(No Model.) 2 Sheets—Sheet 1.

# J. H. REINHARDT.

## RAILWAY SWITCH.

No. 536,482. Patented Mar. 26, 1895.

Fig. 1.

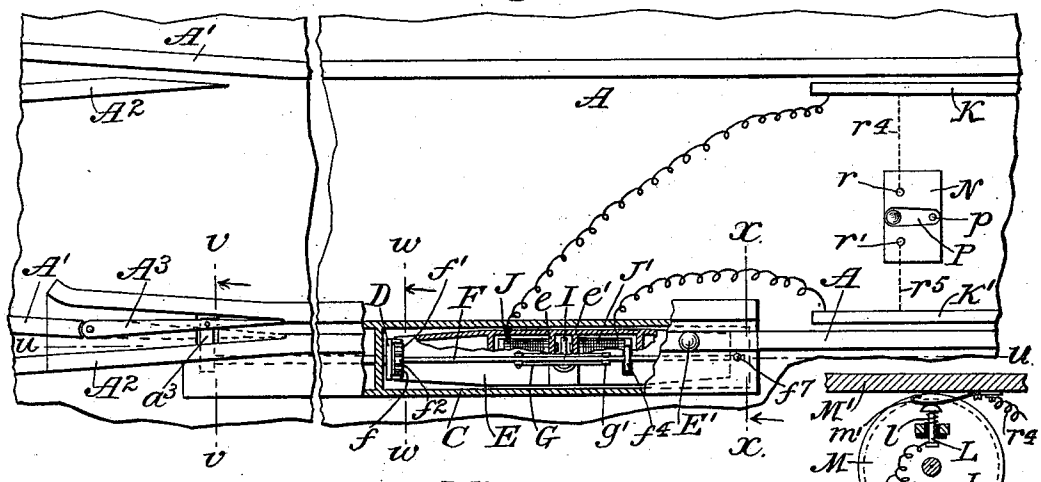



Fig. 2.

Fig. 3.

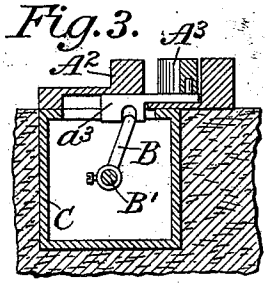



Fig. 4.

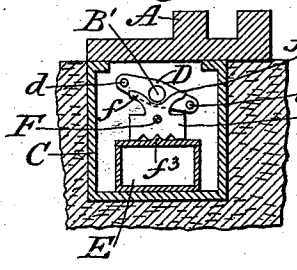



Fig. 5.

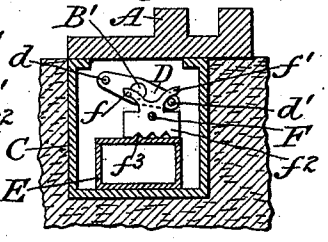



Fig. 6.

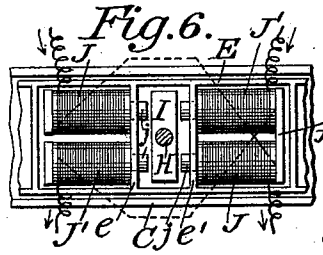



Fig. 7.

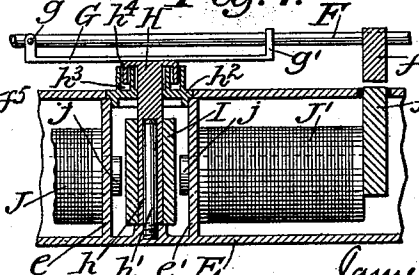
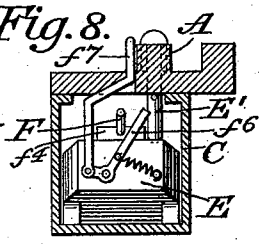



Fig. 8.

