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RAILWAY SIGNAL.

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1,016,385. Patented Feb. 6, 1912.

FIG. 1

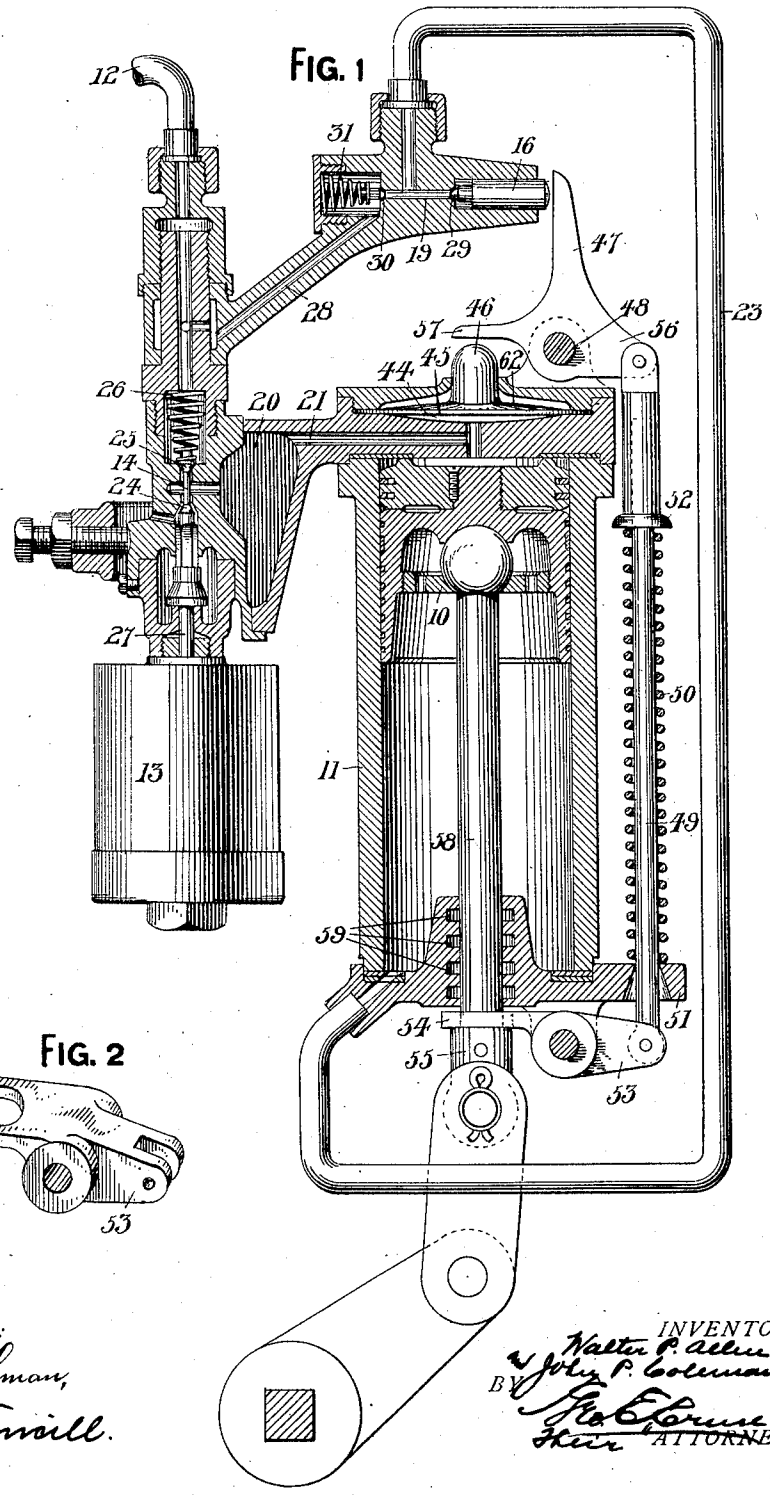

FIG. 2

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WALTER P. ALLEN, OF ARDMORE, PENNSYLVANIA, AND JOHN P. COLEMAN, OF NEW YORK, N. Y., ASSIGNORS TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

RAILWAY-SIGNAL.

