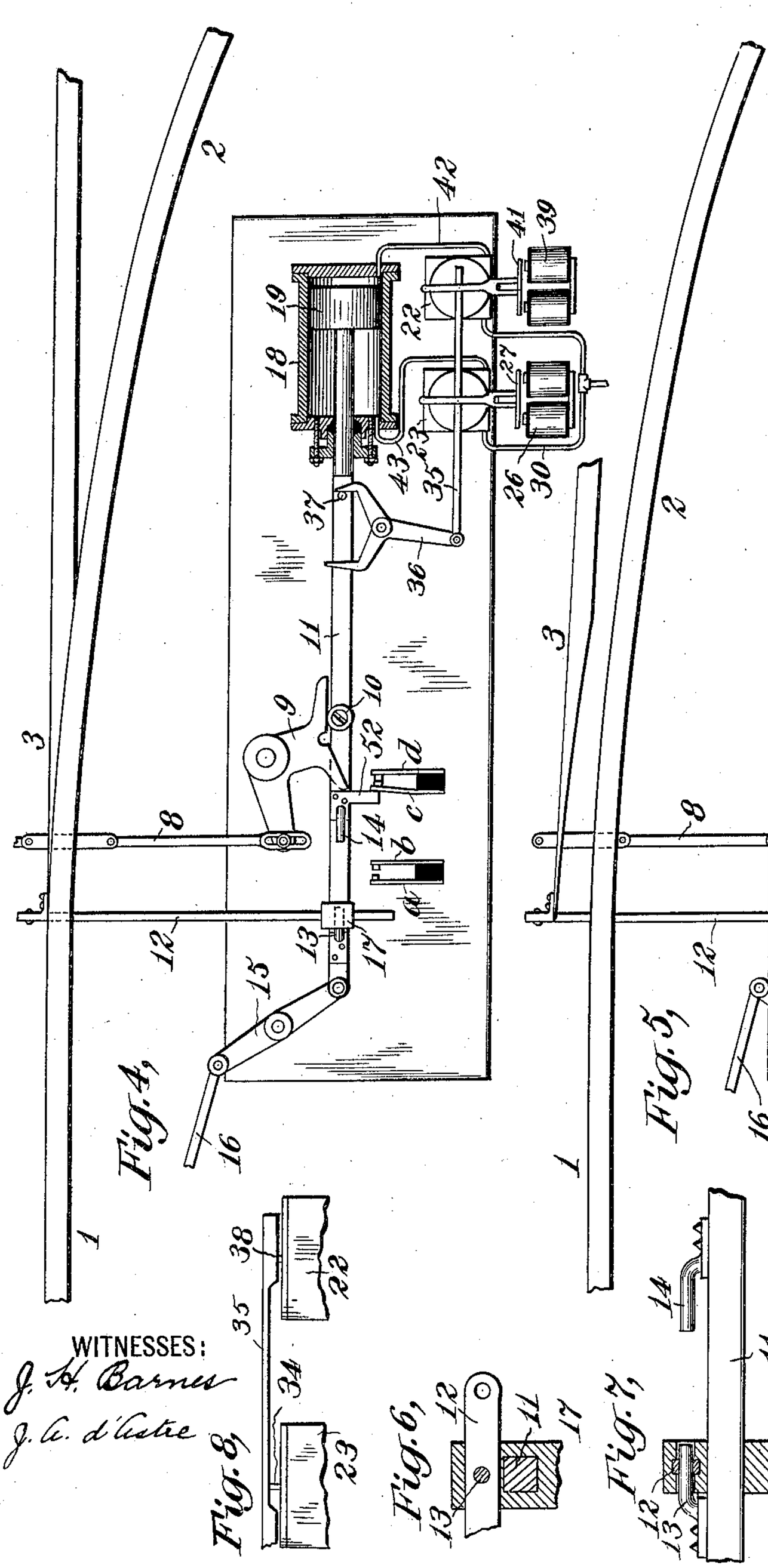

Fig. 4,

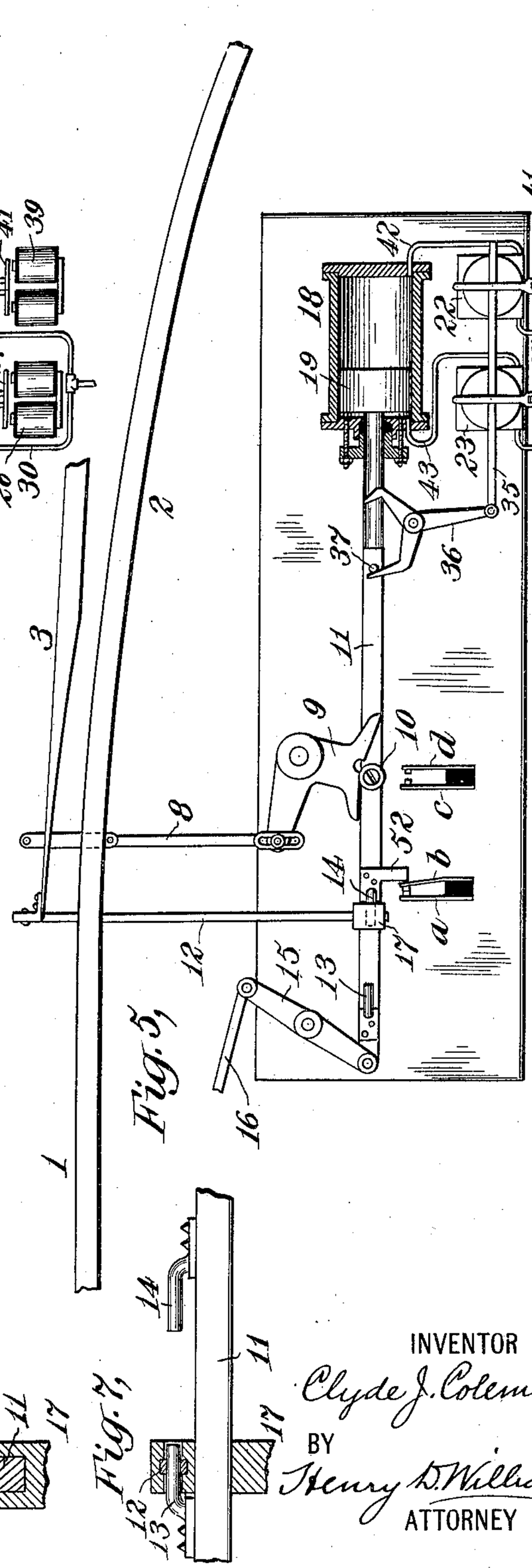

Fig. 5,

Fig. 8,

Fig. 6,

Fig. 7,

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No. 770,265. Patented September 20, 1904.

UNITED STATES PATENT OFFICE.

CLYDE J. COLEMAN, OF NEW YORK, N. Y., ASSIGNOR TO THE HALL SIGNAL COMPANY, A CORPORATION OF MAINE.

RAILWAY SWITCH AND INTERLOCKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 770,265, dated September 20, 1904.

Application filed October 2, 1902. Serial No. 125,698. (No model.)

To all whom it may concern:

Be it known that I, CLYDE J. COLEMAN, a citizen of the United States, residing in the borough of Manhattan, in the city of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Railway Switch and Interlocking Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to railway switch and interlocking apparatus, and includes improved means whereby the switch may be shifted and the signals operated from a signal tower or station, the switch and signals being interlocked, so as to prevent the giving of an improper signal.

