T. M. FREEBLE.

SAFETY APPARATUS FOR RAILWAY TRAINS.

APPLICATION FILED FEB. 20, 1913.

1,155,478.

Patented Oct. 5, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

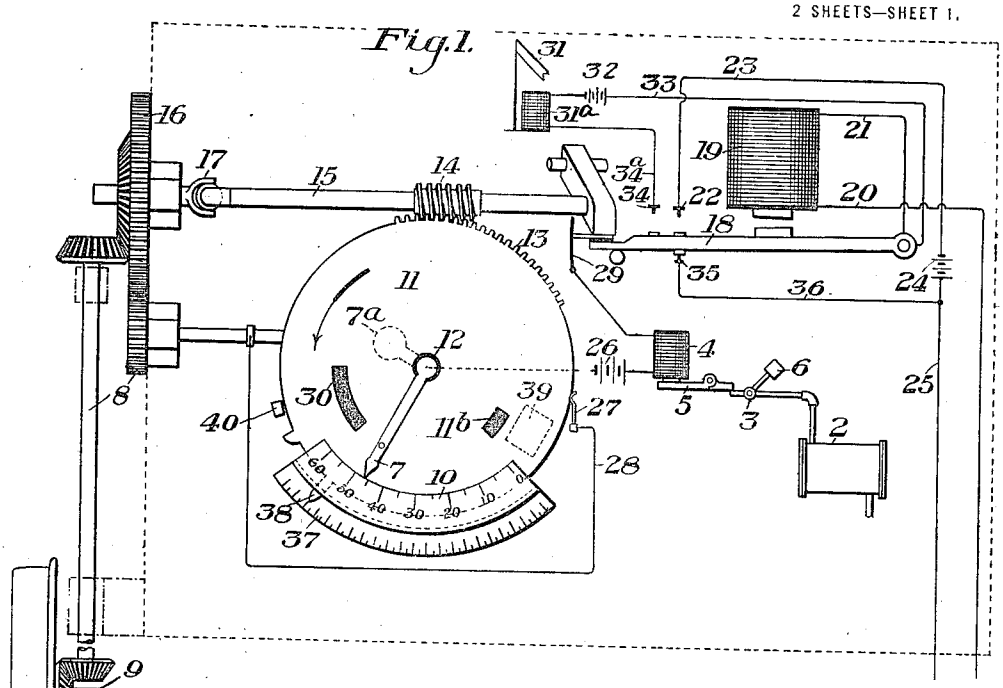
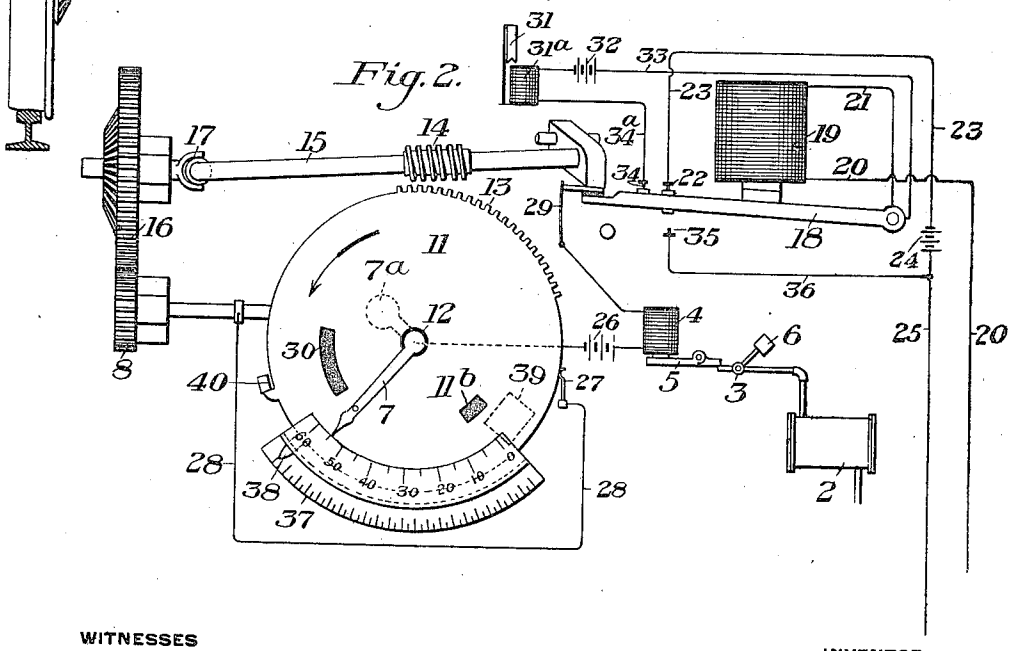


Fig. 2.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3.