1,016,385. Specification of Letters Patent. **Patented Feb. 6, 1912.**

Application filed February 4, 1911. Serial No. 606,628.

To all whom it may concern:

Be it known that we, WALTER P. ALLEN, a citizen of the United States, residing at Ardmore, in the county of Montgomery and State of Pennsylvania, and JOHN P. COLEMAN, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Railway-Signals, of which the following is a specification.

Our invention relates to railway signal mechanisms and particularly to railway signal mechanisms actuated by fluid pressure, as for example by compressed air. In the customary practice, the signal devices (usually semaphores) are biased to one position of indication, usually the "danger" position, and are moved to one or more other positions of indication by fluid pressure. When the pressure of the fluid is released the signal is normally moved back to its biased position by the action of gravity. In a signal mechanism embodying our invention, means are provided for assisting or effecting this last movement of the signal device by fluid pressure in case the force of gravity should be counterbalanced or overbalanced by any cause, such as by abnormal friction in the moving parts on account of sticking or freezing. We also provide means for preventing the operation of such assisting or effecting means except at times when their operation is required to move the signal device to its biased position.

We will describe a railway signal mechanism embodying our invention, and then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a sectional view showing a railway signal mechanism embodying our invention; Fig. 2 is a perspective view showing one of the parts of the mechanism shown in Fig. 1.

Similar reference characters refer to similar parts in each of the views.

Referring now to Fig. 1, 10 designates a piston movable in a cylinder 11, which piston may be operatively connected with a railway signal device in any of the usual and well known manners, by means of a piston rod 58.

Although we have here shown the cylinder as being fixed and the piston movable, we do not desire to limit ourselves to this specific arrangement, for the piston may equally well be fixed and the cylinder movable and operatively connected with the signal device.

12 designates a source of fluid pressure, usually compressed air, which is employed as motive power for the movement of the piston 10, and 14 designates a valve device controlled by an electromagnet 13, for governing the admission of the fluid pressure to the cylinder 11.

It will be understood that the signal device operated by the piston 10 is biased by gravity toward one of its positions of indication, and that it is to be moved by fluid pressure on one side of the piston to another position of indication. For example, as shown in Fig. 1 of the accompanying drawing, the moving parts are in the positions which they occupy when the signal device is in its biased position. Upon the admission of fluid pressure to the upper side of the piston the signal device will be moved to and held in another position of indication. Upon the release of this fluid pressure and the opening of the upper end of the cylinder to atmosphere, the signal device will under normal conditions be moved back to its biased position by the action of gravity so that the piston 10 again occupies the position shown in the accompanying view.

20 designates a chamber from which a port or passage 21 leads to one end of the cylinder 11. The admission of fluid pressure from the source 12 to this chamber 20, and the opening of the chamber to atmosphere are effected by the valve device 14. This valve device comprises two valves 24 and 25 which are rigidly connected and which are moved to one position by a spring 26 and to another position against the action of the spring 26 by an armature or plunger 27 of the magnet 13 when the latter is energized. The valve 25 opens and closes the passage through which the fluid from the source 12 passes to the chamber 20, and the valve 24 opens and closes the passage through which the fluid escapes from the chamber 20 to the atmosphere. It will be understood that when the valve 24 is unseated the valve 25 is seated, and vice versa. An electro-magnetically controlled

valve device of this character is illustrated and described in United States Letters Patent No. 357,109 issued February 1st, 1887, to George Westinghouse, Jr., to which patent reference may be had.

The operation of the mechanism as thus far described will be readily understood.