My invention has for its principal object the employment of liquefied gas to supply the power for shifting the switch, and the liquefied gas employed is capable of supplying the requisite power in the form of a gas when the pressure on the liquid is reduced, and I prefer to employ liquefied carbon dioxid as such power medium. The gas-pressure to shift the switch is applied in a chamber, which I shall designate as the "gas-pressure-applying" chamber and which may be embodied in various forms, such as a piston-chamber or a turbine or any other suitable form capable of receiving and applying the pressure of the expansive gas to shift the switch. Suitable controlling devices are provided, such as a valve or valves, for controlling the gas supplied to the gas-pressure-applying chamber, and in the best embodiment of my invention such controlling means are electrically controlled, and thereby the interlocking means may comprise suitable levers controlling electrical contacts, and the connections with the switch and signals may be by electrical conductors. The liquefied gas may be stored in a chamber or storage-tank, and this storage-tank may be detachably connected, so that each switch may be provided with a storage-tank, which when exhausted may be detached and replaced by a charged tank, and all piping may thus be avoided, each switch-operating mechanism containing its own power apparatus. Thus I obviate the loss through leakage incident to the use of piping, as well as the great expense of such piping as is now employed in pneumatic systems. I am also enabled to economically employ comparatively high pressure in the switch-operating apparatus and to secure certainty of operation, as well as economy, in the cost of operation.

My invention includes various improvements in construction, as hereinafter particularly set forth, and I will now describe the railway switch and interlocking apparatus embodying my invention illustrated in the accompanying drawings, forming part of this specification, and will thereafter point out my invention in claims.

Figure 1 is a diagrammatic view of a portion of a track with a switch, switch-operating mechanism, signals, and interlocking apparatus. Fig. 2 is an enlarged vertical sectional detail of one of the electrically-operated valves of the switch-operating mechanism. Fig. 3 is a vertical section of the same, taken on a plane indicated by the line 3 3, Fig. 2. Fig. 4 is an enlarged plan, partly in section, of the switch-operating mechanism and a portion of the switch, showing the switch set for main-line traffic. Fig. 5 is a similar view showing the switch set for the siding. Figs. 6 and 7 are details of portions of the switch-locking device. Fig. 8 is a detail elevation of the valve cut-off rod and adjacent parts.

The track comprises a straight section or main line 1 and a diverging section or siding 2, a switch 3 being located at the point of divergence of the siding. Signals are provided to guard the approach to the switch from all directions, the signal 4 to guard the approach to the switch from the siding 2, the signal 5 to guard the approach to the switch on the straight track from the right, and the two signals 6 and 7 to guard the approach to the switch from the left and toward the points of the switch, the signal 6 indicating by its safety position that the switch is set for main-line traffic and the signal 7 indicating by its safety position that the switch is set to permit a train to pass from the main line on to the siding. The construction of the signals forms no part

of the present invention, the signals being shown as of a type adapted to be operated by liquid-gas pressure in accordance with my invention as set forth and claimed in application for Letters Patent, filed July 8, 1901, serial number 57,530. These signals are normally at "danger" and are shown in their normal danger positions, and their mechanism will operate to cause them to give safety indications when electric circuits are closed through their operating-circuits by the interlocking apparatus to be hereinafter described.

The switch 3 may be of any usual or suitable construction and is shifted by the switch-rod 8, which is adjustably connected to the escapement-crank 9, this escapement-crank being actuated by engagement with the stud 10 on the piston-rod 11. The escapement-crank commences and completes each movement with the portion of its surface which is in engagement with the actuating-stud 11 in a position parallel to the direction of movement of such actuating-stud, and therefore not actuated thereby, thus permitting actuation of the piston-rod to unlock the lock-bar 12 at the commencement of each stroke by withdrawing one of the plungers 13 or 14 from engagement therewith and to lock the lock-bar 12 at the completion of each stroke by forcing the other plunger 13 or 14 into engagement with the lock-bar. The piston-rod 11 and lock-bar 12 slide in a block 17, which is also perforated to receive either one of the plungers 13 14 when in locking position.

