No. 801,440. PATENTED OCT. 10, 1905.

J. P. COLEMAN.

APPARATUS FOR MOVING SWITCH RAILS.

APPLICATION FILED JUNE 23, 1905.

2 SHEETS—SHEET 1.

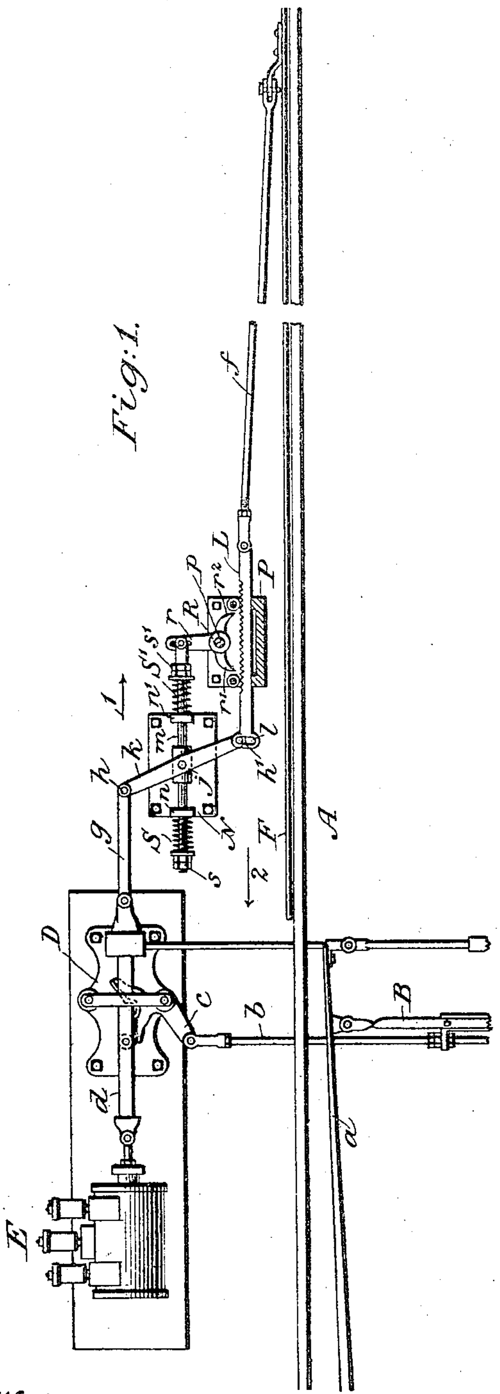

Fig: 1.