Upon energizing the magnet 13, the valve 25 will be unseated to permit the fluid pressure to flow into the chamber 20 and thence through the port 21 to the upper end of the cylinder 11, where it will move the piston 10 to the lower part of the cylinder, thus moving the signal device connected therewith from its biased position. The piston 10 will be held in the position to which it has been moved as long as its upper face is acted upon by the fluid pressure. When the magnet 13 is deënergized, the valve 25 is seated by the action of the spring 26, and the valve 24 is unseated at the same time, thereby allowing the fluid pressure in the cylinder and the chamber 20 to escape to the atmosphere, when under normal conditions the action of gravity will move the signal device to its biased position and the piston 10 will therefore be moved back to the upper end of the cylinder.

We will now describe one form of mechanism by means of which this return movement of the piston and signal device is effected in case the action of gravity is counterbalanced or overbalanced by abnormal conditions.

28 and 23 designate a passage leading from the source 12 of fluid pressure to the lower end of the cylinder 11. Interposed in this passage is a valve device 19 by means of which the lower end of the cylinder 11 may be connected with the source of fluid pressure 12 or with the atmosphere. This valve device is similar to the valve device 14 hereinbefore described, and comprises a valve 30 which opens and closes a port between passages 23 and 28, and a valve 29 which opens and closes a port between passage 23 and the atmosphere. A spring 31 tends to hold the valve 30 seated and the valve 29 unseated, and 16 designates a valve stem by means of which the valve 30 may be unseated and the valve 29 seated, against the action of the spring.

It will now be readily understood that when the valve device 19 is operated by pressure on the valve stem 16, fluid pressure from the source 12 will be admitted to the lower side of piston 10, and will move the piston to the upper end of the cylinder. It is desirable from an economical point of view, as well as for other reasons, that the fluid pressure should be thus admitted to the lower end of the cylinder only when the force of gravity is prevented from moving the signal device to the position toward which it is normally biased. It is furthermore undesirable that the fluid pressure should be admitted to the lower end of the cylinder after the signal device has reached the position to which it is normally biased, for the reason that if it were so admitted, a stuffing box of the usual type would be required at the lower end of the cylinder in order to avoid a wasteful leakage of the fluid pressure. A stuffing box of this character is undesirable because of the danger that it may cause additional friction in the moving parts.

In order to admit the fluid pressure to the under side of the piston when necessary to move the signal to the position toward which it is biased, and yet to avoid these undesirable features, we provide means for the automatic control of the valve device 19, which we will now describe. A crank lever 47, pivoted at 48, is provided with an arm 56 to which is connected a rod 49 extending downwardly through a suitable guide 51. This rod 49 carries a spring 50 which is normally in compression and which abuts against the guide 51 and a shoulder 52 on the rod 49, hence the tendency of the spring 50 is to hold the crank 47 in engagement with the valve stem 16 to hold the valve open against the action of the valve spring 31.

The lower end of the rod 49 is however connected with one end of a pivoted lever 53, the other end of which is provided with forks 54 adapted to straddle the piston rod 58 and to be engaged by a shoulder 55 on the piston rod when the piston 10 has reached substantially the upper end of its stroke. The pivoted lever 53 is shown more clearly in Fig. 2. It will be readily seen that this lever 53 operates to hold the crank 47 disengaged from the valve stem 16 while the signal is in the position toward which it is normally biased; that is, while the piston 10 is at the upper end of its stroke.

44 designates a chamber in communication with the upper end of the cylinder 11 by means of a suitable port or passage. Within this chamber is a diaphragm 45 upon which lies a disk 62 carrying an extension 46. The diaphragm 45 when it responds to the action of fluid pressure in the chamber 44, moves the disk 62 and the projection 46 into engagement with an arm 57 of the crank 47 whereby the crank is held out of operative engagement with the valve stem 16. While as here shown, the member 45 is a flexible diaphragm, we do not desire to limit ourselves to this specific means.

The operation of the entire mechanism will now be readily understood.