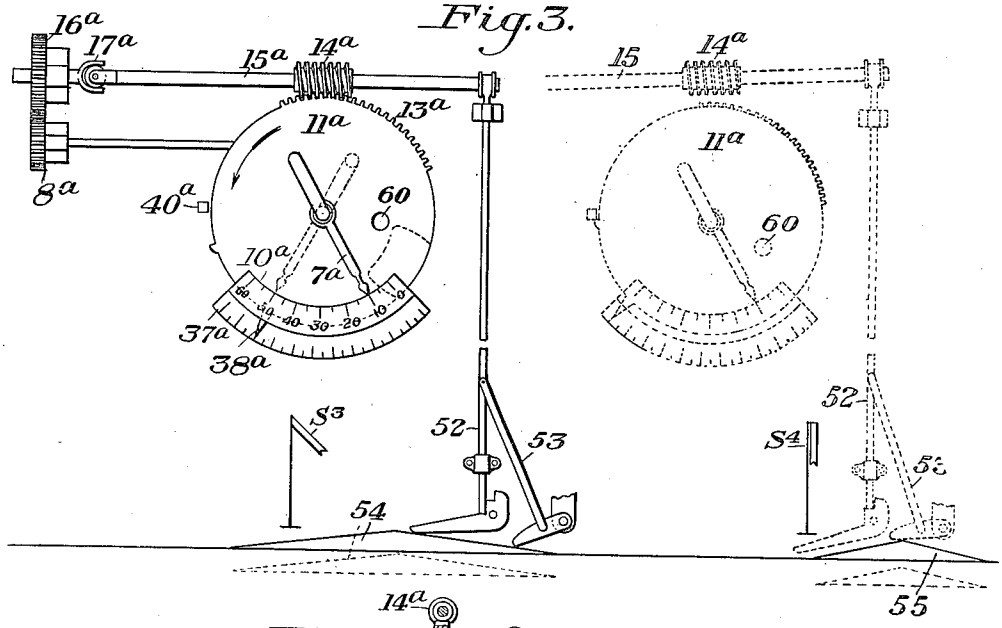


Fig. 4.

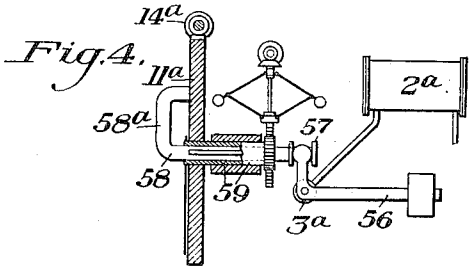
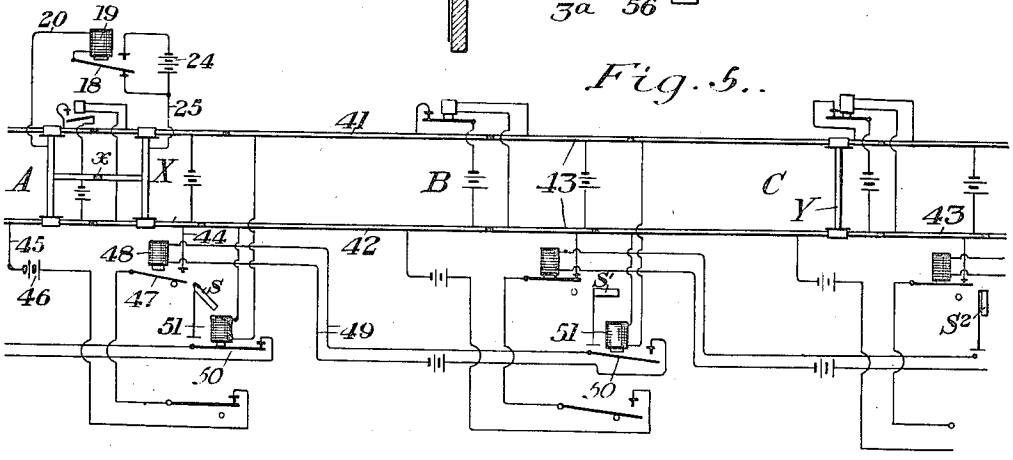


Fig. 5.