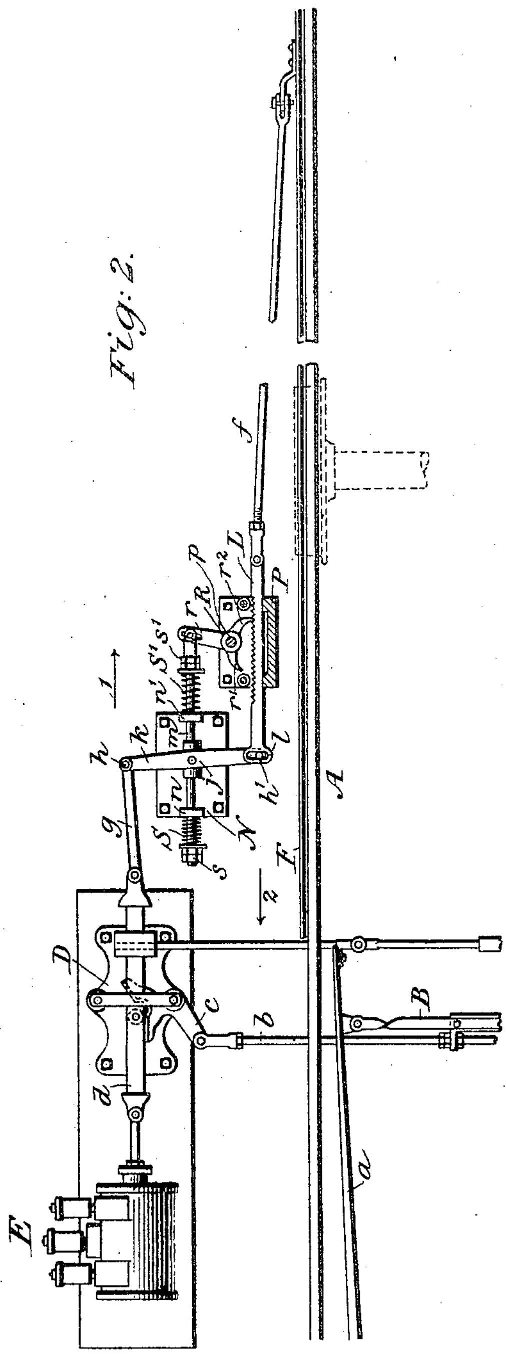

Fig: 2.

Witnesses:
John A. Rennie
W. N. Korsill

Inventor:
John Pressley Coleman
By Geo. E. Cruse.
his Attorney.

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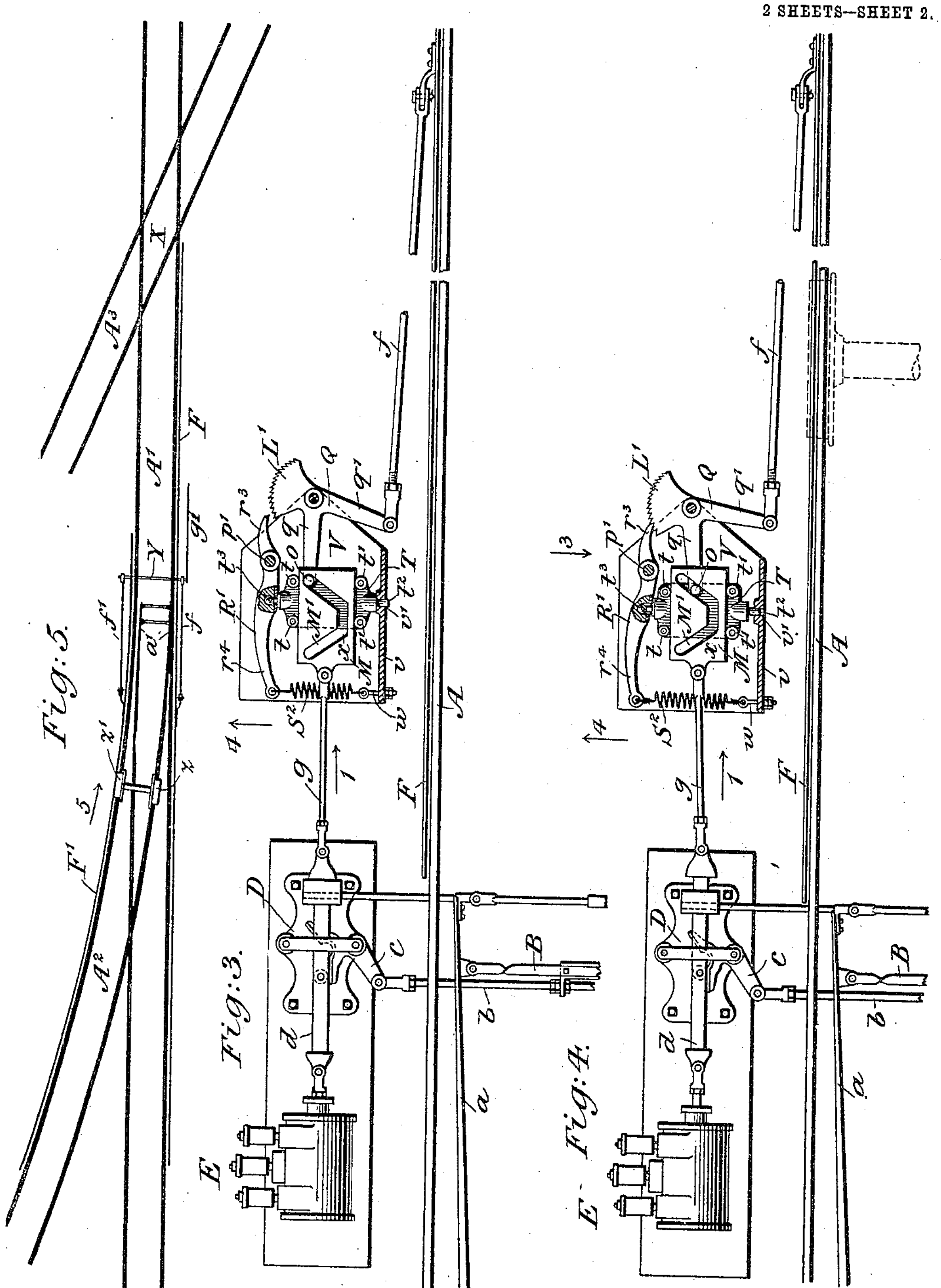