A detector-bar mechanism of usual construction may be provided, and, as shown, the end of the piston-rod 11 is pivotally connected to a crank 15, which is pivotally connected to an actuating-rod 16 of a detector-bar. (Not shown.)

The gas-pressure-applying chamber of the switch-operating mechanism is shown as a cylinder 18 and a piston 19, fitted within the cylinder. To the piston 19 is secured the piston-rod 11, above referred to, the piston-rod entering the cylinder through a stuffing-box of usual construction. The piston is double-acting, being actuated positively in both directions by the gas-pressure, and is provided with valve mechanism adapted to admit and exhaust the gas-pressure to and from the cylinder at both ends thereof. The gas-pressure is supplied from a source of liquefied gas, which in the embodiment of my invention shown is a storage-tank 40, and a pressure-reducing valve 20 is interposed in the connections between the storage-tank and a gas-pressure-applying chamber. The function of the reducing-valve is to reduce the initial and variable high pressure of the liquefied gas to a substantially constant low pressure, selected as the proper working pressure in the gas-pressure-applying chamber. The pressure-storage tank has a connection or coupling 21, whereby it may be detachably connected in place, so as to be replaced when discharged or exhausted by a charged storage-tank.

The gas supplied to the pressure-applying chamber is controlled by suitable valve mechanism, and this valve mechanism is controlled by the interlocking mechanism. In the embodiment of my invention shown in the drawings two valve devices 22 and 23 are provided, the valve device 22 being connected to the right end of the cylinder 18 by the pipe 42 and the valve device 23 being connected to the left end of the cylinder by the pipe 43. The two valve devices are of identical construction, and the valve device 23 is separately shown in section in Figs. 2 and 3. The inlet-valve 24 and the exhaust-valve 25 of this valve device are both upon the same stem and are operated by the electromagnet 26 through its armature 27, the armature-lever 28, and connecting-bar 29, this connecting-bar being of sufficient weight to maintain the armature normally in retracted position and the inlet-valve 24 closed and the outlet-valve 25 open. The gas enters the valve-casing through the pipe 30 and is controlled by the cut-off valve 31, and a spring 32 and the diaphragm 33 tend to hold this cut-off valve closed, and when the cut-off valve 31 is open the gas flows into the chamber of the diaphragm and thence to the inlet-valve 24. The stem 34 of the cut-off valve is actuated by the valve cut-off rod 35, and the valve cut-off rod is actuated by the cut-off crank 36, which is engaged by a pin 37 on the piston-rod 11 at the conclusion of each stroke of the piston 19. The valve cut-off rod 35 has inclined faces or cams, which at the final movement of each stroke of the piston move clear of the stem of the cut-off valve of the valve device which supplied gas to cause such movement of the piston, permitting the cut-off valve to be closed not only by the action of its retracting-spring, but also by the direct pressure of the gas against the diaphragm, so that at the completion of each stroke of the piston the gas-supply is positively cut off and waste or leakage of gas is prevented.

As shown in Figs. 1, 2, 3, 4, 6, 7, and 8, the piston 19 has completed its stroke to the right, and the cut-off valve 31 of the left valve device 23 has closed. The inlet-valve 24 is also shown closed in Fig. 2; but it is evident that the gas-supply is cut off altogether independently of the inlet-valve. The valve cut-off rod 35 has also actuated the stem 38 of the cut-off valve of the right valve device 22 and has forced this cut-off valve open, so that the right valve device is ready to supply gas to the cylinder whenever its electromagnet 39 is energized and caused to attract its armature 41 to open its inlet-valve. As shown in Fig. 5, the parts are in the reverse position, and the cut-off valve of the right valve device 22 is closed, and the cut-off valve of the left valve device 23 is open.