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SAFETY APPARATUS FOR RAILWAY-TRAINS.

1,155,478. Specification of Letters Patent. Patented Oct. 5, 1915.

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To all whom it may concern:

Be it known that I, THOMAS M. FREEBLE, a citizen of the United States, and a resident of Rochester, in the county of Beaver and State of Pennsylvania, have invented a new and useful Improvement in Safety Apparatus for Railway-Trains, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which:

Figures 1 and 2 are diagrammatic views illustrating one embodiment of my invention, the two views showing certain parts in different positions. Fig. 3 is a view similar to Fig. 1, but showing a modification. Fig. 4 is a detail view showing a part of the apparatus of Fig. 3, and Fig. 5 is a diagram showing one arrangement of track circuits for controlling the operation of the apparatus.

My invention has relation to safety apparatus for railway trains or vehicles; and is designed to provide means of this character which is simple in combination, and positive and reliable in operation.

My invention is more particularly designed to provide safety apparatus of this character of a nature to permit an engineer to run his train past a caution signal at any desired speed, but which will, nevertheless, compel him, if his speed is above the maximum demanded by safety requirements, to immediately reduce speed, until such maximum is reached, before arriving at the block end. Otherwise, the train will be automatically stopped. In its preferred form, my invention also provides means whereby any derangement of the apparatus from its normal working condition will result in an automatic stop. It also provides means whereby suitable cab signals may be sounded or displayed.

My invention comprises a train controlling device, such as a brake valve, and means for controlling said device, said means comprising a train driven speedometer element, and a train driven cyclometer element, these two elements having coöperating means whereby under certain conditions the train-controlling device will be operated to give an automatic stop.

The operation of the cyclometer element is track-controlled. When thrown into operation by predetermined track conditions, if the train speed is excessive, it will be moved to a position to effect an automatic stop of the train unless the engineer promptly reduces his speed. By so doing, he causes a movement of the speedometer element relatively to the cyclometer element of a character to prevent the two elements from being brought into a relation which will give an automatic stop.

The cab apparatus may be controlled either electrically or mechanically; and the track control of the cyclometer element may be effected either electrically by means of suitable track circuits controlled by the movement of the trains, or through the medium of track stops controlled by the usual track-signal system, or in any other suitable manner.

In that form of my invention which is shown in Figs. 1 and 2, and which will first be described, the cab apparatus is electrically controlled. In these figures, the numeral 2 designates a train brake pipe having a release valve 3. This release valve is normally held in closed position by the action of electro-magnet 4 acting upon the armature 5, the valve stem having a counter-weight 6 which will act to open the valve as soon as the armature 5 is released by the magnet.

7 designates the pointer of a speedometer instrument, which may be in general of any well known type and which is driven by suitable gear connections 8, from one of the axles 9 of the train. 10 is a scale traversed by the pointer arm 7 to indicate the speed of the train. 11 is a cyclometer element, which is shown as mounted for rotation about the axis of the speedometer arm 7, but which is insulated therefrom as indicated at 12. This element 11 is shown as in the form of a disk having a segment of its periphery formed with worm teeth 13, which are adapted to be engaged and driven by a worm 14 on a shaft 15. This shaft 15 is arranged to be constantly driven in any suitable manner while the train is in motion. In the drawings, I have indicated it as being driven by the reducing gears 16, through the train of gearing 8, which drives the speedometer. The shaft 15 has a universal joint at 17 so that the portion of the shaft which carries the worm 14 can be raised and lowered to control the engagement of the work with the worm teeth 13. This vertical movement of the shaft section is shown as being effected by the armature 18 of an electro-magnet or relay 19. This magnet 19 is in a normally

closed local circuit formed by the conductors 20, 21; the armature 18; the armature contact 22; conductor 23; battery 24 and conductor 25.

The circuit of the magnet 4 is through the battery 26, speedometer arm 7, cyclometer disk 11, contact 27 engaging the periphery of said disk, the conductor 28, a portion of the gear 8, gearing 16, shaft 15, and the movable contact device 29 which engages the end of the armature 18. By carrying the circuit of this magnet 4 through the gearing in the manner just described, it will be readily seen that if this gearing should break, or if the shaft section carrying the worm 14 should fail to move into engagement with the gear teeth 13 when the armature 18 is released by the relay magnet 19, in any such case the circuit of said magnet will be broken and the brake valve 3 will be actuated to give an automatic stop.