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John A. Rennie
W. N. Scovell

Inventor:
John Pressley Coleman
By Geo. E. Cruse.
his Attorney.

UNITED STATES PATENT OFFICE.

JOHN PRESSLEY COLEMAN, OF EDGEWOOD PARK, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH AND SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

APPARATUS FOR MOVING SWITCH-RAILS.

No. 801,440. Specification of Letters Patent. Patented Oct. 10, 1905.

Application filed June 23, 1905. Serial No. 266,616.

To all whom it may concern:

Be it known that I, JOHN PRESSLEY COLEMAN, a citizen of the United States, residing at Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Moving Switch-Rails, of which the following is a specification.

As is well known to those versed in the art a detector-bar is a safety device employed for the purpose of preventing the movement of a railway-switch while an engine or car or other vehicle is moving or standing over the said switch. In practice a detector-bar is generally held or supported adjacent a track-rail of a railway and in such proximity to a switch that a car or other vehicle passing or standing over the switch will at the same time be passing or standing over the detector-bar, and, furthermore, the detector-bar is adapted to be moved through a certain predetermined range before a movement of the switch can take place, and it is so located in relation to the track-rail to which it is adjacent and is so adapted to move that in the course of its movement the upper edge or surface of the said detector-bar will rise above the upper surface of the track-rail and will thereby engage with a wheel or wheels of any car or vehicle which may at the time of such movement be standing or passing over the said detector-bar. When such engagement takes place, the detector-bar is thereby arrested in its movement, and a movement of the switch being dependent on the prior movement of the detector-bar the arrest of the latter at the beginning of its movement will prevent any movement of the switch. When a detector-bar is thus stopped in its movement by the wheels of a car or other vehicle or by any other obstruction, an excessive strain is set up in the detector-bar and its supports and connections, and under certain conditions this strain may and, in fact, occasionally does result in a rupture of the detector-bar or its connections or supports and the object for which the detector-bar is employed is thereby defeated. This is more particularly the case when switches and detector-bars are operated by power, such as compressed air or electricity, because the power developed in such a case may greatly exceed the amount necessary for performing the function of operating the switch-rails and detector-bar. I have shown the switches and detector-bars as being operated by compressed air in the drawings which accompany this specification, though the apparatus embodying my invention may equally well be used in connection with detector-bars which are operated by any other form of power—manual, electric, or otherwise.

It is an object of my invention to provide means for relieving a detector bar or bars from the excessive strain which may be thus imposed on them and at the same time to lock them and their operating mechanism so that the detector-bar cannot be moved until the car or train has completely passed off the switch or the other obstructing cause, whatever it may be, has been removed.

Having now stated the object of my invention, I will proceed to describe an apparatus embodying my invention and then point out the novel features thereof in claims.

Of the accompanying drawings, Figures 1 and 2 are plan views and illustrating one form of apparatus embodying my invention. Fig. 1 shows the parts in one position and Fig. 2 the parts in a different position. Figs. 3 and 4 are plan views illustrating another form of apparatus. Fig. 3 shows the parts in one position and Fig. 4 the parts in a different position. Fig. 5 is a diagrammatic view of a portion of railroad-track comprising a switch.

Similar letters of reference designate corresponding parts in all of the figures.