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(No Model.) 2 Sheets—Sheet 2.

# J. H. REINHARDT.

## RAILWAY SWITCH.

No. 536,482. Patented Mar. 26, 1895.

Fig. 9.

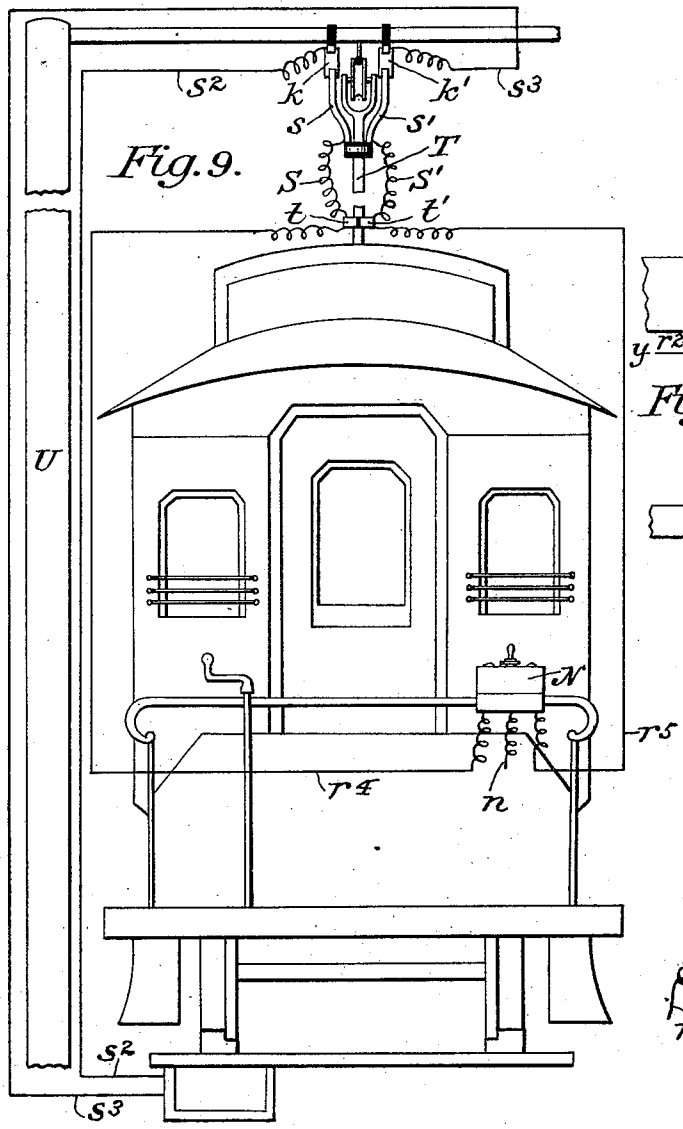



Fig. 10.

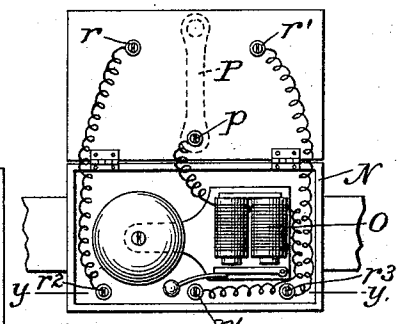



Fig. 11.

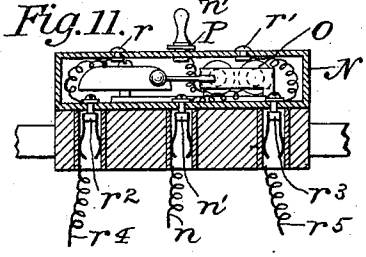



Fig. 12.