The interlocking device is adapted to be controlled at a suitable tower or station conveniently located and at any desired distance from the switch. Where several switches are in proximity to each other, the controlling-levers for the several switches would usually be located at a single tower or station. The drawings show a single switch and its signals and interlocking mechanism for the control of these simple elements. The control may be entirely electrical, as in the embodiment of my invention shown, the manual controlling devices comprising a switch-lever 45 and two signal-levers 46 and 47. Indicators are also provided at the controlling tower or station to indicate to the operator the completion of each switch-shifting operation, the indicator 49 giving the clear indication to show that the switch is set for the straight track or main line and the indicator 48 giving the clear indication to show that the switch is set for the diverging line or siding. These indicators are actuated by electromagnets 50 and 51, respectively, which are controlled by contacts *a* and *b* and *c* and *d*, respectively, of the switch-operating mechanism, and a projection 52 on the piston-rod 11 closes the contacts *c* and *d* when the switch is set for the main line and closes the contacts *a* and *b* when the switch is set for the siding, operating to open and close the contacts at the beginning and ending of the movement of the piston and before and after the switch has been actuated. As shown in Figs. 1 and 4, the contacts *c* and *d* are closed, and the circuit to clear the indicator 49 may be traced in Fig. 1 as follows: from battery B by wires 53 54 through electromagnet 51 of indicator 49, wire 55, contacts *d c*, and wires 56 and 59, back to battery. The circuit to clear the other indicator 48 would flow from battery B by wires 53 60 through electromagnet 50 of indicator 48, wire 61, contacts *a b*, and wires 56 and 59, back to battery. The indicators also close contacts in the signal-circuits, and, as shown in Fig. 1, the main-line indicator has closed the contacts *e* and *i* in the circuits of the two main-line signals 6 and 5, and either one of these signals may be cleared.

The following operations are necessary to effect the clearing of the left main-line signal 6 to permit a train to approach the switch from the left and to proceed on the main line. Although the switch is properly set, the operator must nevertheless move the switch-lever 45 in the proper direction to bring the switch to the proper position or toward the left, so as to close it upon the contact *o*. Such movement will close the circuit of the electromagnet 26 of the left valve device 23 of the switch-operating mechanism opening the inlet-valve 24; but the closed condition of the cut-off valve 31 will prevent waste of gas. The circuit thus closed will be as follows: from battery B by wire 53, switch-lever 45, contact *o*, wires 62 70, electromagnet 26, and wires 71 and 59, back to battery. The signal-circuit may now be completed by moving the main-line signal-lever 46 to the left, thereby closing such lever on the contact *m*. The circuit will be as follows: from battery B by wire 53, switch-lever 45, contact *o*, wire 62, contacts *i e*, wire 63, signal-lever 46, contact *m*, wire 64, signal 6, and wires 65 and 59, back to battery.

The following operations will be required to give a clear signal to a train approaching from the right on the main line: The switch-lever 45 must first be moved to the left, as above described, and then the signal-lever 46 must be moved to the right, closing this lever upon the contact *r*. The circuit to clear the right main-line signal 5 will be as follows: from battery B by wire 53, switch-lever 45, contact *o*, wire 62, contacts *i e*, wire 63, signal-lever 46, contact *r*, wire 66, signal 5, and wires 67 59, back to battery.

I will now describe the operations for clearing the left siding-signal 7 to permit a train to approach the switch from the left and proceed on the siding. The switch-lever 45 is now to be moved to the right, closing it upon the contact *n*. This will close the circuit of the electromagnet 39 of the right valve device as follows: from battery B by wire 53, lever 45, contact *n*, wires 72 73, electromagnet 39, and wires 74 and 59, back to battery. As above described, the cut-off valve of this right valve device is now open, and therefore the opening of the inlet-valve, which will result from the energization of the electromagnet 39, will cause the gas to be supplied to the right end of the cylinder 18, and the piston 19 will be actuated and moved to the left, the switch-lock bar will be unlocked, the switch will be actuated and moved to the position for the siding, (see Fig. 5,) and the switch-lock bar will be locked with the switch in such position. Upon the completion of the left stroke of the piston 19 the projection 52 on the piston-rod will close the contacts *a b*, and thereby the circuit for clearing the indicator 48 will be closed. This circuit has been heretofore described and is as follows: from battery B by wires 53 60, electromagnet 50, wire 61, contacts *a b*, and wires 56 and 59, back to battery. After the indicator 48 has been put clear the clear-signal can be given to the approaching train, and to give this signal the operator moves the signal-lever 47 to the left, closing it upon the contact *s*. The circuit for the signal 7 thus closed may be traced as follows: from battery B by wire 53, switch-lever 45, contact *n*, wires 72 75, contacts *u v*, wires 76, signal-lever 47, contact *s*, wire 77, signal 7, and wires 65 59, back to battery. The closing of this circuit clears the signal 7, thereby giving the proper indication for the train to proceed.