Referring first to Figs. 1 and 2, A designates a portion of railway-track, *a* a switch-point or derail which is connected through a bridle-rod B and connection *b* with a crank *c* of a switch and lock movement D, operated in this particular case by an electropneumatic motor E. F designates a detector-bar which moves above and below the top of the adjacent rail once with each movement of the switch-operating mechanism, commencing its movement prior to that of the switch-crank *c*. *f* designates a detector-bar driving-rod through which motion is transmitted to the detector-bar. *g* designates a link which is connected at one end to the sliding bar *d* of the switch and lock movement D and at the other end *h* to the lever *k*, which is pivoted on a pin *j*, and has its other end *h'* connected to the slotted end *l* of a rack-bar L. The pivotal pin *j* is carried by a rod or bar *m*, which is supported in bearings n and n' on a base N, the said base being rigidly attached to a tie or ties of the railway-track or otherwise held in fixed relation to the switch and lock movement D. The bar m extends outwardly beyond the bearings n and n' and carries springs S S', one on each of its outwardly-extending ends, and also stops s s', one at the end of each spring. The springs S S' are not attached to the bearings or the stops, but they are made of such a length that a movement of the bar m in either direction will tend to compress one or the other of the springs. One end of the bar m, preferably the end remote from the switch and lock movement D, extends beyond the stop s' and is connected to a slotted arm r of a crank R, which is provided with two pawls r' r^2. The pawls are adapted to engage under conditions hereinafter to be described with the teeth of the rack-bar L. The said rack-bar L is supported by a base plate or casting P, (shown partly in section,) which may be carried by a tie or ties of the railway-track or otherwise suitably held in fixed relation to the base N. The rack-bar L, which is adapted to be moved in a longitudinal direction by a movement of the lever k, forms a link or connection between the said lever k and the detector-bar driving-rod f. The crank R, with its pawls r' r^2, is pivoted on the pin p, which is carried by the base-casting P.

The operation of my invention is as follows: Suppose the switch and switch-operating mechanism to be in what I will herein call their "normal" position and suppose that it is desired to move the switch-operating mechanism and therethrough the switch into its other position, which I will call the "reverse" position. Suppose, further, that the detector-bar F is in no wise restrained from moving by the presence of a car or other obstruction of any kind. Then upon the application of power to the switch-motor E motion will be transmitted from the sliding bar d through the link g to the end h of the lever k, thereby tending to move the said end h of the lever k in the direction indicated by the arrow l. The detector-bar F being not restrained the pin j will act as a fulcrum for the lever k, being held in position by resistive force of the springs S S', which are made sufficiently strong for this purpose, and the lever k will consequently respond to the applied force transmitted through the link g, and the other end h' of the said lever will, by its movement in the direction of the arrow 2, move or "throw" the detector-bar to its other or reverse position through the medium of rack-bar L and driving-rod f. In other words, when no additional load is imposed upon the lever k beyond that due to the inertia and ordinary friction of the detector-bar and its connections the pin j will act as the fulcrum of the lever k and the detector-bar will be caused to move in the ordinary manner by a movement of the switch-operating mechanism. Suppose, however, that power is applied to the switch-operating motor while a car is standing on or passing over that part of the track to which the detector-bar is adjacent or while the detector-bar is restrained by other means from making a complete movement. Then under these conditions a partial movement will be given to the detector-bar, whereby it will be caused to rise until its further progress is arrested by reason of the engagement of its upper edge with the overhanging tread of the car-wheels in a manner well known to the art, and in the absence of the mechanism embodying my invention an excessive strain will be set up in the detector-bar and driving-rod owing to the fact that a considerable amount of force is being applied to move the detector-bar while it is restrained from moving by the presence of the car which is standing or passing over it. Where my invention is used, however, the following action will take place: Referring to Fig. 2, the end h' of the lever k is restrained from moving by the fact of the detector-bar to which it is connected by the rack-bar L and the driving-rod f, being held down by the weight of the car, the wheels of which are engaging with the upper edge of said detector-bar. The other end h of the lever k, however, will continue to move in the direction of the arrow i in response to the movement of the sliding bar d in that direction. Consequently the end h' will become the fulcrum of the lever k and the pin j, which is not attached to the base N, will move forward, (in the same direction as h,) thereby causing the spring S to be compressed and moving the arm r of the crank R in the direction of arrow l until the pawl r^2 engages with a tooth of the rack-bar L, thereby securely locking the said rack-bar and through it the switch-operating mechanism and the driving-rod and detector-bar against further movement. As soon as the said locking takes place any further stress that may be transmitted through the link g will be taken up by the spring S and the bar m. In like manner the switch may be in the reverse position and may be prevented from moving to the normal position by the presence of a car on the track or by some obstructing cause which tends to restrain the detector-bar from moving, and in this event the pawl r' will perform a function similar to that already described with reference to pawl r^2 and by engagement with a tooth of the rack-bar L will lock the detector-bar and thereby relieve it and its driving-rod of excessive strain in a like manner to that already described.

