

W. S. ROBERTS.

APPARATUS FOR OPERATING RAILWAY AND TRAMWAY POINTS, SIGNALS, AND THE LIKE.
APPLICATION FILED DEC. 27, 1916.

1,331,379.

Patented Feb. 17, 1920.

4 SHEETS—SHEET 1.

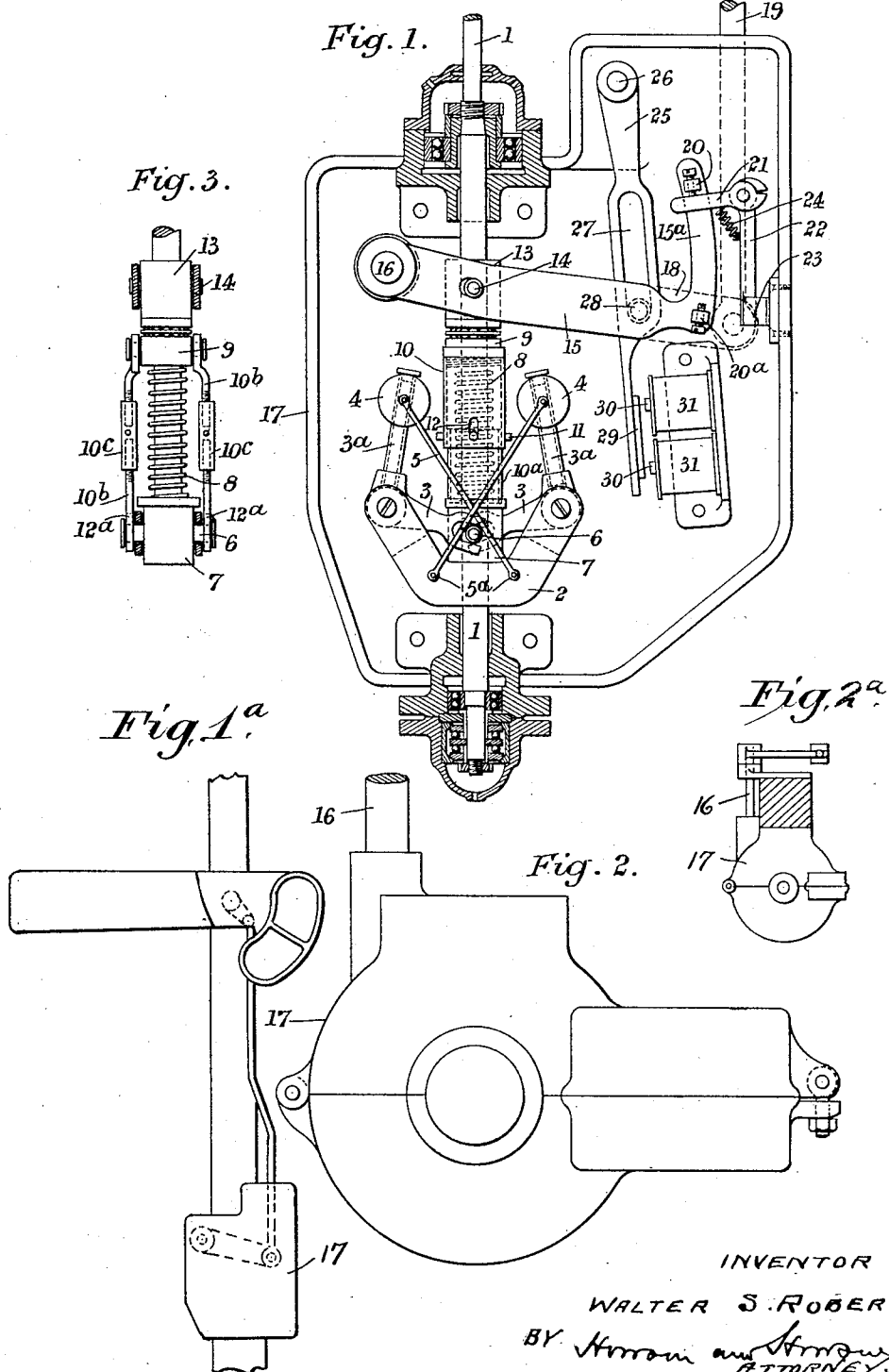
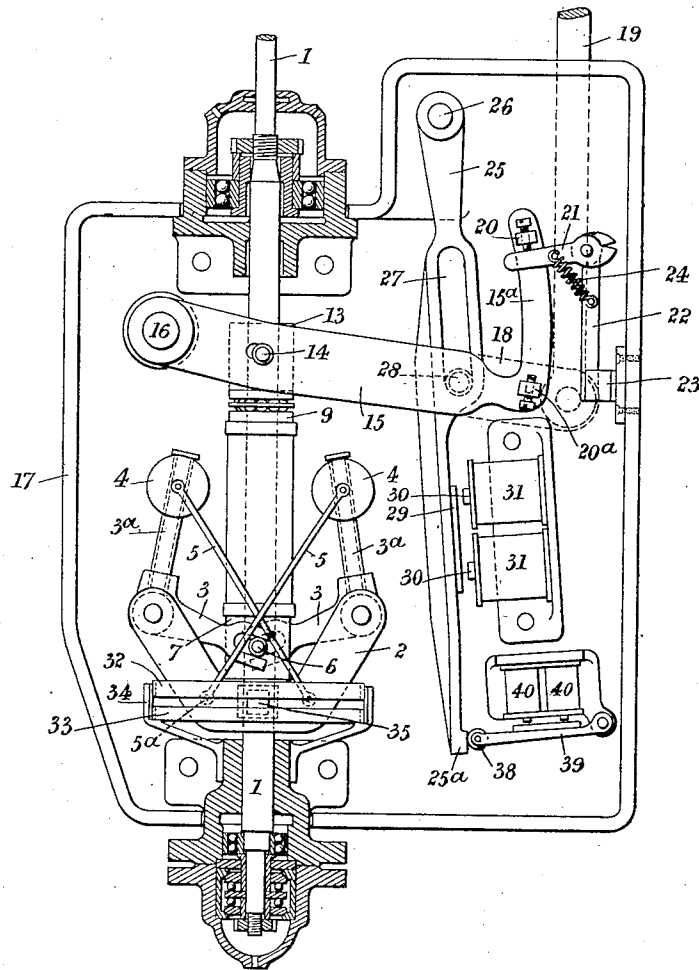