The following operations are necessary to clear the siding-signal 4 to permit a train to

approach the switch from the siding and enter the main line. The switch-lever 45 must first be moved to the right, as above described; but if the switch is already properly set this will only result in opening the inlet-valve of the right valve device 22, and the closed condition of the cut-off valve will prevent waste of gas. After the switch-lever has been moved to the right the signal-lever 47 may be actuated to clear the signal 4 and will be moved to the right, thereby closing it upon the contact *t*. The circuit thus closed will be as follows: from battery B by wire 53, switch-lever 45, contact *n*, wires 72 75, contacts *u v*, wire 76, signal-lever 47, contact *t*, wire 78, signal 4, and wires 79 59, back to battery.

It will be observed that each of the four signal-clearing operations above described is dependent, first, upon the putting of the switch-lever into proper position to shift the switch to the desired position; second, upon the clearing of the proper indicator, and, third, upon the actuation of the proper signal-lever in the direction necessary to give the signal, thereby moving it away from the contact device which would have to be closed to give a signal to a train approaching from the opposite direction. Thus the giving of the clear-signal to the approaching train is subject to the existence of safety conditions both at the switch and at the signals, and an improper signal cannot be given.

It is obvious that various modifications may be made in the construction above particularly described within the spirit and scope of my invention.

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

1. In a railway switch apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, and a gas-pressure-applying chamber in operative connection with the switch and in controllable communication with the pressure-storage tank, whereby gas may be supplied from the pressure-storage tank to the gas-pressure-applying chamber and applied therein to shift the switch.

2. In a railway switch apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a pressure-reducing valve connected to such storage-tank at the high-pressure side of the valve, and a gas-pressure-applying chamber in operative connection with the switch and in controllable communication with the pressure-reducing valve at the low-pressure side of the valve, whereby gas may be supplied from the pressure-storage tank to the gas-pressure-applying chamber and applied therein to shift the switch.

3. In a railway switch apparatus, the combination of a switch, liquefied-gas-supplying means, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, a valve mechanism controlling the admission and exhaust of gas to each end of the chamber, and electromagnetic means controlling such valve mechanism.

4. In a railway switch apparatus, the combination of a switch, liquefied-gas-supplying means, a pressure-reducing valve connected to the liquefied-gas-supplying means at the high-pressure side of the valve, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, a valve mechanism controlling the admission and exhaust of gas to each end of the chamber, such valve mechanism being in communication with the pressure-reducing valve at the low-pressure side of such valve, and electromagnetic means controlling such valve mechanism.

5. In a railway switch apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, a valve mechanism controlling the admission and exhaust of gas from the pressure-storage tank to each end of the chamber.

6. In a railway switch apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a pressure-reducing valve connected to such storage-tank at the high-pressure side of the valve, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, a valve mechanism controlling the admission and exhaust of gas from the pressure-storage tank to each end of the chamber, such valve mechanism being in communication with the pressure-reducing valve at the low-pressure side of the valve, and electromagnetic means controlling such valve mechanism.

