(No Model.) 2 Sheets—Sheet 1.

W. W. LE GRANDE.

ELECTRIC RAILWAY SIGNAL.

No. 303,526. Patented Aug. 12, 1884.

Fig. 1

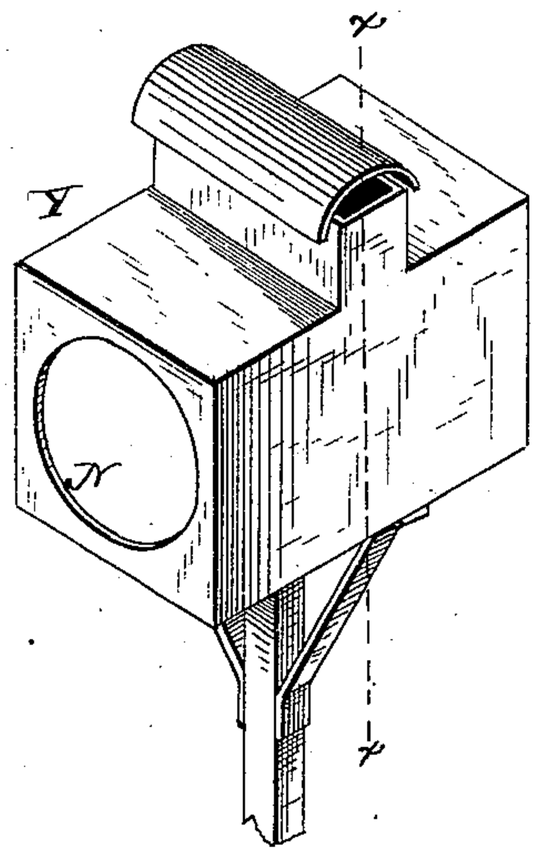


Fig. 2

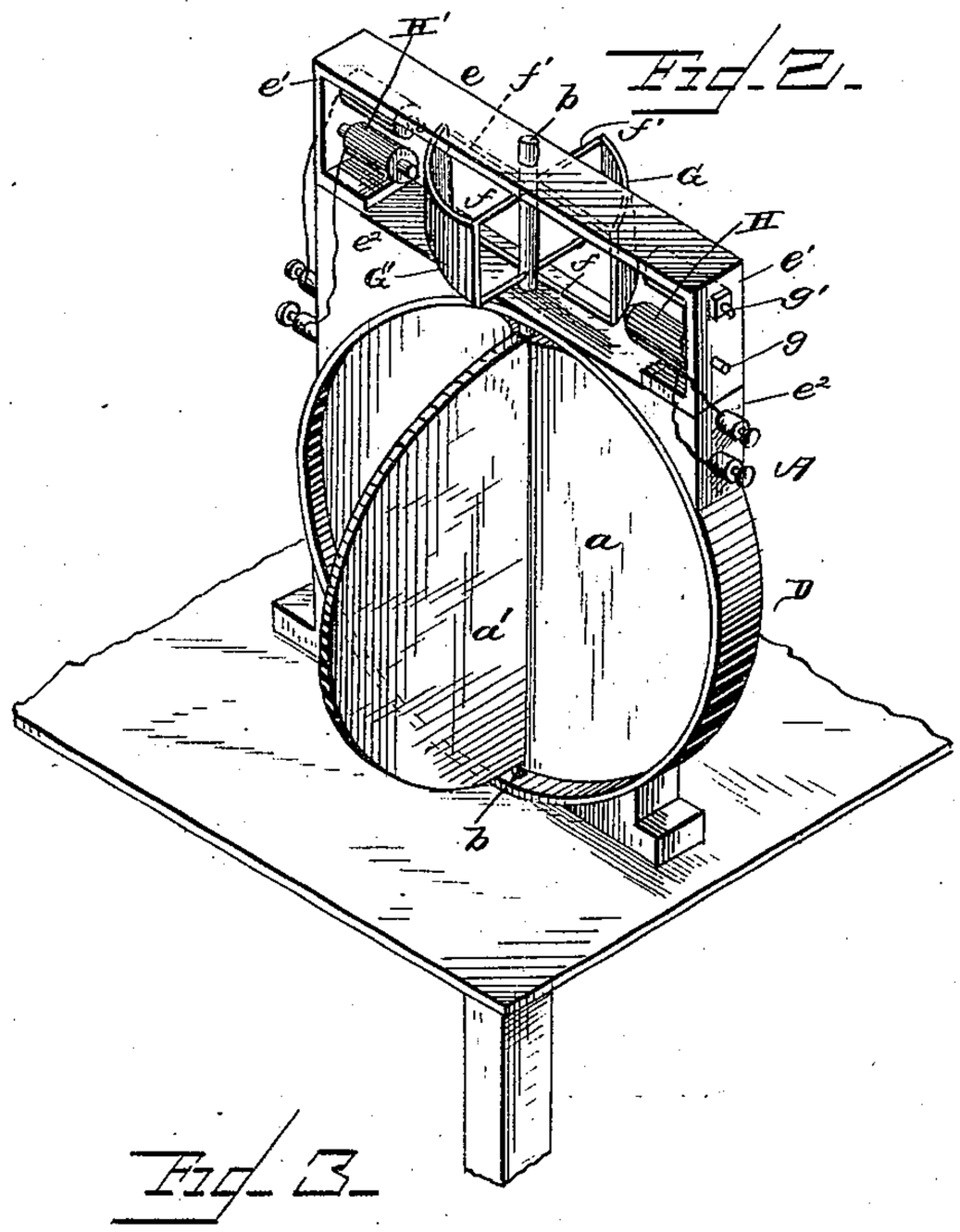
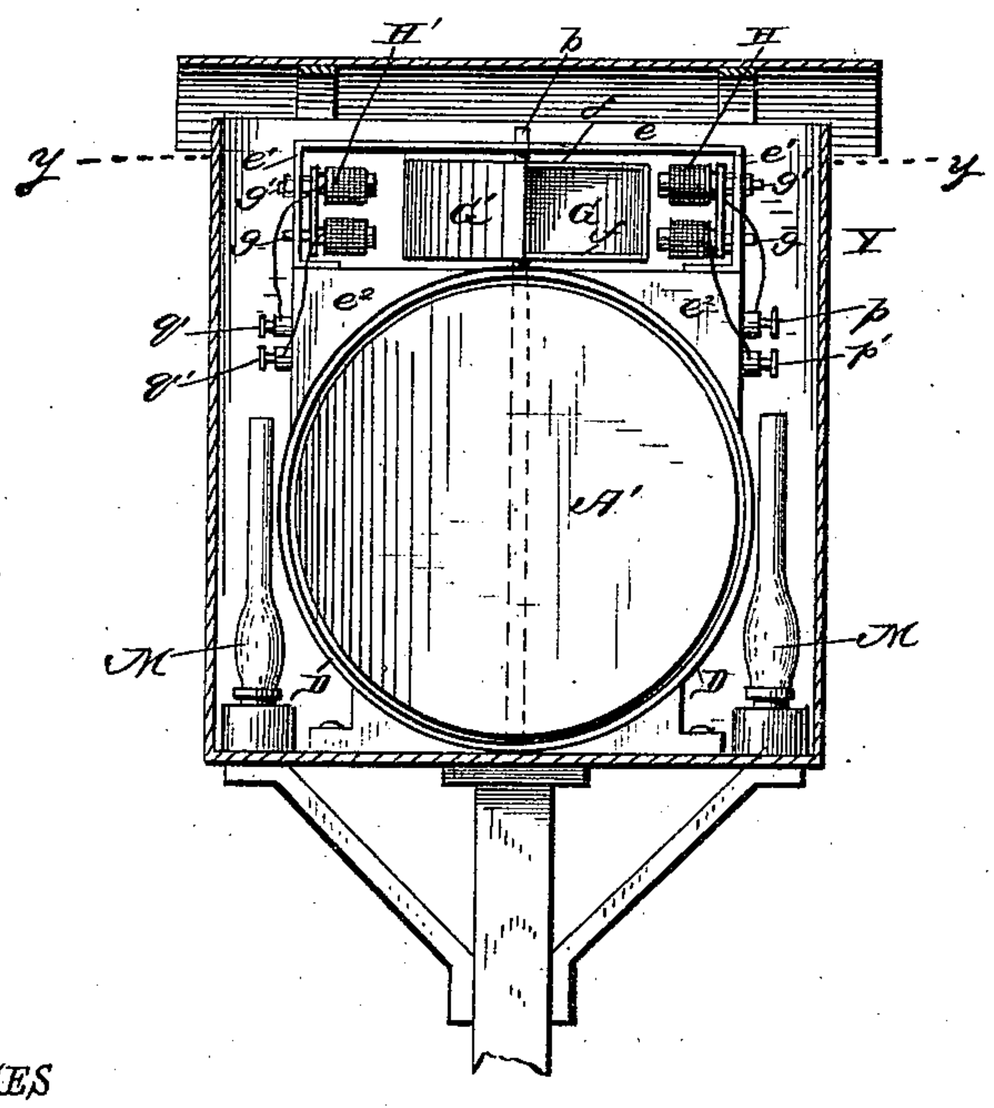