Fig. 4.



INVENTOR
 WALTER S. ROBERTS
 BY *Harmon and Harmon*
 ATTORNEYS

W. S. ROBERTS.

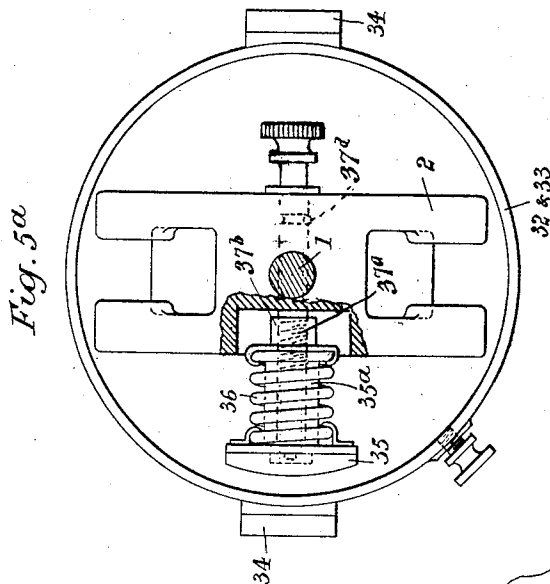
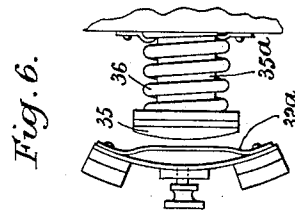
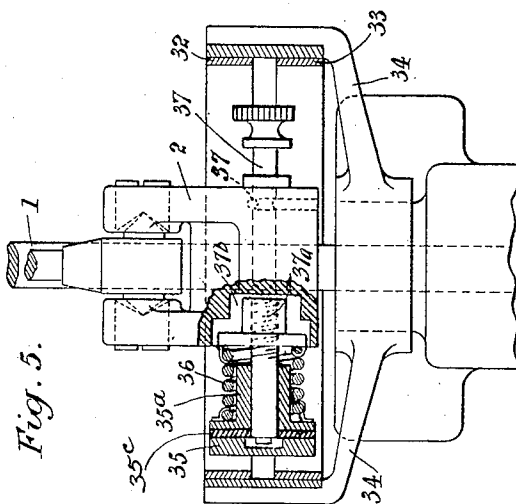
APPARATUS FOR OPERATING RAILWAY AND TRAMWAY POINTS, SIGNALS, AND THE LIKE.