7. In a railway switch apparatus, the combination of a switch, liquefied-gas-supplying means, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated by the gas in the gas-pressure-applying chamber, and a valve mechanism controlling the admission and exhaust of gas to the gas-pressure-applying chamber, such valve mechanism including a cut-off valve controlled by the switch shifting and locking mechanism to cut off the gas-supply for actuating the switch in one direction after the completion of the movement of the switch in such direction.

8. In a railway switch apparatus, the combination of a switch, liquefied-gas-supplying means, a pressure-reducing valve connected to the liquefied-gas-supplying means at the high-pressure side of the valve, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated by the gas in the gas-pressure-applying chamber, and a valve mechanism controlling the admission and exhaust

of gas to the gas-pressure-applying chamber, such valve mechanism being in communication with the pressure-reducing valve at the low-pressure side of such valve, such valve mechanism including a cut-off valve controlled by the switch shifting and locking mechanism to cut off the gas-supply for actuating the switch in one direction after the completion of the movement in such direction.

9. In a railway switch apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated by the gas in the gas-pressure-applying chamber and a valve mechanism controlling the admission and exhaust of gas from the pressure-storage tank to the gas-pressure-applying chamber, such valve mechanism including a cut-off valve controlled by the switch shifting and locking mechanism to cut off the gas-supply for actuating the switch in one direction after the completion of the movement in such direction.

10. In a railway switch apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a pressure-reducing valve connected to such storage-tank at the high-pressure side of the valve, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated by the gas in the gas-pressure-applying chamber, and a valve mechanism controlling the admission and exhaust of gas from the pressure-storage tank to the gas-pressure-applying chamber, such valve mechanism being in communication with the pressure-reducing valve at the low-pressure side thereof, such valve mechanism including a cut-off valve controlled by the switch shifting and locking mechanism to cut off the gas-supply for actuating the switch in one direction after the completion of the movement in such direction.

11. In a railway switch apparatus, the combination of a switch, liquefied-gas-supplying means, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, and a valve mechanism controlling the admission and exhaust of gas to the gas-pressure-applying chamber to actuate the switch shifting and locking mechanism in both directions, such valve mechanism including a cut-off valve for each direction of movement of the switch, the cut-off valve for each direction of movement being controlled by the switch shifting and locking mechanism to cut off the gas-supply after the completion of the movement of the switch in such direction.

12. In a railway switch apparatus, the combination of a switch, liquefied-gas-supplying means, a pressure-reducing valve connected to the liquefied-gas-supplying means at the high-pressure side of the valve, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, and a valve mechanism controlling the admission and exhaust of gas to the gas-pressure-applying chamber to actuate the switch shifting and locking mechanism in both directions, such valve mechanism including a cut-off valve for each direction of movement of the switch, the cut-off valve for each direction of movement being controlled by the switch shifting and locking mechanism to cut off the gas-supply after the completion of the movement of the switch in such direction.

13. In a railway switch apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, and a valve mechanism controlling the admission and exhaust of gas from the pressure-storage tank to the gas-pressure-applying chamber to actuate the switch shifting and locking mechanism in both directions, such valve mechanism including a cut-off valve for each direction of movement of the switch, the cut-off valves for each direction of movement being controlled by the switch shifting and locking mechanism to cut off the gas-supply after the completion of the movement of the switch in such direction.

14. In a railway switch apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a pressure-reducing valve connected to such storage-tank at the high-pressure side of such valve, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, and a valve mechanism controlling the admission and exhaust of gas to the pressure-applying chamber to actuate the switch shifting and locking mechanism in both directions, such valve mechanism being in communication with the pressure-reducing valve at the low-pressure side of such valve, and such valve mechanism including a cut-off valve for each direction of movement of the switch, the cut-off valve for each direction of movement being controlled by the switch shifting and locking mechanism to cut off the gas-supply after the completion of the movement of the switch in such direction.