Fig. 3



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

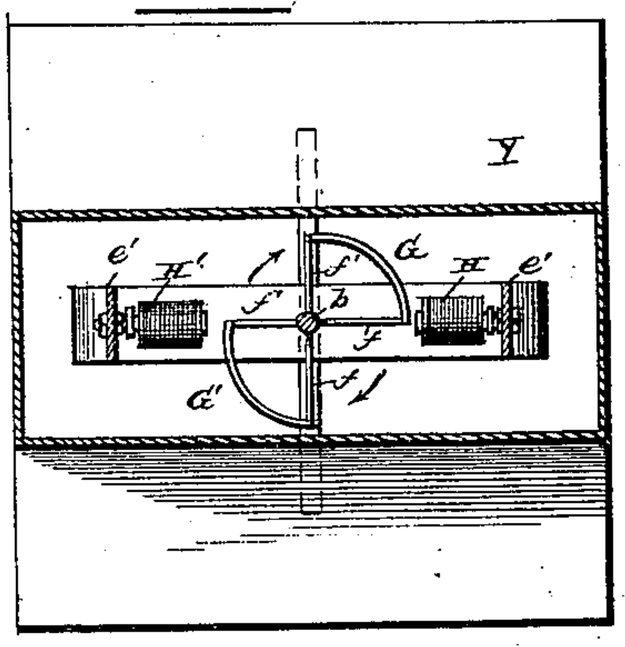


Fig. 5.

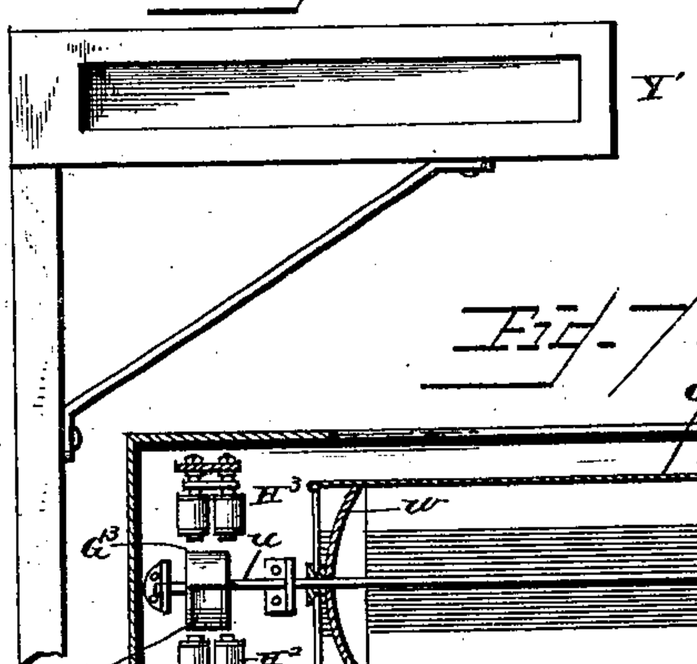


Fig. 7.