APPLICATION FILED DEC. 27, 1916.

1,331,379.

Patented Feb. 17, 1920.

4 SHEETS—SHEET 3.

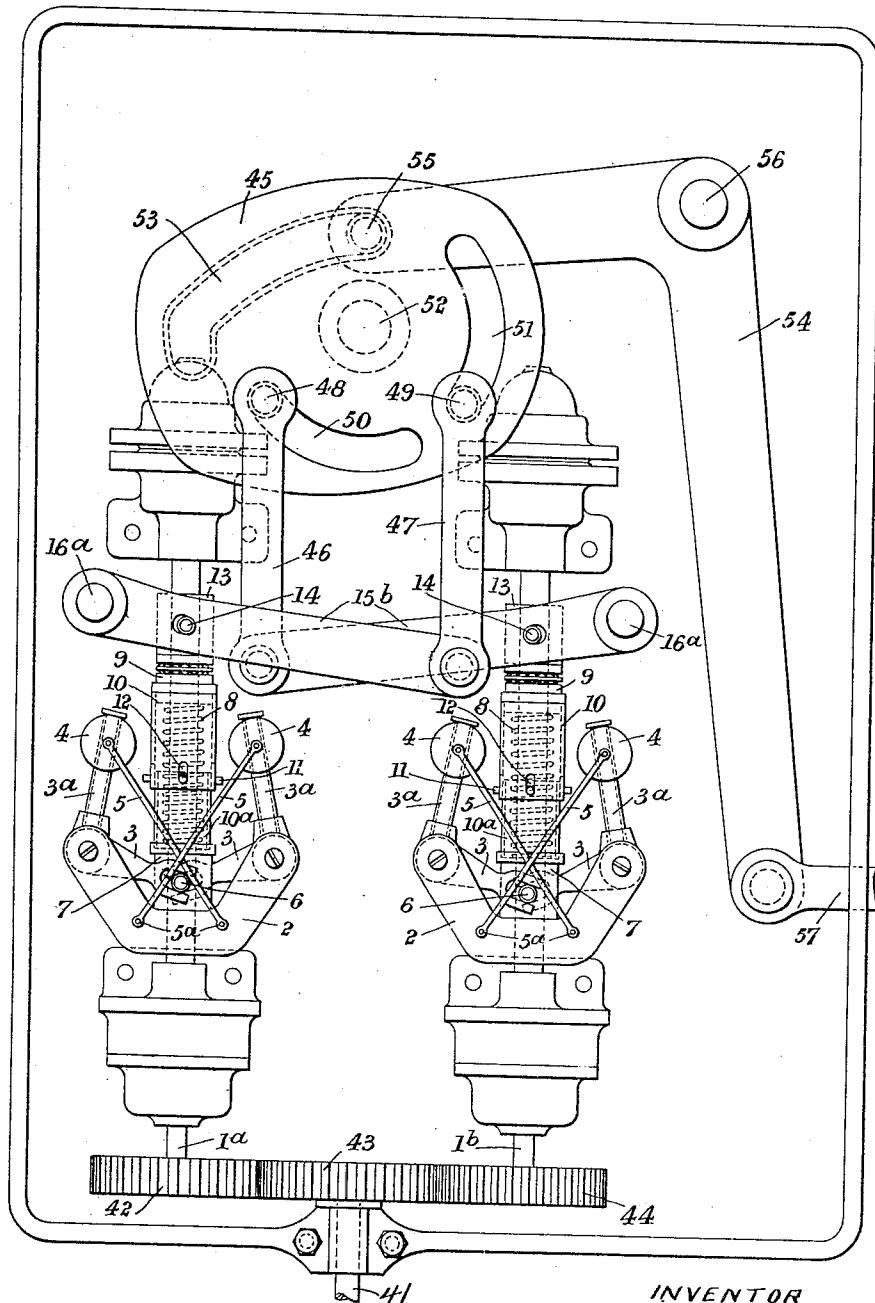


INVENTOR

WALTER S. ROBERTS.