When the signal device is in its biased position, usually the "danger" position of indication, the parts of the mechanism will be in the position shown in the drawing. When now the valve device 14 is actuated, as

by the energizing of magnet 13, to admit fluid pressure to the upper side of piston 10, the piston will be moved downward toward another position of indication, usually the "clear" position. The shoulder 55 on the piston rod will then be moved out of engagement with the lever 53, but the crank 47 will still be held out of operative engagement with the valve stem 16 by the action of the fluid pressure on the diaphragm 45. When the valve device 14 is again actuated, as by deënergizing the magnet 13, to open the upper side of the piston 10 to atmosphere, the piston and the signal device will under normal conditions immediately start to move back to the biased position of the signal device by the action of gravity. If this movement is unimpeded, a pressure above atmospheric pressure will be maintained in the upper part of the cylinder 11 and in the chamber 44, and the diaphragm 45 will therefore still be caused to hold the crank 47 out of operative engagement with the valve stem 16. If, however, the movement of the signal device should be retarded or prevented, due to abnormal friction or other causes, the pressure in the diaphragm will fall to a point at or near atmospheric pressure, and the diaphragm will collapse, allowing the spring 50 to move the crank into operative engagement with the valve stem 16. The valve device 19 will then be actuated to admit the full fluid pressure to the under side of the piston 10, thereby moving the signal device back to its biased position. As soon as it has reached this position, the shoulder 55 will engage the lever 53 to disengage the arm 47 from the stem 16 thereby allowing the valve device 19 to be moved by the spring 31 to again open the lower end of the cylinder 11 to atmosphere.

As hereinbefore stated, since the fluid pressure is admitted to the lower side of the piston only when needed for the movement of the piston, a stuffing box of the usual type is unnecessary. As here shown the stuffing box comprises a smoothly bored hole in the lower cylinder head, the walls of the hole being provided with annular recesses 59. These recesses act to retard the escape of the fluid between the piston rod and the walls of the hole by creating eddy currents in the fluid which attempts to thus escape.

Wherever we herein use the term "signal device" we mean a device of any character adapted to give indications to the driver of a train or car, such for example as a visual signal which by its color, or by its position relative to its support, gives indication of the service condition of the railway track which it governs; or a train stop device adapted to engage a part on a moving car or train for the control of such car or train. Also wherever we herein use the term "fluid pressure", we mean either a liquid or a gas under pressure, although we preferably employ a gas, such for example as compressed air.

Having thus described our invention, what we claim is:

1. In combination with a signal device biased to one position of indication, a fluid pressure mechanism comprising a cylinder and a piston having relative movement and one of which is operatively connected with the said signal device, a source of fluid pressure, means for admitting said fluid pressure to one side of the piston whereby the signal device is moved to another position of indication against the force of gravity, and for cutting off the fluid pressure from the said side of the piston whereby the signal device may return to its biased position of indication, means operative upon a reduction of the fluid pressure on the said side of the piston below a predetermined point for admitting fluid pressure from the said source to the other side of the piston to move the signal device to its biased position of indication and means for cutting off the fluid pressure from the second mentioned side of the piston when the signal device reaches its biased position.

2. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with said signal device, a source of fluid pressure, means for admitting said fluid pressure to one end of the cylinder whereby the signal is moved to another position of indication, and for opening the same end of the cylinder to the atmosphere whereby the signal device is free to return to its biased position, a member responsive to variations in the fluid pressure in the said end of the cylinder, mechanism controlled by the said member and arranged to admit fluid pressure from the said source to the other end of the cylinder when the pressure on the member falls below a given point, and means for rendering said mechanism inoperative when the signal device reaches its biased position of indication.

3. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with said signal device, a source of fluid pressure, means for admitting said fluid pressure to one end of the cylinder whereby the signal device is moved to another position of indication, means for opening the said end of the cylinder to the atmosphere whereby the signal device is free to return to its biased position of indication, a mechanism for admitting the said pressure to the other end of the cylinder when the fluid pressure in the first mentioned end falls below a given point, and means for rendering said mechanism inoperative when

the signal reaches its biased position of indication whereby the fluid pressure is cut off.

4. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with said signal device, a source of fluid pressure, means for admitting said fluid pressure to one end of the cylinder whereby the signal device is moved to another position of indication against the force of gravity, means for opening the said end of the cylinder to the atmosphere whereby the signal device is free to return by gravity to its biased position of indication, a member adapted to respond to variations in the pressure of the fluid in the said end of the cylinder, a normally closed valve for controlling the admission of said fluid pressure to the other end of the cylinder, and mechanism interposed between the said member and the said valve for opening the valve to admit the said fluid pressure to the said other end of the cylinder when the pressure on the member falls below a given point.

5. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with said signal device, a source of fluid pressure, means for admitting said fluid pressure to one end of the cylinder whereby the signal is moved to another position of indication, means for opening the same end of the cylinder to the atmosphere whereby the signal device is free to return by gravity to its biased position, a member adapted to respond to variations in the pressure of the fluid in the said end of the cylinder, a normally closed valve for controlling the admission of said fluid pressure to the other end of the cylinder, mechanism interposed between the said member and the said valve for opening the valve to admit the said fluid pressure to the second mentioned end of the cylinder when the pressure on the member falls below a given point, and means operatively connected with the signal device for rendering the said mechanism inoperative when the signal device reaches its biased position of indication whereby the fluid pressure is cut off.

6. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with the signal device, a source of fluid pressure, an electro-magnetically controlled valve device adapted to connect one side of the piston with the source of fluid pressure or with the atmosphere according to whether the valve controlling magnet is energized or deënergized, and means controlled by the pressure on the same side of the piston and by the position of the signal device for connecting the other side of the piston with the source of fluid pressure or with the atmosphere.

7. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with the signal device, a source of fluid pressure, an electro-magnetically controlled valve device adapted to connect one side of the piston with the source of fluid pressure or with the atmosphere according to whether the valve controlling magnet is energized or deënergized, a second valve device controlled by the pressure on the same side of the piston and adapted to connect the other side of the piston with the atmosphere or with the source of fluid pressure according to whether the pressure on the first mentioned side of the piston is above or below a given point, and means operated by the signal device for controlling the said second valve device according to the position of the signal device.

8. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with the signal device, a source of fluid pressure, an electro-magnetically controlled valve device adapted to connect one side of the piston with the source of fluid pressure or with the atmosphere according to whether the valve controlling magnet is energized or deënergized, a second valve device, a member responsive to variations in the pressure in the cylinder on the said side of the piston, mechanism interposed between the said member and the second valve device for controlling the second valve device to connect the other side of the piston with the atmosphere or with the source of fluid pressure according to whether the pressure on the said member is above or below a given point, and means operated by the signal device to hold said mechanism inoperative when the signal device is in its biased position.

9. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with the signal device, a source of fluid pressure, an electro-magnetically controlled valve device adapted to connect one side of the piston with the source of fluid pressure or with the atmosphere according to whether the valve controlling magnet is energized or deënergized, a member responsive to variations in the pressure in the cylinder on the said side of the piston, a second valve device adapted to connect the other side of the piston with the source of fluid pressure or with the atmosphere, mechanism interposed between the said member and the said second valve and adapted to control the second valve, and means operated by the signal device for ren-

dering the said mechanism inoperative in its control of the second valve when the signal device is in the position toward which it is biased.

10. In combination with a signal device biased to one position of indication, a cylinder, a piston movable therein and operatively connected with the signal device, a source of fluid pressure, a valve device adapted to connect one side of the piston with the source of fluid pressure or with the atmosphere according to whether said valve device is in one position or another, a member responsive to variations in the pressure in the cylinder on the said side of the piston, a second valve device adapted to connect the other side of the piston with the source of fluid pressure or with the atmosphere, mechanism interposed between the said member and the said second valve and adapted to control the second valve, and means operated by the signal device for rendering the said mechanism inoperative in its control of the second valve when the signal device is in the position toward which it is biased.

In testimony whereof, we affix our signatures each in the presence of the witnesses.

WALTER P. ALLEN.
JOHN P. COLEMAN.

Witnesses:
THEO. H. M'CALLA,
GEORGE R. SCATTERGOOD,
A. L. VENCILL,
I. J. HARTER.