In the actual construction of the apparatus embodying my invention I do not limit myself to the use of the springs S S'; but the said springs, if so desired, may be dispensed with and some other form of resilient cushions used in their place—as, for example, a pair of cylinders containing compressed air. I prefer, however, to use the springs for the reason that they form a simpler and more convenient means of attaining my object.

Figs. 3 and 4 illustrate another form of apparatus embodying my invention. In this form the principle involved is the same; but the construction is different from that shown in Figs. 1 and 2, a motion-plate and bell-crank being used in place of the lever *k* of Figs. 1 and 2 to transmit the motion of the link *g* to the detector-bar connection *f*. M designates a motion-plate adapted to move in a longitudinal direction—that is, in a direction parallel to the track A—in response to like movements of the link *g*, and also adapted to move in a transverse direction—that is, in the direction of the arrow 4—under conditions to be hereinafter described. The motion-plate M is provided with a slot M′ in which a pin *o*, carried by the arm *q* of the crank Q, is adapted to slide. The other arm *q′* of the crank Q is secured to the detector-bar driving-rod *f* and through the said driving-rod imparts motion to the detector-bar F. The crank Q is provided with a toothed sector L′, the teeth of which are adapted to engage with the pawl-shaped arm r^3 of the lever R′, the said lever being fulcrumed on the pin *p′* and having a long arm r^4. T designates a sliding plate, of cast-iron or other suitable material, and carries four rollers *t t t′ t′*, which act as guides to the longitudinal movements of the motion-plate M. V designates a base-plate, of cast-iron or other suitable material, having a flange *v*, which is provided with a hole or aperture *v′*, which serves as a guide for the end t^2 of the sliding plate T. The other end t^3 of the sliding plate T is provided with a universal pivot, which rests in a recess formed in the arm r^4 of the lever R′. S^2 designates a spring, which is secured at one end to the end of the arm r^4 of the lever R′ and at the other end to some rigidly-fixed member of the apparatus, such as the flange of the base-plate V. Between the end of the spring S^2 and the flange of the base-plate I provide an adjusting-screw *w* for varying the tension of the spring S^2 as may be desired.

I will now describe the operation of my apparatus as shown in Figs. 3 and 4. As in the case of the apparatus shown in Figs. 1 and 2, the detector-bar F derives its motion from the motor E through the medium of the interposed mechanism. In Figs. 1 and 2 I have shown an arrangement by which a continuous movement in one direction is imparted to a detector-bar by a movement of the link *g* in one direction and another continuous movement in the reverse direction is imparted to it by a corresponding movement of the link *g* in the reverse direction. In the present case the movement of the detector-bar is the same under both conditions—that is to say, whether the link *g* is moving in one direction or the other. This will be easily understood by an examination of the shape of the slot M′. For example, suppose that power is applied to the motor E, causing a movement of the slide *d* and the link *g* in the direction of the arrow 1. Then the motion-plate M will move in the same direction and the pin *o* will thereby be forced to travel along the right-hand arm of the slot M′ until it reaches the center portion of the slot. The movement of the pin *o* will then cease for a moment, while the motion-plate M continues its movement in the direction of arrow 2, thereby bringing the end *x* of the central portion of the slot M′ into contact with the pin *o*, and a further continued movement of the motion-plate in the same direction will force the pin *o* to traverse the left-hand arm of the slot M′, the end of which it will reach coincidentally with the completion of the movement of M. Any movement of the pin *o* is of course accompanied by a like movement of the arm *q* of the crank Q. Consequently, a complete movement of the switch-operating mechanism in the direction of the arrow 1 will result in a reciprocating or oscillatory movement of the crank Q, and a like movement will thereby be imparted to the detector-bar F—that is to say, during one complete movement of the switch-operating mechanism the detector-bar will be raised sufficiently to bring its upper edge above the upper surface of the rail. It will then be held in that position for a moment and will then move back again to its original position. In like manner a reverse movement of the switch-operating mechanism and motion-plate M will result in a similar movement of the detector-bar—that is to say, the pin *o* will first move from the extreme end of the left-hand arm of the slot M′ down to the point *x*. It will then traverse the central portion of the slot, and finally it will move up the right-hand arm of the slot back to the position in which it is shown in Fig. 3.