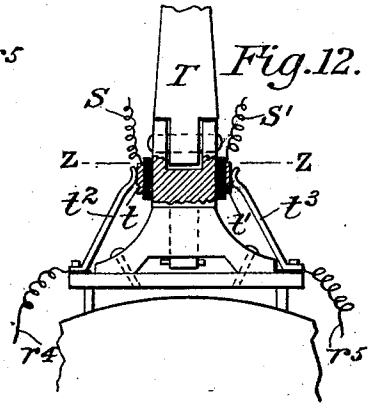
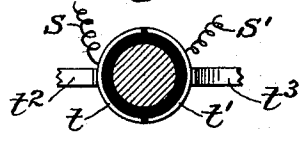



Fig. 13.

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William B. Greeley

ATTORNEY.

# UNITED STATES PATENT OFFICE.

JAMES H. REINHARDT, OF NEWARK, NEW JERSEY.

## RAILWAY-SWITCH.

SPECIFICATION forming part of Letters Patent No. 536,482, dated March 26, 1895.

Application filed July 10, 1894. Serial No. 517,071. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES H. REINHARDT, of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Railway-Switches; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

This invention relates particularly to switching devices for street railways whereby the position of the switch-tongue may be controlled from an approaching car and such car turned to one branch or the other as may be desired. The object particularly in view is to provide a device of this character which shall be reliable under all conditions of use and particularly one which shall be specially adapted for use upon electric railways.

A practical application of the invention will be described in detail hereinafter and the features of novelty will be set forth in the claims.

In the accompanying drawings: Figure 1 is a plan view of a portion of a railway, the switch being shown, the plate which covers a portion of the switch actuating devices being represented as broken away to show parts beneath, and the electrical switch carried on the car being also indicated. Fig. 2 is a vertical longitudinal section on the line *u—u* of Fig. 1, through the casing which incloses the switch actuating devices, a car being represented in part. Fig. 3 is a section on the line *v—v* of Fig. 1, looking in the direction of the arrow on said figure. Fig. 4 is a section on the line *w—w* of Fig. 1, looking in the direction of the arrow on said line. Fig. 5 is a similar view, the parts being represented in different positions. Fig. 6 is a plan view of a portion of the switch controlling devices, the cover of the casing being removed. Fig. 7 is a partial longitudinal section through the center of the switch controlling devices. Fig. 8 is a section on the line *x—x* of Fig. 1, looking in the direction of the arrow on said line. Fig. 9 is a general view representing a car in position upon the track and representing a different arrangement of the electrical conductors. Fig. 10 is a plan view of the electrical switch box carried on the car, the lid of the box being thrown back. Fig. 11 is a vertical section on the line *y—y* of Fig. 10. Fig. 12 is a detail elevation partly in section, of the support for the trolley pole upon the car, illustrating the manner of making electric connection with the overhead conductors. Fig. 13 is a horizontal section on the line *z—z* of Fig. 12.

The invention relates in part to the means whereby the electrical current which is relied upon to set the switch actuating devices, may be directed as required to produce the result desired, in part to the devices for completing the circuit of the energizing current from the moving car to the devices which directly control or effect the setting of the switch actuating devices, in part to such controlling devices and in part to the mechanical devices whereby the approaching car is itself caused to shift the switch in the direction which has been predetermined.

Referring first to Sheet 1 of the drawings, I will proceed to describe the mechanical devices for shifting the switch and the electrical devices for controlling said actuating devices. The rails A, A, of the main line, the rails A′, A′, of one branch, the rails $A^2$, $A^2$, of the other branch and the movable tongue $A^3$ may be arranged in the ordinary and usual or any preferred manner. The tongue $A^3$ is adapted to be engaged, through the medium of a notched piece $a^3$ with an arm B which is rigidly secured to a shaft B′. The latter is mounted in suitable bearings beneath the switch and is of a suitable length to insure the full movement of the switch tongue before it is hidden from view by the approaching car, while its extremity projects through the wall of a casing C and has fixed thereto a double arm D which bears at each end a pin or stud *d* or *d′*. The casing is made as tight as it may reasonably be made to exclude water or dirt but at the same time the parts contained within it are so protected, as will hereinafter more clearly appear, that the presence of dirt or water within the casing would not interfere with the proper operation of the switch.