Fig. 6.

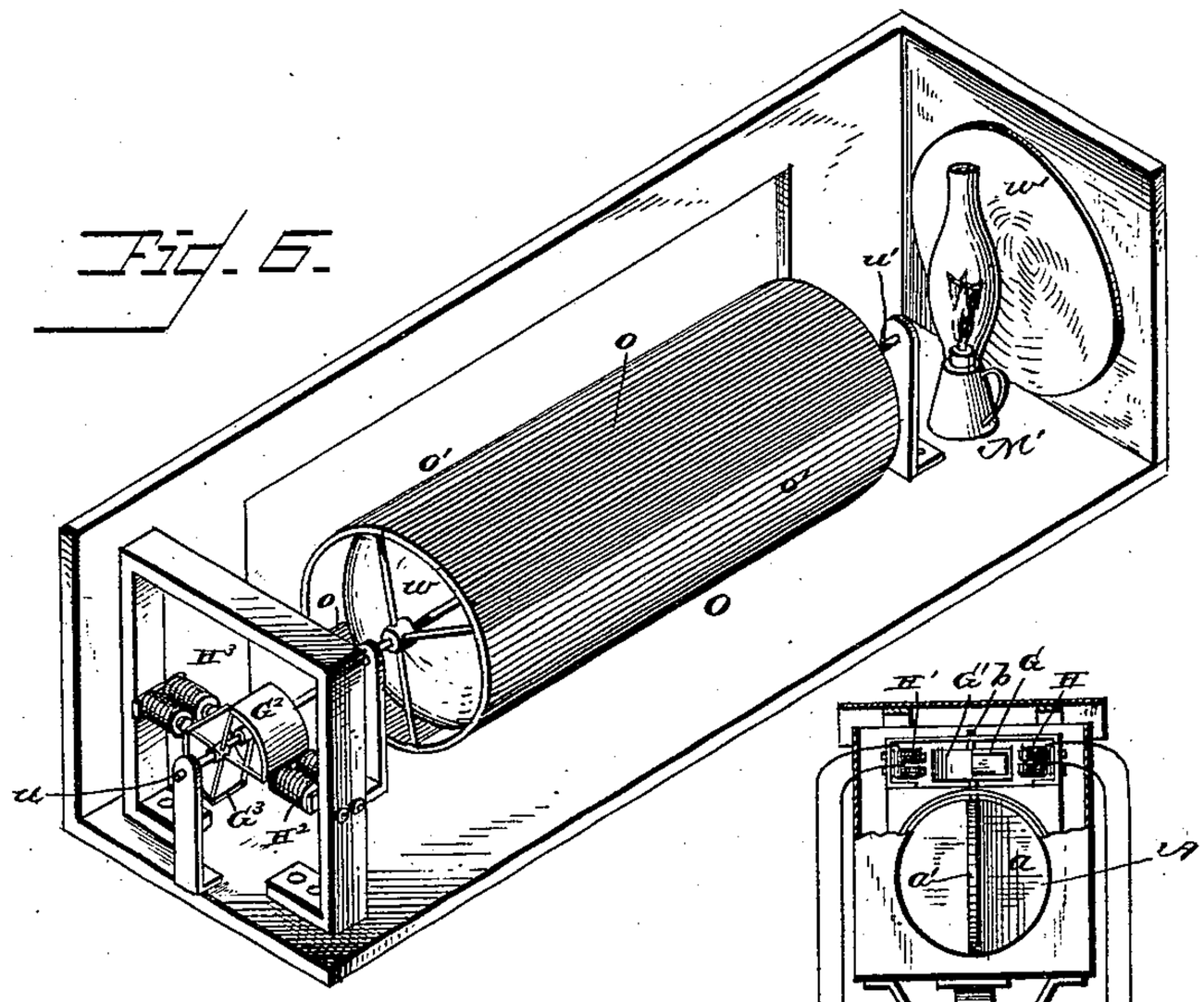
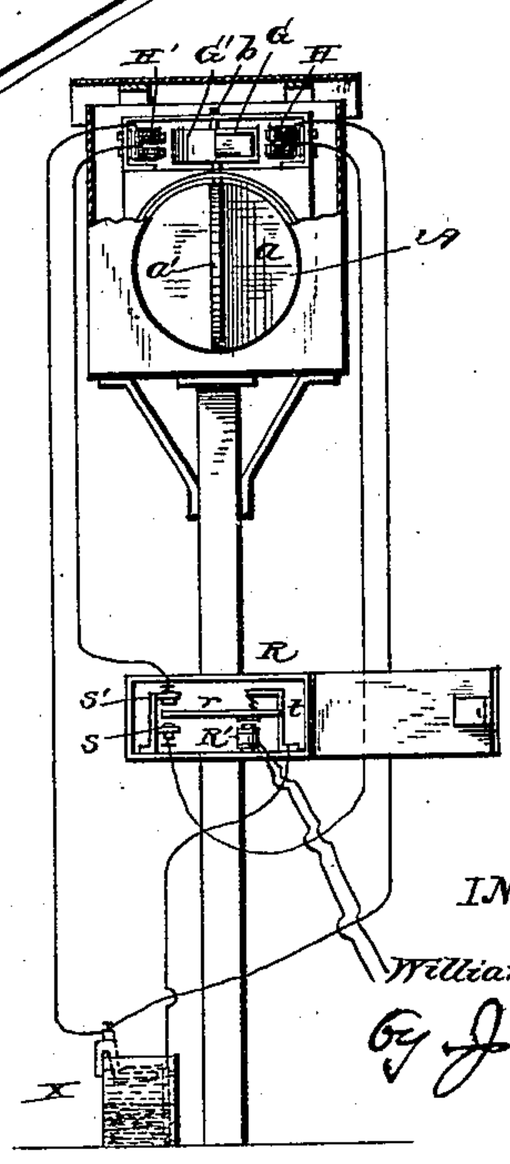


Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM W. LE GRANDE, OF LOUISVILLE, KENTUCKY, ASSIGNOR TO THE NATIONAL ELECTRIC RAILWAY SIGNAL COMPANY, OF SAME PLACE.

ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 303,526, dated August 12, 1884.

Application filed February 29, 1884. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. LE GRANDE, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Electric Railway-Signals, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to an improvement in electric disk and semaphore signals for railways, its object being to work signals on closed circuit, and to set a signal to both its "danger" and "safety" positions by the positive action of electric currents instead of relying, as heretofore, on the action of gravity or retracting-springs to return it to a normal position after being removed therefrom by an electro-magnet. A further object is to obtain extended action of electro-magnets for moving a signal alternately in opposite directions.

My invention consists in the combination, with the pivoted signal, of two oppositely-arranged segmental armatures attached thereto, and two electro-magnets arranged to attract said armatures alternately for giving to the signal partial rotations in opposite directions; and it further consists in the combination, with the signal, its attached armatures, and the electro-magnets, of an automatic circuit-changing relay arranged for operation by a main line for breaking a local circuit through one of the magnets while closing a similar circuit through the other, whereby a single main circuit is used for controlling the movement of the signal in both directions by the positive force of electro-magnetism, and without reversing the direction of the current on said main line.

The invention will be fully understood from the following particular description in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of a signal-box for inclosing a signal constructed according to my invention. Fig. 2 is a perspective view of a four-wing-disk signal provided with my improvement, the box, except a portion of the floor, being removed in order to expose to view the interior parts. Fig. 3 is a cross-section of a box inclosing a single-disk signal, the plane of section being on one side of the operative parts, as indicated by the line *x x* in Fig. 1. Fig. 4 is a horizontal section of the box in a plane indicated by line *y y* of Fig. 3. Fig. 5 is a view in elevation of a box for inclosing a semaphore-signal provided with my improvement. Fig. 6 is a perspective view of a semaphore-signal provided with my improvement, the main portion of the inclosing-box being removed. Fig. 7 is a horizontal section of the box and some of the inclosed parts in the plane of the horizontal diameter of the cylindrical semaphore-signal, the armatures and magnets being shown in full lines. Fig. 8 is a view of a disk-signal partly in elevation and partly in vertical section, and having its magnets connected in local circuits controlled by a relay in a main circuit.