Let us suppose that while the above-described operation is taking place there is no engine or car standing on or passing over any part of the detector-bar. Then under these conditions the spring S^2 will be sufficiently strong to hold the arm r^4 of the lever R′, and thereby the sliding plate T, in the position shown in Fig. 3, in spite of the fact that the inertia and friction of the detector-bar and its connections offer a certain amount of resistance to the movement of the crank Q. Suppose, however, that an engine or car is standing on the detector-bar or passing over it and the detector-bar is thereby forcibly restrained from responding completely to the movement of its operating mechanism. Then upon the application of force tending to move the motion-plate M in the direction of arrow 1 the following action will take place: The crank Q will commence to move as in the above-described operation, and will thereby raise the detector-bar until its upper edge comes into contact with the overhanging tread of the wheels of the engine or car that is standing or passing over it. As soon as such contact is made the detector-bar is thereby stopped in its movement. The switch-operating mechanism is, however, still near the beginning of its movement, and consequently force is still being applied tending to move the motion-plate M in the direction of arrow 1 and to force the pin *o* and the arm *q* of the lever Q to continue their movement in the direction of arrow 3. The reaction of this force of course tends to move the motion-plate M in the direction of arrow 4, and the only restraining force which prevents the said motion-plate from so moving is that of the spring S^2, which under ordinary conditions confines the motion-plate to movement in a direction parallel to arrow 1. Under the condition which I am now describing, however, the motion-plate M is forcibly restrained from continuing its movement in the direction of arrow 1. Consequently, it will be forced to move in the direction of arrow 4, and in doing so it will carry the base-plate T along with it and tilt the lever R′ about its fulcrum *p*′, thereby overcoming the pull of the spring S^2 and moving the pawl-shaped arm r^3 into engagement with one or other of the teeth of the sector L′, which forms part of the crank Q. The said crank will thereby be locked as against any further movement and the detector-bar and its driving-rod will be relieved from the excessive strain which would otherwise be imposed on it.

It will be seen that in both of the arrangements embodying my invention which I have now described the same principle is carried out—namely, the provision of a yielding member interposed between the detector-bar and its operating mechanism and means for causing the said yielding member to yield under conditions of excessive strain, and thereby to effect the locking of the switch-operating mechanism and the detector-bar and to relieve it of undue strain.

In Fig. 5 I have shown a diagrammatic view of a switch with two detector-bars for the purpose of illustrating one way in which a very severe strain may sometimes be imposed on a detector-bar. A′ designates a portion of railway-track, and *a*′ is a switch leading off A′ to another track A^2. A^3 is a third track, which crosses track A′ at X. I will assume the point of crossing X to be at a distance from the switch *a*′ considerably less than the length of the detector-bars generally employed. Under these conditions it is the usual practice to have one detector-bar of full length on one side of the track A′, as at F, and another detector-bar F′ located on the side of track A^2 remote from the bar F, the two bars being so connected that they move in unison. The usual way of connecting the two detector-bars is to employ a rocking shaft Y, which is mounted in suitable bearings below the level of the rails and is provided with upstanding arms to which are connected the detector-bar-driving rods *f f*′. The rocking shaft Y is also provided with another arm, by which it is connected to the driving-rod *g*′. The said driving-rod *g*′ is connected to the detector-bar-operating mechanism. Consequently any movement of the said detector-bar-operating mechanism will tend to rock the shaft Y in its bearings, and thereby through *f* and *f*′ transmit the movements of *g*′ to the detector-bars F and F′. Now suppose *z z*′ to be the leading pair of wheels of a car or engine that is entering track A′ from track A^2—that is to say, they are moving in the direction of arrow 5. Suppose that the said pair of wheels has reached a position where the wheel *z*′ is passing over the detector-bar F′, as shown in Fig. 5, but that the wheel *z* has not yet reached a position where it will be over detector-bar F, and suppose, further, that just about this moment power is applied to the switch-operating mechanism for the purpose of moving the switch. As I have already shown, the first part of the operation will consist of a movement of the detector bar or bars. Consequently the two bars F and F′ will commence to move and will contiuue their movement until the upper edge of bar F′ comes into contact with the wheel *z*′, which is passing over it. This will immediately arrest the movement of the bar F′; but, owing to the fact that a considerable amount of power is still being exerted by the switch-operating mechanism tending to move the detector-bars, the rocking shaft Y will be subjected to a certain amount of torsional strain, and under conditions where my invention is not used it will yield or twist sufficiently to allow the bar F to continue its movement to a slight extent only, but still to a sufficient extent to raise its upper edge somewhat above the top of the rail to which it is adjacent. Consequently as soon as the wheel *z* reaches the point where it comes into contact with bar F it will deliver a very severe blow to the said bar, and it will almost inevitably rupture or bend the detector-bar and its supports and connections. Where my invention is used, however, the detector-bars and their operating mechanism will immediately be locked in the manner hereinbefore described as soon as they are restrained in their movement by an extraneous cause, and consequently the bar F will not be able to rise above the level of the rail and will thus escape the very severe strain to which it would otherwise be subjected.