Within the casing C is mounted to rock endwise a box, or more properly, a hollow lever E, one end being weighted so that it shall stand normally in the position indicated in Fig. 2. Near one end of the box or lever E a pin E′ projects through the rail above it in

position to be struck by the wheel of an approaching car, whereby the latter shall tilt the lever endwise, the lever returning to normal position after the car has passed. On the box or lever E is mounted a setting lever F which is free to swing from side to side so that its extremity may stand under either pin $d$ or pin $d'$ of the arm D and thereby rock the shaft B′ and shift the switch tongue $A^3$ in one direction or the other as the car passes, the direction of movement of the switch tongue being determined by the position of the setting lever F. The extremity of the lever F which engages the pins $d$, $d'$, is preferably provided with two horns $f, f'$, substantially as represented in Figs. 4 and 5. As the lever E, by reason of the preponderance of the end next the arm D, tilts back to normal position after operation, carrying with it the lever F, the under side of the horn in descending will strike the pin which has just been elevated and, sliding down upon the pin, will cause the lever F to swing back to central position. The lever F is so supported upon the lever E that in addition to its capacity of oscillation from side to side it may also be tilted up and down endwise to some extent. For this purpose it is pivoted, as at $g$, in the forked end of a pivoted bar G and is guided in a fork $g'$ at the other end of said bar. The object of this arrangement is to permit a notched plate $f^2$, which is carried by the forward extremity of the lever, to engage a tooth $f^3$ which is mounted on the lever E, whereby the lateral movement of the lever F is prevented except at the proper time. The means for tilting the lever F will be described hereinafter. Normally the lever F stands in its middle position so that if the lever E is tilted by the passage of a wagon wheel over the pin E′ it shall not affect the shaft B′, the end of the lever F passing between the pins $d$, $d'$, and the horns $f, f'$ not being long enough to strike either of said pins when the end of the lever starts directly upward from its middle position.

The bar G is secured to a stud H which is bored out, as at $h$, so that it may fit over the fixed pivot pin $h'$ which is rigidly secured to the bottom of the box lever E between two partition plates $e$ and $e'$. The stud H passes through a cap plate $h^2$ which is adapted to fit snugly over the partition plates $e$ and $e'$ and the side walls of the recess in the lever E to protect the space beneath from access of dust or moisture. Upon the upper side of the plate $h^2$ is formed an annular channel $h^3$ which may be filled with oil or other suitable sealing substance and may be entered by an annular flange $h^4$ which is fixed to the bar G, whereby the entrance of dust or moisture between the stud H and the plate $h^2$ is effectually prevented.

Within the space between the partitions $e$, $e'$, which is effectually sealed, as described above, the stud H receives an armature I and by means of electro magnets suitably mounted within the recess of the lever E the armature may be swung in one direction or the other, carrying with it the setting lever F. The magnets J, J′, which are depended upon to move the armature I are mounted within the cavity of the box-like lever E and their cores $j, j$, project through the partitions $e$, $e'$, the latter being formed of non-magnetic material. The magnets are preferably four in number, the two magnets J, J, being arranged to swing the armature in one direction while the magnets J′, J′, are arranged to swing the armature in the opposite direction. Provision is made whereby the energizing current may be directed through the magnets J, J, or through the magnets J′, J′, at the will of the motorman or other person on the approaching car and for this purpose the pairs of magnets are connected respectively to contact strips K, K′, which are fixed in the road-bed near the inner side of the rails A, A, or to contact strips $k, k'$, supported above the road-bed, as shown in Figs. 1 and 9 respectively, in position to be struck by contact makers carried by the car.