The cyclometer disk 11 is provided with the insulating sector 30; and when this sector is in a position underneath the speedometer arm 7, the circuit of the magnet 4 is broken, thereby causing an application of the brakes.

31 designates a cab signal which may be of any suitable character, either visual or audible, or both, and which is controlled by the relay magnet 31ª. This magnet is in a local circuit which includes a battery 32, conductor 33, armature lever 18, armature contact 34 and conductor 34ª; this circuit being closed when the magnet 19 is energized.

35 is a back contact for the armature 18, having a connection 36 with the conductor 25. This back contact and connection provides for keeping the magnet 19 in circuit between the conductors 20 and 25 in the released position of the armature 18.

The normal position of the parts is that shown in Fig. 2. The magnet 19 is kept energized by the battery 24 so long as the track ahead is clear. When, however, the train passes a caution signal, the magnet 19 is deënergized by the opening of the local circuit, thereby dropping the armature 18 against the back contact 35 and causing the jointed shaft section 15 to drop and engage the worm 14 with the worm teeth 13. The cyclometer element 11 now commences to rotate in the direction of the arrows. If the train is, at this time, running at a relatively high speed, it will be seen that the disk 11 can move only a short distance before the insulating segment 30 is brought into contact with the speedometer arm 7, and thereby break the circuit of the magnet 4. To prevent this, the engineer must at once reduce his speed. This will cause the speedometer arm 7 to move downwardly and backwardly away from the insulating segment 30. The actuating gearing for the disk 11 is preferably so proportioned that the train can travel nearly the entire block length before the cyclometer element completes its movement. The distance which the cyclometer element will move will, in the particular arrangement shown, depend upon the length of the toothed arc 13 of the cyclometer element. It will be obvious that this toothed arc may be made of any desired length to give the proper speed at or below which the train would have to be brought after passing a caution signal in order to prevent an automatic operation of the brakes. A scale 37, traversed by a pointer 38, on the disk 11 may be provided to indicate to the engineer the distance traveled within the block. While, therefore, the engineer is permitted to pass the caution signal at any desired rate of speed, he must reduce this speed to the safety maximum before reaching the end of the block or the train will be automatically stopped by the operation of the brake valve 3. If the engineer is negligent, or is, for any reason, unable to reduce the speed, then the train will be automatically stopped before the end of the block is reached. The pointer 38, by its position relative to the actual speed scale, gives a permissive speed indicator. That is to say, the engineer by observing this pointer can tell exactly how fast he can run without being subject to an automatic stop. The cyclometer element is, when inoperative, held by means such as hereinafter described in the position shown in Fig. 1, which is the position of maximum permissive speed. When the cyclometer element commences to rotate, the indicator 38 moves continuously in the direction of least permissive speed until the predetermined limit is reached. The deënergization of the magnet 19 also opens the circuit of the relay magnet 31ª and displays or sounds the cab signal, thus notifying the engineer that a caution signal has been passed. The parts will remain in the position shown in Fig. 5 until such time as the magnet 19 is reënergized by track conditions to raise the worm 14 to the position shown in Fig. 2. The cyclometer element is then automatically returned to its original position by any suitable means, such as the counterweight indicated at 39 and is stopped in this position by a suitable stop device, such as indicated at 40. I also preferably provide the disk 11 with another insulated sector 11ᵇ. In case of any breakage in the gearing which drives the speedometer element, the counterweight 7ª on the speedometer element 7 will return said element to zero position. It will then contact with the sector 11ᵇ and open the circuit of the magnet 4. Any suitable means may be provided for closing the valve 3 to again start the train. In the arrangement shown this may be done manually.

Any suitable arrangement of track circuits may be provided for controlling the magnet 19. In fact, so far as this is concerned, my invention is adapted for use with existing systems of track circuits. For the purpose of illustration, I have shown one arrangement of track circuits in Fig. 5. This figure shows the track rails 41 and 42 as divided into the block sections A, B and C. Each of the track rails has an insulated section 43 in each block. The electrical connection of each of these insulated sections with an adjacent track rail is controlled by the connections 44 and 45, these connections including a battery 46, and also the armature 47 of a relay magnet 48. This relay magnet 48 has a circuit 49 controlled by the armature 50 of a relay magnet 51 which is connected across the rails 41 and 42 of an advance block.