It is to be understood that not only do I not limit myself to the use of any specific switch-operating mechanism in conjunction with my invention, but that the mechanism embodying my invention is equally applicable to cases where no switch or derail is operated at all—as, for example, in the case of crossing bars, such as are oftentimes used at the junction or crossing of two or more railway-tracks. It is also to be understood that I do not limit myself to the exact details of construction of the apparatus which I have shown in the accompanying drawings, but that certain modifications in the construction or arrangement of parts might be made without departing from the principle embodied in my invention.

What I claim is—

1. The combination with a detector-bar, a motor for operating the detector-bar, and connections intermediate the said motor and detector-bar comprising a yielding member which when the detector-bar is restrained from moving yields to take up the strain developed by the motor in the parts moved thereby.

2. The combination with a detector-bar, of a motor for operating the detector-bar, connections intermediate the said motor and detector-bar comprising a yielding member, and a lock operated by the yielding member, said lock being adapted to restrain the motor from completing its movement when the bar by extraneous causes is restrained from moving and said yielding member being adapted to take up the strain on the parts due to the restraint imposed on the movement of the motor.

3. The combination with a detector-bar, of a motor for operating the detector-bar, connections intermediate the motor and detector-bar comprising a yielding member and a lock operated by the yielding member and adapted to be so operated when the detector-bar by extraneous causes is restrained from moving and adapted by such operation to relieve the detector-bar of strain due to any movement of the motor which may occur while the detector-bar is restrained from movement.

4. The combination with a detector-bar, a motor for operating the detector-bar, and connections intermediate the motor and detector-bar comprising a yielding member and a lock operated by the yielding member, the said yielding member comprising a lever having a fulcrum adapted to move under an abnormal stress, and the fulcrum being restrained from such movement during normal conditions by a spring or equivalent resilient member, the said lock being adapted to be operated by a yielding movement of the said yielding member.

5. The combination with a plurality of detector-bars, a motor for operating the detector-bars and connections intermediate the said motor and detector-bars comprising a yielding member which when the detector-bars are restrained from moving yields to take up the strain developed by the motor in the parts moved thereby.

6. The combination with a plurality of detector-bars, a motor for operating the detector-bars and connections intermediate the said motor and detector-bars comprising a yielding member and a lock operated by the yielding member said lock adapted to be so operated when the detector-bars are restrained by extraneous causes from movement and adapted by said operation to relieve the detector-bars of strain on the parts due to the restraint imposed on the movement of the motor.

7. The combination with a detector-bar, a motor for operating the detector-bar, and connections intermediate the said motor and detector-bar comprising a yielding member which when the detector-bar is retrained from moving yields to lock the motor against further movement.

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

JOHN PRESSLEY COLEMAN.

Witnesses:
A. HERMAN WEGNER,
HENRY R. BAUER.