BY *Harmon and Harmon*
ATTORNEYS

Fig. 7.



INVENTOR
 WALTER S. ROBERTS
 BY *Harmon and Harmon* ATTORNEYS

UNITED STATES PATENT OFFICE.

WALTER SYDNEY ROBERTS, OF LIVERPOOL, ENGLAND, ASSIGNOR TO THE RAILWAY SIGNAL COMPANY, LIMITED, OF WESTMINSTER, ENGLAND.

APPARATUS FOR OPERATING RAILWAY AND TRAMWAY POINTS, SIGNALS, AND THE LIKE.

1,331,379.

Specification of Letters Patent.

Patented Feb. 17, 1920.

Application filed December 27, 1916. Serial No. 139,141.

To all whom it may concern:

Be it known that I, WALTER SYDNEY ROBERTS, a subject of the King of Great Britain, residing at 179 Warbreck Moor, Aintree, in the city of Liverpool and county of Lancaster, England, have invented new and useful Improvements in Apparatus for Operating Railway and Tramway Points, Signals, and the like, of which the following is a specification.

This invention relates to apparatus for the operation of railway and tramway signals, points, and the like, by electricity. In such apparatus, as hitherto constructed it has been customary to employ an electric motor, and a combination of spur, worm, or other gearing. The object of this invention is to provide mechanism which is simple and efficient and in which all, or the greater part, of the gearing hitherto employed is dispensed with.

I will describe my invention, with reference to the accompanying drawings, but I do not limit myself to the precise details hereinafter described and illustrated, nor to arranging the mechanism in the position illustrated.

Figure 1 is a front elevation, partly in section and with the cover removed, and Fig. 2 is an external plan of the casing of the apparatus arranged in accordance with this invention for operating a signal arm, or the like, by controlled spring action. Figs. 1^a and 2^a show respectively in elevation and plan the apparatus applied to operating a signal. Fig. 3 illustrates a modification of the controlled spring arrangement shown in Fig. 1.

Fig. 4 is a front elevation, partly in section and with the cover removed, of an arrangement for operating the signal arm, or the like, by an electro-magnetic trip arrangement.

Figs. 5 and 5^a illustrate, in elevation, partly in section, and in plan respectively, a switch arrangement for controlling the electro-magnetic trip mechanism shown in Fig. 4. Fig. 6 illustrates, in plan, a modification of this arrangement.

Fig. 7 is a plan (with the cover removed) of an arrangement suitable for operating railway, or tramway, points, or the like.

Like reference numerals indicate like parts in the several figures of the drawings.

Referring first to the arrangement shown in Fig. 1:—The operating shaft is marked 1 and is shown as being arranged vertically. It may be connected either directly, or indirectly, to the source of power such as an electric motor. The crosshead 2, (which is preferably made of light metal, such, for example, as aluminium alloy) is connected to the shaft 1, so as to rotate with it. Bell-cranks 3, are centered to the ends of the crosshead 2, and carry governor weights 4, which may be capable of movement along the arms 3^a, of the cranks 3. Attached to the weights 4, and the crosshead 2, I have shown a device 5 hereinafter described, for controlling the movements of the weights 4, upon the crank arms 3^a. The inner ends of the cranks 3, are forked to respectively engage rollers 6, carried on trunnions on opposite sides of the collar 7 (which I term the bell-crank collar), free to move along the shaft 1, but constrained to rotate therewith. A spiral spring 8, (having any desired predetermined initial compression), is arranged between the collar 7, and the collar 9 which I term the operating collar, which rotates with the shaft 1, but, like the bell-crank collar 7, is capable of sliding along the said shaft. If the collars 7 and 9 were not constrained to rotate with the shaft, the rollers would, on the rotation of the shaft, tend to jam in the forked ends of the cranks 3. The said collar 9, is connected to the bell-crank collar 7, by means of links 10, 10^a, which are illustrated as being telescopic tubular links which incase the spring 8. The link 10^a, can slide within the link 10, for a distance determined by studs 11, secured to the link 10^a, and engaging with slots, or elongated holes, in the link 10, one of which holes is seen at 12. One of the objects of the links 10, and 10^a, is to take the effect of the initial compression of the spring 8 off the connections to the device to be operated (which I will presume to be a signal arm) when the latter is in the "on" position and also to allow of the utilization of this compression of the spring when the signal arm is being moved to the "off" position. The length of the slots 12, is equal to the axial movement of the collar 7, before the compression of the spring 8 becomes equal to the resistance offered by the loose collar 13, because of the weight of the devices between