For the purpose of tilting the lever F to release its notched plate $f^2$ from the tooth $f^3$ before each operation I have fixed upon the rear end of the lever an armature $f^4$. Below the armature $f^4$ and in close proximity thereto I have secured to the cores $j$ and $j$ of the adjacent magnets J, J′, an extension piece $f^5$ which is magnetized with either core when the current passes through the coils of its magnet and therefore attracts the armature $f^4$ and tilts the lever F sufficiently to release it from the tooth $f^3$. The armature $f^4$ is approximately the length of the extension piece $f^5$ and is therefore attracted whether the magnet J or the magnet J′ is energized.

Upon the rear end of the box lever E is pivoted a bent lever $f^6$, whose upper and longer arm stands in proximity to the end of the lever F, while the shorter arm has pivoted thereto a rod $f^7$ which projects through the casing C near the rail, whereby, as the car approaches, the rod $f^7$ is depressed and the longer arm of the lever $f^6$ is caused to strike the rear end of the lever F and swing its forward end under one of the pins, whereby the switch may be shifted. This device permits the switch to be operated in one direction by a car not provided with circuit closing devices, the rod $f^7$ being so placed as to be operated only by a wheel having an extra wide tread.

Contact with the strip K or with the strip K′ is made from a contact point carried by the car, as before stated. Such contact point might be a fixed plate or brush but I prefer the arrangement represented in Fig. 2. In this arrangement two bolts L, L, are supported diametrically opposite each other on the inside of the wheel M of the car, the bolts being insulated from the wheel and forced outward by springs $l$, $l$. The two bolts are connected by a wire $m$ and upon the truck frame M′ is secured a spring contact plate $m'$ in position

to be rubbed by the end of one of the bolts L, L, as the wheel rotates. The contact plate K or K′ being sufficiently long to insure the contact therewith of one or the other of the bolts L, L, the circuit will be completed from the contact plate $m'$ to the contact K or K′ and thence to the magnets J, J, or J′, J′, whenever the car passes over the contacts K or K′, and the energization of one set of magnets or the other will depend upon the condition of the circuit in advance of the plate $m'$.

As the invention is particularly intended for application to electric trolley railways the circuit from the magnets J, J, and J′, J′, will ordinarily be completed by connection to the rails A, A, or to the return wire of the circuit if one be used. If the generator, however, is carried on the car the circuit might be conveniently completed from the magnets to the rails and thence through the wheels and frame of the car back to the generator.

As indicated above, means are provided whereby the energizing current may be directed to one set of magnets J, J, or the other set J′, J′, from the car itself. These means comprise a suitable electrical switch which is under the control of the motorman, the switch-box N (Fig. 1) being represented in Fig. 9 as secured in convenient position to the dash-board of the car.

As represented in Figs. 10 and 11, I prefer to combine with the switch an indicator, such as a single stroke bell, by means of which the motorman may know that the other devices have operated properly to set the switch. The conductor $n$ which supplies the current necessary for operating the switch is led from the source of supply, whether the same be an independent generator or a tap from the trolley wire, and is connected to a suitable binding post $n'$, thence through the electric indicator O (which is represented as a bell) to a fixed point $p$. The movable switch P is preferably secured upon the cover of the box and is preferably pivoted upon the point $p$. Other contact points $r$ and $r'$ are also fixed on the cover of the box and are respectively connected through contact devices $r^2$ and $r^3$ fixed in the body of the box and conductors $r^4$ and $r^5$, to the contact plates $m'$, $m'$, hereinbefore referred to. By setting the switch P upon one or the other of the contacts $r$ and $r'$ the current may be directed, through the described connections, to either set of magnets J, J, or J′, J′, and the setting lever F thereby swung to one side or the other to cause the movement of the switch tongue $A^3$ in the required direction.