Figure 1 simply gives an external view of a disk-signal box, Y.

Referring to Fig. 2, the signal A consists of two preferably translucent disks, *a* and *a'*, intersecting each other diametrically. Such a signal is preferably constructed by arranging four semicircular skeleton frames at right angles to each other on a vertical shaft, as at *b*, and covering said frames with some light material, such as bunting, which will allow light to pass through it. Two of the semicircular frames directly opposite each other, and forming together a complete circle, have red coverings *a'*, and the covering *a* of the other two are white. Thus a four-wing-disk signal is formed, having two red or danger wings, and two white wings, which, when exposed, indicate "safety." It will be understood that instead of this four-wing disk a single round red disk, A', might be mounted on the shaft *b*, as shown in Fig. 3, and when such a disk is exposed or turned flatwise to the intended line of sight, "danger" is indicated, while, when the disk is turned edgewise, or at right angles to its danger position, it indicates "safety." Both forms of the disk-signal are mounted in the same manner and operated by precisely similar devices. The shaft *b* is mounted diametrically in a supporting-frame,

D, and projecting above the same, has a bearing for its upper end in a horizntal bar, *e*, of a bracket, the vertical end bars, *e' e'*, of which rest upon suitable blocks or foundations, e^2 e^2, which surmount the supporting-frame. Above this supporting-frame and below the bar *e* the shaft *b* has radially-projecting arms *f f'*, which, at their outer ends, carry segmental soft-iron plates or armatures G and G', arranged somewhat eccentric to the shaft, and on opposite sides of the shaft are two electro-magnets, H and H', arranged to act upon said armatures, respectively. It will be observed on reference to Fig. 4 that the arms *f* are somewhat longer than the arms *f'*, and therefore the armatures respectively come gradually closer to the poles of either magnet when the arms *f* swing toward the said poles. It will also be seen that when the armature of one magnet is closest to its poles the other armature stands at the greatest distance from the poles of its magnet. When one of the magnets is energized by an electric current it will attract its armature so as to swing it in that direction, which will cause it to move laterally in front of the magnet-poles, and at a gradually-decreasing distance therefrom, while at the same time the armature of the other and inactive magnet swings laterally at a gradually-increasing distance from its poles, so as to be placed in position to swing in the opposite direction, when its magnet becomes active and the other inactive. A similar armature operating in a manner similar to these is shown in my Patent No. 287,446, granted October 30, 1883. Each magnet has one of its cores, *g*, extended through a hole in an adjacent vertical bar, *e'*, and each has also a screw-pin, *g'*, extending through a hole in such bar, said screw-pin being provided with suitable nuts, by means of which the magnets may be adjusted closer to or farther from their armatures, as desired. The coils of magnet H have their opposite terminals connected to binding-posts *p p'*, while the coils of magnet H' are similarly connected to posts *q q'*, said posts being mounted upon the foundations e^2 e^2. A wire from the post *p'* of magnet H connects electrically with a metallic stop, *s*, arranged on one side of the armature *r* of a relay, R, (see Fig. 8,) and a wire from post *q'* of the magnet H' connects with a similar metallic stop, *s'*, arranged on the opposite side of said armature. The posts *p* and *q* are both connected with one pole of a local battery, X, the other pole of which is connected to the relay-post *t*, and through it to the armature *r*. It will now be seen that when the main circuit L is closed through the coils of the relay-magnet R', and the armature *r* is attracted against its lower stop, the circuit of the local battery is closed through magnet H, and the armature G will will be held in its closest proximity to the poles of said magnet; but should the main circuit be broken or short-circuited from the relay the relay-armature will be retracted against its upper stop and the circuit of the local battery broken through magnet H and closed through magnet H', which will then swing its armature into its position of closest approach. When magnet H holds its armature the shaft *b* is turned so as to expose the white wings of the signal and turn the red wings edgewise to the line of sight as predetermined, or to simply turn the single red disk edgewise, as the case may be, this indicating safety; and when the magnet H' holds its armature the shaft will be turned to expose the red wings, or simply to turn a single red disk flatwise to the line of sight or to a position indicating "danger."