X designates a train in block A, this train having two parts which are insulated from each other at *x*. The conductors 20 and 25 forming part of the circuit of the magnet 19 are connected to the two parts of the train at opposite sides of the insulation *x*. When the train is in the position shown in Fig. 5, with its front portion bridging the insulated rails 43, the circuit of the relay magnet 19 will be closed through the connections 44 and 45, if the relay magnet 48 is energized. If, however, this magnet is deënergized and its armature 47 is dropped, the circuit of the magnet 19 will be open. Assuming, therefore, that the track signal S is in a caution position, by reason of the track conditions in the advance block C, (such as the presence of the train in said block, as indicated at Y), the relay magnet 48 will be deënergized; and as soon as the train actually reaches the position shown at Fig. 5, the magnet 19 will be deënergized. The cyclometer element will now be put into operation and the engineer must either reduce his speed or the train will be stopped before reaching the end of block B. If the signal S′ at the entrance to block C is either at danger, or at a caution position when the train reaches the entrance to that block, the insulated rail sections 43 at the end of block B will be electrically isolated from the track rails and the cab apparatus will be as shown at Fig. 1. If, however, the signal S′ is in clear position the magnet 19 will be reënergized from the battery 46 as soon as the forward part of the train bridges the rails 43 of block B and the cab apparatus will be restored to normal position. It will be seen, therefore, that where the track arrangement is as shown in this figure, the magnet 19 cannot be reënergized until a clear block is reached. This condition may, however, be modified in any desired manner known in the art.

In Figs. 3 and 4 I have shown a modification in which the cab apparatus is controlled by mechanical means instead of electrical. In these figures corresponding parts have the same reference characters as in Figs. 1 and 2 with the letter "a" added thereto. The vertical movement of the shaft 15^a is controlled by trip devices 52 and 53 which are actuated respectively by suitable track trips 54 and 55. The two trips 52 and 53, as well as the corresponding track trips 54 and 55, are in different vertical planes. These track trips are designed to be operated in the well known manner by suitable means controlled by the different positions of the track signals. If the signal S^3 shown in Fig. 3 is at safety position, the track trip 54 will be in the lowered position shown in dotted lines; but if the signal S^3 is in caution position, as indicated in this figure, the track trip 54 will be raised to the full line position shown and the train trip 52 will be actuated to cause the engagement of the worm 14^a with the cyclometer element 11^a. In like manner, if the signal S^4 in the succeeding block is in a caution or danger position, the track trip 55 will be in the position shown in dotted lines and will not actuate the train trip 53; but if the signal S^4 is in safety position, then the track trip 55 will be in the full line position shown in Fig. 3, and will actuate the train trip 53 to raise the worm 14^a out of engagement with the cyclometer element 11^a. In this arrangement the brake valve 3^a is also operated mechanically instead of electrically. This may be effected in various ways. I have shown the stem of the valve as having a counter-weighted actuating lever 56, one arm of which engages the collar 57 on a member 58, which extends through and is movable endwise within the hollow shaft 59 of the speedometer and which terminates at the outer side of the cyclometer disk 11^a in a bent arm 58^a. Normally, this arm is held by its engagement with said disk in the position shown in Fig. 4, thereby keeping the brake valve 3^a closed. When, however, the disk 11^a is moved to a position such that the end of this arm is brought opposite an aperture 60 formed in said disk, the end of this arm enters the aperture and thereby permits the member 58 to move endwise under the action of the weight, and this in turn opens the valve 3^a. The member 58 rotates with the speedometer shaft 59, but is capable of endwise movement therein.

The advantages of my invention will be apparent to those skilled in the art, since it provides means of simple, positive and efficient character, which, while permitting an engineer to run past a caution signal at a high rate of speed, positively compels him to reduce his speed to safety limits before passing into the next block or else have his train automatically stopped. He can, however, maintain considerable speed through the major portion of the caution block by

proper attention to the apparatus, and thus avoid the necessity for keeping his train speed down through the entire block. If the succeeding block is clear when the train reaches it, the train speed can be immediately increased. By a proper arrangement of track stops, the operation of the cab apparatus can be modified in various ways. Thus, for instance, a clearing stop, such as that shown at 55 in Fig. 3, may be placed at the intermediate portion of each block and controlled by the signal guarding the entrance to the next block, (or otherwise by track conditions in the next block) so that if this block has been cleared while the train is in the preceding block, the cam apparatus will at once be restored to its normal position and the engineer can take any desired speed. It will also be understood that the accompanying drawings are largely conventional and that in actual practice the invention may be embodied in various forms of apparatus within the scope of the appended claims.