It is obvious that the connections for controlling the movement of the switch might be made overhead, as well as at the surface of the road-bed and an arrangement for this purpose is represented in Fig. 9. The switch P is connected as before to the source of supply of the actuating current and the contacts $r$ and $r'$ are respectively connected by conductors $r^4$ and $r^5$ and S and S′ to contact brushes $s$ and $s'$ which are carried by the trolley pole T and are adapted to be brought in contact with contact strips $k$, $k'$, which are supported overhead by one of the poles U which support the trolley wire and are thence connected by suitable conductors $s^2$, $s^3$ to the magnets J, J, or J′, J′, as before.

In some cases the trolley pole T is swung upon its vertical axis many times in the same direction so that it would not be feasible to connect the conductors $r^4$, $r^5$ directly to the pole. Accordingly I have provided means, as represented in Figs. 12 and 13, whereby the trolley pole may be swung rapidly in the same direction without affecting the conductors. At the base of the trolley pole are secured two semi-circular strips $t$, $t'$, which are connected respectively to the conductors S and S′ before referred to. Spring contacts $t^2$, $t^3$ are secured to the supporting frame-work of the trolley pole and bear upon the semi-circular strips $t$ and $t'$, being respectively connected to the conductors $r^4$ and $r^5$.

In describing the mode of operation of the improved devices, let it be assumed that the switch-tongue $A^3$ is in the position represented in Fig. 1, that the box-lever E stands as shown in Fig. 2, and that the lever F occupies its middle position as represented in Fig. 4. If the motorman of the approaching car desires to throw the switch-tongue $A^3$ in the opposite direction he shifts the electrical switch P so that the current is completed through the magnets J′, J′. The first effect of the passage of the current through these magnets is to magnetize the extension $f^5$ of the common pole piece and thereby to attract the armature $f^4$ on the rear end of the lever P and to tilt the said lever vertically far enough to raise the notched plate $f^2$ from engagement with the teeth $f^3$, thereby leaving the lever F free to swing laterally. The magnets J′, J′, acting upon the armature I, swing the lever F from its middle position represented in Fig. 4 to the position represented in Fig. 5, in which the shoulder of the plate $f^2$ stands immediately below the pin $d'$, the horn $f'$ passing over said pin. As the car comes nearer its wheel strikes the pin E′ (Fig. 2) and rocks the box-lever E from the position shown in Fig. 2, raising its forward end with the plate $f^2$. The shoulder of the said plate $f^2$ strikes the pin $d'$ of the double arm D and throws it up, thereby oscillating the shaft B′ and, through the arm B, throwing the switch tongue $A^3$ from the position shown in Fig. 1, thereby permitting the car to pass on in the required direction. As soon as the wheel of the car leaves the pin E′ the forward end of the box lever E drops down, owing to its greater weight, and carries with it the lever F and the plate $f^2$. As the plate $f^2$ begins to descend the horn $f'$ strikes upon the pin $d'$ and slides upon the same giving the lever F a sufficient impulse laterally to carry it back to its middle position in which it rests until it is shifted again. Should the switch tongue $A^3$ be already in its required

position it will not be necessary for the motorman to complete the circuit of one set of magnets or the other, but should he do so the lever F will be released and shifted laterally as before and the box lever E will be tilted as before. This time, however, the arm D being already in the proper position the horn $f$ or $f'$ may either be arranged to strike laterally against the corresponding pin $d$ or $d'$ so that the lateral shifting of the lever F is checked, or the horn is carried under the pin and, rising against the same, carries the plate $f^2$ farther to one side so that the pin is finally received in the recess between the two horns and breakage is prevented. Then, after the car has passed, the plate $f^2$ will drop back without being restored to its middle position and at the next action of the mechanism will either be in proper position or will be swung as before to such position. If a car equipped, not with the electrical setting devices, but with a wheel having a broader tread should approach the rod $f^7$ will be depressed, the lever F will thereby be swung in the proper direction and the tilting of the lever E through the pin E' be effected as before. The completing of the circuit through the proper set of magnets J, J, or J', J', by the shifting of the electrical switch P will be effected through the described connections in a manner already explained and not requiring further description herein.