the said collar and the signal arm. The collar 13, is provided on opposite sides with roller trunnions 14, which engage with the lever 15, pivoted on to the shaft 16, which passes through the main casing 17, of the apparatus and at its outer end, is attached to a lever 18, in connection with the signal arm track switch, or other like element through the connecting rod 19. This lever 18 is indicated in dotted lines in Fig. 1, but is not seen in Fig. 2 as the part of the shaft on which it is carried is broken away.

The lever 15, may be provided with an extension 15^a, carrying adjustable attachments 20, 20^a, to operate the arm 21, of a switch to open, or close, (according to the position of the lever 15) an electric circuit; the said arm 21, operating the contact-making arm 22, to make and break contact with the contact pieces 23. 24, indicates a spring which may be provided between the parts 21, 22, to insure quick breaking of the circuit. The mechanism for holding the signal arm, "off" may consist of a lever 25, centered at 26, to the casing and having in it a slot 27, with which engages a roller 28, carried by the lever 15, so that, the armature 29, carried by the lever 25, is moved toward, or away from, the pole pieces 30, of the electro-magnet 31, according to the position of the lever 15. Antifriction devices, such as ball bearings, should be introduced between the various movable parts of the mechanism to minimize friction. When the shaft rotates the weights 4, under centrifugal force, move outward from the shaft as the speed increases and, through the cranks 3^a, 3, and roller 6, move the collar 7, upward, this, at the commencement, being prevented by the initial compression of the spring 8; but, as the speed, and centrifugal force increase, the compressive power of the spring 8, is overcome and the weights 4, move slightly outward to the extent allowed by the slots 12, and this causes further compression of the spring 8. This continues until the centrifugal force exerted by the weights 4, overcomes the resistance offered by the collar 13, and the centrifugal moment of the weights 4, acting on the collar 7, being in excess of the centripetal moment of the spring 8, the weights 4, will move farther outward, the centrifugal force increasing as the peripheral velocity of the weight centers increases. The movement of the collar 7, is transmitted through the lugs 11 and slots 12, to the collar 9, and through the loose collar 13, to the lever 15, pivoted at 16, lever 18, (outside the casing) and signal rod 19. If the weights 4, were immovably attached to the cranks 3, the operation of the signal arm might be effected in a very small interval of time so, to guard against the operation being too sudden, I allow the weights 4, to be capable of movement along the arms 3^a, of the cranks,

but such movement is controlled by the links 5, which are centered at 5^a, to the crosshead 2, their other ends being centered respectively to the weights 4. The outward movement of the weights 4, must be in the arcs of circles about the centers 5^a, and therefore the weights must move along the arms 3^a, the effect of which is to give less leverage for the centrifugal force of the weights 4, as this force increases.

When the lever 15, is moved to the maximum extent from the normal position, the adjustable attachment 20^a, moves the arm 21 of the switch so that the contact at 23, is broken by the contact arm 22 and the motor is cut out leaving only the electro-magnet 31, in circuit, the resistance of this electro-magnet being such as to consume only a small amount of current. As the lever 15, moves, the roller 28, travels along the slot 27, and causes the lever 25, to bring the armature 29, into such proximity to the electro-magnet 31, that it, being energized, attracts and holds the lever 25, to the pole-pieces 30. The lever 15, when at its maximum distance from its normal position, is held in that position by the roller 28, bearing against the side of the slot 27, so long as the electro-magnet 31, is energized, thus holding the signal arm in the "off" position.

To allow the lever 15, to return to its normal position the circuit for the current passing through the electro-magnet 31, is broken and this releases the armature 29, from the pole-pieces 30, and frees the lever 25, and, as no resistance is now offered to the roller 28, by the slot 27, the lever 15, returns to its normal position, the adjustable attachment 20, moves the arm 21, of the switch so that electric contact is made at 23, by the contact arm 22, and the circuit for the motor is completed to allow it to be ready for again operating the mechanism when required.