What I claim is:

1. In train control apparatus, an indicating device, comprising a normally inactive movable member, normally inoperative driving connections for actuating said member from a moving part of the vehicle, and a track controlled trip operating under predetermined track conditions to operatively connect said member with the said driving connections, together with means with which said member co-acts to indicate the permissive speed of the train under such predetermined conditions, substantially as described.

2. In train control apparatus, an indicating device, comprising a normally inactive movable member, normally inoperative driving connections for actuating said member from a moving part of the vehicle, and a track controlled trip operating under predetermined track conditions to operatively connect said member with the said driving connections, means with which said member co-acts to indicate the permissive speed of the train under such predetermined conditions, and means along the track for causing said trip to operate at definite predetermined points under said conditions, substantially as described.

3. In train control apparatus, an indicating device, comprising a normally inactive movable member, normally inoperative driving connections for actuating said member from a moving part of the vehicle, and a track controlled trip operating under predetermined track conditions to operatively connect said member with the said driving connections, means with which said member co-acts to indicate the permissive speed of the train under such predetermined conditions, and means for limiting the movement of said member in the direction of reduced permissive speed, substantially as described.

4. In train control apparatus, an indicating device, comprising a normally inactive movable member, normally inoperative driving connections for actuating said member from a moving part of the vehicle, and a track controlled trip operating under predetermined track conditions to operatively connect said member with the said driving connections, means with which said member co-acts to indicate the permissive speed of the train under such predetermined conditions, means along the track for causing said trip to operate at definite predetermined points under said conditions, and a speed scale with which said member co-acts when operative to indicate the permissive speed of the train under the predetermined conditions, and another scale which coöperates with said member to show actual distance traveled by the vehicle beyond one of said predetermined points, substantially as described.

5. In train control apparatus, an indicating device, comprising a normally inactive movable member, normally inoperative driving connections for actuating said member from a moving part of the vehicle, and a track controlled trip operating under predetermined track conditions to operatively connect said member with the said driving connections, means with which said member co-acts to indicate the permissive speed of the train under such predetermined conditions, means for limiting the movement of said member in the direction of reduced permissive speed, and means co-acting with said movable member to automatically reduce the speed of the train if the indicated permissive speed is exceeded, substantially as described.

6. The combination with a railway track divided into block sections, and means in each block controlled by track conditions for actuating a device on a moving vehicle, of a normally inoperative indicating member on the vehicle, means coöperating with said device to show permissive speed of the train under predetermined conditions, and driving means connected to a moving part of the vehicle for actuating said device and controlled by said track means to be engaged with and disengaged from said member, said driving means, when operative, moving said member to an extent proportional to the distance traveled by the vehicle in one of said blocks after the driving means become operatively engaged with said member, substantially as described.

7. The combination with a railway track divided into block sections, and means in each block controlled by track conditions for actuating a device on a moving vehicle, of a

normally inoperative indicating member on the vehicle, means coöperating with said device to show permissive speed of the train under predetermined conditions, driving means connected to a moving part of the vehicle for actuating said device and controlled by said track means to be engaged with and disengaged from said member, said driving means, when operative, moving said member to an extent proportional to the distance traveled by the vehicle in one of said blocks after the driving means become operatively engaged with said member, and means for automatically returning said member to its normal position when it is disengaged from its driving means, substantially as described.

8. Train control apparatus, comprising a cyclometer element mounted on the train or other vehicle, gearing for driving said element from a moving part of the train, said gearing having a member which is movable into and out of driving relation, and a relay magnet having its armature operatively connected to said member, said magnet having its circuit completed through and controlled in part by said armature, substantially as described.

9. Safety apparatus for railways, comprising a movable element whose position is controlled by the speed of the vehicle which carries it, another movable element whose position is controlled by the distance traveled by the said vehicle, track controlled means for controlling the operation of the last named movable element, speed controlling means for the vehicle, an electromagnetic device for controlling the operation of the speed controlling means, and an electric circuit for said device, the two movable elements having coöperative means for controlling said circuit, said circuit being normally closed through portions of the gearing which operate said elements; substantially as described.

In testimony whereof, I have hereunto set my hand.

THOMAS M. FREEBLE.

Witnesses:
H. M. CORWIN,
GEO. H. PARMELER.