I may use this signal and its accessories in any suitable system of main circuits. For instance, I may use the same in connection with the system of main block-circuits shown and described in Patent No. 272,276, granted to me February 13, 1883, it which event I will arrange the signal-disk to be turned to its safety position by magnet H' when the main circuit is open, as it normally is, and the armature-lever of the relay against its upper stop, the magnet H turning the disk to its danger position when the main circuit is closed and the lever of the relay drawn against its lower stop.

I may use the signal and relay with any main circuit to be either broken or closed by passing trains.

In order that the signal may be properly observed at night I place in the casing suitable lamps, M M, for illuminating the disk. The ends of the casing are provided with glass circular windows, as at N, which allow the signal to be plainly seen, while protecting it and the lamp from wind, rain, and snow.

The letter Y' designates the casing of a semaphore-signal.

In Figs. 6 and 7 the letter O indicates a hollow cylindrical or tubular semaphore-signal arranged horizontally and having at its ends journals *u u'*, mounted in suitable bearings. The journal *u* projects beyond its bearings, and is provided with radial arms carrying armatures G^2 and G^3, arranged in the same manner as the armatures G G', except that they move in a vertical instead of a horizontal plane. The electro-magnets H^2 and H^3 are arranged and connected to act alternately on these armatures in the same manner as heretofore described with reference to the disk-signal. The cylinder has two opposite quadrants, *o o*, of its circumference colored red, while the other two, *o' o'*, are white. When one of the magnets is active, the signal will be turned to show its white surfaces at the openings in the sides of the casing Y', and when the other magnet only is active the signal will be turned to show its red surfaces. The magnet H^2 is supposed to be active in the drawings.

In constructing the signal, I prefer to make a skeleton tube of wire and cover it with trans-

lucent material of red and white colors properly arranged, as indicated. One end of the tube I leave open and arrange in the other end a reflector, *w*. Opposite the open end I arrange a reflector, *w'*, and a lamp, M', which will, when lighted at night, illuminate the signal so that it may be plainly seen, the reflector *w* throwing back the light and condensing it within the cylinder, thus enhancing its illumination.

From the foregoing description it will be seen that the electro-magnets act positively to move the signals in both directions, and a closed circuit is used for holding the signal in its normal position.

The advantages are obvious to those familiar with electric railway-signals, it being well known that springs for moving signals are not reliable, as they are liable to have their tension increased and decreased by change of temperature and become relaxed by continued use, so as to require frequent adjustment. Gravity also as a retracting motive power for signals is objectionable, from the fact that, in order to be prompt, it must oppose the magnet with a force requiring great battery-power to overcome it for setting the signal.

While I have shown and described my improvement applied to two specific forms of signals, I wish it to be understood that it is within the scope of my invention to apply said improvements for operating any kind of signal requiring movement in two directions, whether the signal be used for railways or for any other purpose.

What I claim is—

1. The combination, with a signal arranged for movement in opposite directions, of two electro-magnets for producing its respective movements, two local battery-circuits, including the respective magnets, and an automatic relay, included in a main circuit and arranged to close said local circuits alternately, substantially as described.

2. The combination, with a rocking signal and two electro-magnets, of two segmental armatures attached to said signal and arranged to move transversely in front of the poles of said magnets at a gradually-decreasing distance when attracted thereby, said armatures being arranged with respect to their magnets for producing movements of the signal in opposite directions, substantially as described.

3. The combination, with a rocking signal and two electro-magnets, of two segmental armatures attached to said signal eccentrically, and arranged to move transversely in front of the poles of said magnets by the rocking movement of the signal and at a gradually-decreasing distance when attracted, the approach of one armature to its magnet causing the distance between the other armature and its magnet to be increased, substantially as described.

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

W. W. LE GRANDE.

Witnesses:
LUCIUS D. HAMILTON,
I. B. DABNEY.