Fig. 3 shows a modification in which the links between the collars 7, and 9, are simple links which can have devices, such as at 10^a, to adjust their lengths. Slots, as at 12^a, are provided in the said links so that the roller 6, would perform functions similar to those performed by the studs 11 and poles 12 in the arrangement Fig. 1.

The mechanism can be applied to either the British standard type of signal arm in which the movement of the arm is downward to the "off" position, or to the type of signal arm in which the movement of the arm to the "off" position is upward. In the latter case I prefer to employ an arm of light material, such, for example, as one of aluminium alloy.

Figs. 4, 5 and 5^a illustrate a trip arrangement which may be employed. This consists of insulated contact rings 32, 33, as shown in Figs. 4 and 5 carried by the arms

of a fixed bracket 34. A contact piece 35, is carried by a tube, or the like, 35^a capable of sliding on a stem 35^b (from which it is insulated by the insulation at 35^c) projecting from the crosshead bracket 2 and controlled by a spring 36, which tends to draw the said piece 35 away from the contact rings 32 and 33. The tension of the said spring can be adjusted by an adjusting device, such for instance, as that shown in Figs. 5 and 5^a which consists in making the stem 35^b the end of a rod 37 passing through the cross-head bracket 2. The normal position of the contact piece 35 is fixed by resting against the end of the rod 37, which is free to be rotated but is prevented from any longitudinal motion by a peg 37^a entering a groove around the rod 37 which has a portion of its length screwed at 37^a, and is capable of operating the nut 37^b to which one end of the spring 36 is fixed. By turning the rod 37 by its head the initial tension on the spring 36 may either be increased or decreased, thus producing either an increased, or decreased tensional action on the contact piece 35 when this is against the contact rings 32 and 33. These changes in tension are necessarily accompanied by changes in the normal speed of rotation at which the apparatus will commence to operate.

As the speed of the shaft 1, increases the contact piece 35, will have a tendency to move outward under centrifugal force radially to the axis of the shaft 1, and against the action of the spring 36 and, when this movement becomes sufficient, (that is when the motor reaches its predetermined speed) electrical contact will be made between the contact rings 32, and 33, by the contact piece 35, and the electric circuit which includes the coils of the magnet 40, (Fig. 4) will be closed and the magnet will attract the armature of the lever 29, and allow the roller 28 to move in the slot 27 so that the rod 19 is capable of being operated through the lever 15.

The holding-off lever 25, is provided with an extension piece 25^a, (as shown in Fig. 4) which normally abuts against a roller 38, carried by the armature lever 39, of the aforesaid electro-magnet 40, placed in the circuit, established when the contact piece 35, makes contact with the contact rings 32, 33, Figs. 4, 5 and 5^a. Fig. 6 shows a modification in which the rings 32 and 33 are replaced by contact springs one of which is shown at 32^a. In this case the controlling circuit is only closed for a fraction of a revolution of the contact rubber 35.

By the aforesaid mechanism the lever 15, is locked in its predetermined position until the motor has reached its normal speed. The effect of this is that the weights 4, will not be allowed to fly outward until the mo-

tor attains predetermined speed and that the signal arm is locked in the danger position.

In the arrangement illustrated in Fig. 7, the operating shafts 1^a, 1^b, are shown as being rotated from the motor shaft 41, by toothed gear (42, 43, 44) the wheels 42 and 44 being of such free-wheel character that, when the shaft 41, is rotating the one, or the other, of the said wheels, the other is not rotated so that either can be rotated while the other remains stationary according to the direction of rotation of the shaft 41.

The general construction of each of the centrifugal parts and the parts through which they act is a duplication of that described with regard to Fig. 1.