It will be apparent that the circuit closing devices on a given car might be set so as to throw each switch in a given direction as it is approached by the car, the switch P being then dispensed with, and likewise different cars might be equipped with circuit closers fixed in different positions in order that certain switches may be operated, the contact strips connected with the different switches being correspondingly placed. It will also be obvious that various other modifications of various portions of the devices represented in the drawings and described herein might be made without departing from the spirit of my invention.

I claim as my invention—

1. The combination with a movable switch tongue, of a shaft, means to impart movement from said shaft to said tongue by the oscillation of said shaft, a double arm secured to said shaft, a lever adapted to be shifted by the passage of the car and means to cause said lever to act upon one end or the other of said arm.

2. The combination with a movable switch tongue, of a shaft mounted to oscillate, means to transmit movement from said shaft to said tongue, a double arm secured to said shaft, a lever adapted to be shifted by the passage of a car, a second lever mounted on the first named lever, and adapted to be shifted to stand between either end of said arm and the first named lever, and means to shift the second named lever.

3. The combination with a movable switch tongue, of a lever adapted to be shifted by the passage of a car, means to transmit the movement of said lever to said switch tongue in one direction or the other, a setting lever mounted on the first named lever, and adapted to determine the direction of movement imparted to said switch tongue, and a magnet mounted on the first named lever and adapted to shift the setting lever.

4. The combination of a shaft mounted to oscillate, a switch tongue operated by said shaft, a double arm secured to said shaft and having pins in its ends, an actuating lever adapted to be tilted to produce a movement of said shaft, a setting lever mounted on said actuating lever to swing laterally between said actuating lever and one or the other of said pins, diverging horns mounted on said setting lever and adapted to contact with one or the other of said pins during the return movement of the actuating lever to swing said setting lever into central position, substantially as shown and described.

5. The combination of a switch tongue, an actuating lever, means to impart movement therefrom to said switch tongue in one direction or the other, a setting lever mounted on said actuating lever to swing laterally to determine the direction of movement of said intermediate means and having capacity for rocking vertically, a notched block carried by said setting lever, a relatively fixed tooth to engage said notched block, means to tilt said setting lever vertically to release it from said tooth and means to shift said setting lever laterally when released, substantially as shown and described.

6. The combination with a movable switch tongue, an actuating lever and intermediate means whereby movement in either direction may be imparted to said switch tongue, of a setting lever, an armature carried by said setting lever, two sets of magnets adapted to act upon said armature in opposite directions, and means to cause one or the other set to be energized.

7. The combination with a movable switch tongue, an actuator and intermediate means whereby movement in either direction may be imparted to said switch tongue, of a setting lever adapted to swing laterally to determine the direction of movement of said switch tongue and having capacity for rocking vertically a notched block carried by said setting lever, a radially fixed tooth to engage said notched block, an armature carried by said setting lever, a magnet to act on said armature to swing the setting lever laterally and a second armature carried by said setting lever to be acted upon by said magnet to rock said setting lever vertically.

8. The combination with a movable switch tongue, of a box-like actuating lever, means intermediate said actuating lever and said switch tongue to impart movement to the latter in either direction, a setting lever mounted on said actuating lever to swing laterally and

determine the direction of movement of said intermediate means, magnets mounted within said actuating lever to act upon an armature connected with said setting lever, and means to energize said magnets.

9. The combination with a movable switch tongue, of a box-like actuating lever, means intermediate said actuating lever and switch tongue to impart movement to the latter in either direction, a setting lever mounted on said actuating lever to swing laterally, partitions dividing the recess in said lever into three chambers, an armature connected with said setting lever and disposed in the inner chamber, magnets disposed in the outer chambers and adapted to act upon said armature.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES H. REINHARDT.

Witnesses:
A. N. JESBERA,
A. WIDDER.