15. In a railway switch and interlocking apparatus, the combination of a switch, liquefied-gas-supplying means, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated by the gas in the gas-pressure-applying chamber, the gas-pressure-applying chamber being in controllable communication with the liquefied-gas-supplying means, a signal controlling the approach to the switch, a

switch-lever controlling the gas-supply to the gas-pressure-applying chamber, and signal-operating means controlled by the switch-lever and the switch shifting and locking mechanism.

16. In a railway switch and interlocking apparatus, the combination of a switch, liquefied-gas-supplying means, a pressure-reducing valve connected to the liquefied-gas-supplying means at the high-pressure side of such valve, a gas-pressure-applying chamber, switch shifting and locking mechanism, actuated by the gas in the gas-pressure-applying chamber, the gas-pressure-applying chamber being in controllable communication with the pressure-reducing valve at the low-pressure side of such valve, a signal controlling the approach to the switch, a switch-lever controlling the gas-supply to the gas-pressure-applying chamber, a signal-operating means controlled by the switch-lever and the switch shifting and locking mechanism.

17. In a railway switch and interlocking apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated by the gas in the gas-pressure-applying chamber, the gas-pressure-applying chamber being in controllable communication with the pressure-storage tank, a signal controlling the approach to the switch, a switch-lever controlling the gas-supply to the gas-pressure-applying chamber, and signal-operating means controlled by the switch-lever and the switch shifting and locking mechanism.

18. In a railway switch and interlocking apparatus, the combination of a switch, a pressure-storage tank containing liquefied gas, a pressure-reducing valve connected to such storage-tank at the high-pressure side of the valve, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated by the gas in the gas-pressure-applying chamber; the gas-pressure-applying chamber being in controllable communication with the pressure-reducing valve at the low-pressure side of such valve, a signal controlling the approach to the switch, a switch-lever controlling the gas-supply to the gas-pressure-applying chamber, and signal-operating means controlled by the switch-lever and the switch shifting and locking mechanism.

19. In a railway switch and interlocking apparatus, the combination of a switch, liquefied-gas-supplying means, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated by the gas in the gas-pressure-applying chamber, inlet and exhaust valves for the gas-pressure-applying chamber, a cut-off valve controlled by the switch shifting and locking mechanism to cut off the gas-supply for actuating the switch in one direction after the completion of the movement of the switch in such direction, a signal controlling the approach to the switch, a switch-lever controlling the inlet and exhaust valves, and signal-operating means controlled by the switch-lever and the switch shifting and locking mechanism.

20. In a railway switch and interlocking apparatus, the combination of a switch, liquefied-gas-supplying means, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by gas in the gas-pressure-applying chamber, inlet and exhaust valves for such gas-pressure-applying chamber, a cut-off valve for each direction of movement of the switch, the cut-off valve for each direction of movement being controlled by the switch shifting and locking mechanism to cut off the gas-supply after the completion of the movement of the switch in such direction, a signal controlling the approach to the switch, a switch-lever controlling the inlet and exhaust valves, and signal-operating means controlled by the switch-lever and switch shifting and locking mechanism.

21. In a railway switch and interlocking apparatus, the combination of a switch, liquefied-gas-supplying means, a gas-pressure-applying chamber, switch shifting and locking mechanism actuated in both directions by the gas in the gas-pressure-applying chamber, inlet and exhaust valves for such gas-pressure-applying chamber, a cut-off valve for each direction of movement of the switch, the cut-off valve for each direction of movement being controlled by the switch shifting and locking mechanism to cut off the gas-supply after the completion of the movement of the switch in such direction, electromagnetic means controlling the inlet and exhaust valves and controlling-circuits thereof, an electrically-controlled signal controlling the approach to the switch and a circuit for such signal, a switch-lever controlling the circuits of the electromagnetic valve-controlling means, and signal-operating means controlling the signal-circuits and controlled by the switch-lever and the switch shifting and locking mechanism, substantially as set forth.

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

CLYDE J. COLEMAN.

Witnesses:

HENRY D. WILLIAMS,

HERBERT H. GIBBS.