The levers 15^b, centered at 16^a, are connected to a cam-plate 45, by rods 46, 47, centered at one end to the respective ends of the levers 15^b, and having, at their other ends, pins 48 and 49, which engage with the curved slots 50, 51, in the cam-plate 45, which cam-plate is mounted upon a center, at 52, around which it is capable of rotatory movement. In the cam plate is an eccentric slot 53, in which engages a pin 55, on a crank-lever 54, centered at 56, to the casing and having connected to it the operating rod 57 for actuating the points, or the like. Presuming the shaft 41, to be capable of driving the shaft 1^b, through the gear wheels 43 and 44, while 42 turns freely on the shaft 1^a, when the governor mechanism has sufficient power available, the lever 15^b, will be moved about its center 16^a, and the rod 46, whose pin 48, engages with one end of the slot 50, will cause the cam-plate to move in a clockwise direction around the center 52, in such a manner that the pin 55, will follow the path of the slot 53, and will consequently be moved outward away from the center 52, and, through the crank 54, will draw the rod 57, in the direction toward the mechanism. The said movement of the cam-plate 45, will cause the pin 49, to abut against the end of the slot 51, opposite to that against which it is shown as bearing, as, while the pin 48, is driving the cam-plate in the clockwise direction, the pin 49, is stationary and allows the cam-plate to move the distance allowed by the slot 51, and then (when the cam-plate has been thus moved in the clockwise direction) the slot 51, is in position for moving the cam-plate 45, in the counterclockwise direction. This is accomplished when the shaft 41, is driven in the reverse direction when the wheel 42 rotates in a direction opposite to that in which the wheel 44 was rotated, while the said wheel 44 turns freely on the shaft 1^b. When the governor mechanism has sufficient power available, the lever 15^b, to which the rod 47, is attached will move about the center 16^a, and the rod 47,

will operate the cam-plate in the counter-clockwise direction around the center 52, in the manner in which the rod 46, acted as aforesaid and the rod 57, will be made to travel away from the mechanism. When this movement is finished the mechanism will have returned to the position shown in Fig. 7.

What I claim is:—

1. In a signal system, a pivoted shifting lever, a track switch, signal arm or other like member operated thereby, a rotary shaft, a centrifugal member mounted thereon, and a lost motion operative connection between said centrifugal member and shifting lever, said lost motion connection serving to permit the centrifugal member to accelerate to predetermined speed before displacing said shifting lever.

2. In a signal system, a pivoted shifting lever, a track switch, signal arm or other like member operated thereby, a rotary shaft, a centrifugal member mounted thereon, and a spring-opposed lost motion operative connection between said centrifugal member and shifting lever, said lost motion connection serving to permit the centrifugal member to accelerate to predetermined speed before displacing said shifting lever.

3. In a signal system, a pivoted shifting lever, a track switch, signal arm or other like member operated thereby, a rotary shaft, a centrifugal member mounted thereon, said centrifugal member comprising a pivoted lever and a weight slidable thereon, together with an operative connection between said pivoted lever and the shifting lever and means for decreasing the radial distance of said weight from the axis of said pivoted lever as the speed of rotation of said centrifugal member increases, whereby its centrifugal moment remains substantially constant after the initial acceleration of speed of the shaft.

4. In a signal system, a pivoted shifting lever, a track switch, signal arm or other like member operated thereby, a ro-

tary shaft, a centrifugal member on said shaft, an operative connection between said centrifugal member and shifting lever operative to displace said lever only after the centrifugal member has attained predetermined speed, and means operated by said lever on its displacement adapted to halt a motor.

5. In a signal system, a pivoted shifting lever, a track switch, signal arm or other like member operated thereby, a rotary shaft, a centrifugal member on said shaft, an operative connection between said centrifugal member and shifting lever operative to displace said lever only after the centrifugal member has attained predetermined speed, and means operated by said lever on its displacement adapted to halt a motor, together with means to hold said lever in actuated position.

6. In a signal system, a pivoted shifting lever, a track switch, signal arm or other like member operated thereby, a rotary shaft, a centrifugal member mounted thereon, an operative connection between said centrifugal member and shifting lever to displace the latter, and electromagnetic means for holding said lever in displaced position after the centrifugal member has ceased to operate.

7. In a signal system, a pivoted shifting lever, a track switch, signal arm or other like member operated thereby, an electrically driven shaft, a centrifugal member mounted thereon, an operative connection between said centrifugal member and shifting lever, an electric switch in the driving circuit, and means operated by said lever to open said switch when said lever has been fully actuated, and to close said switch when the lever returns to normal position.

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

WALTER SYDNEY ROBERTS.

Witnesses:

SYDNEY T. HUYTON,
LEIGH O. LAW.