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RECORDING MECHANISM FOR RAILWAY TRAFFIC CONTROLLING APARATUS.

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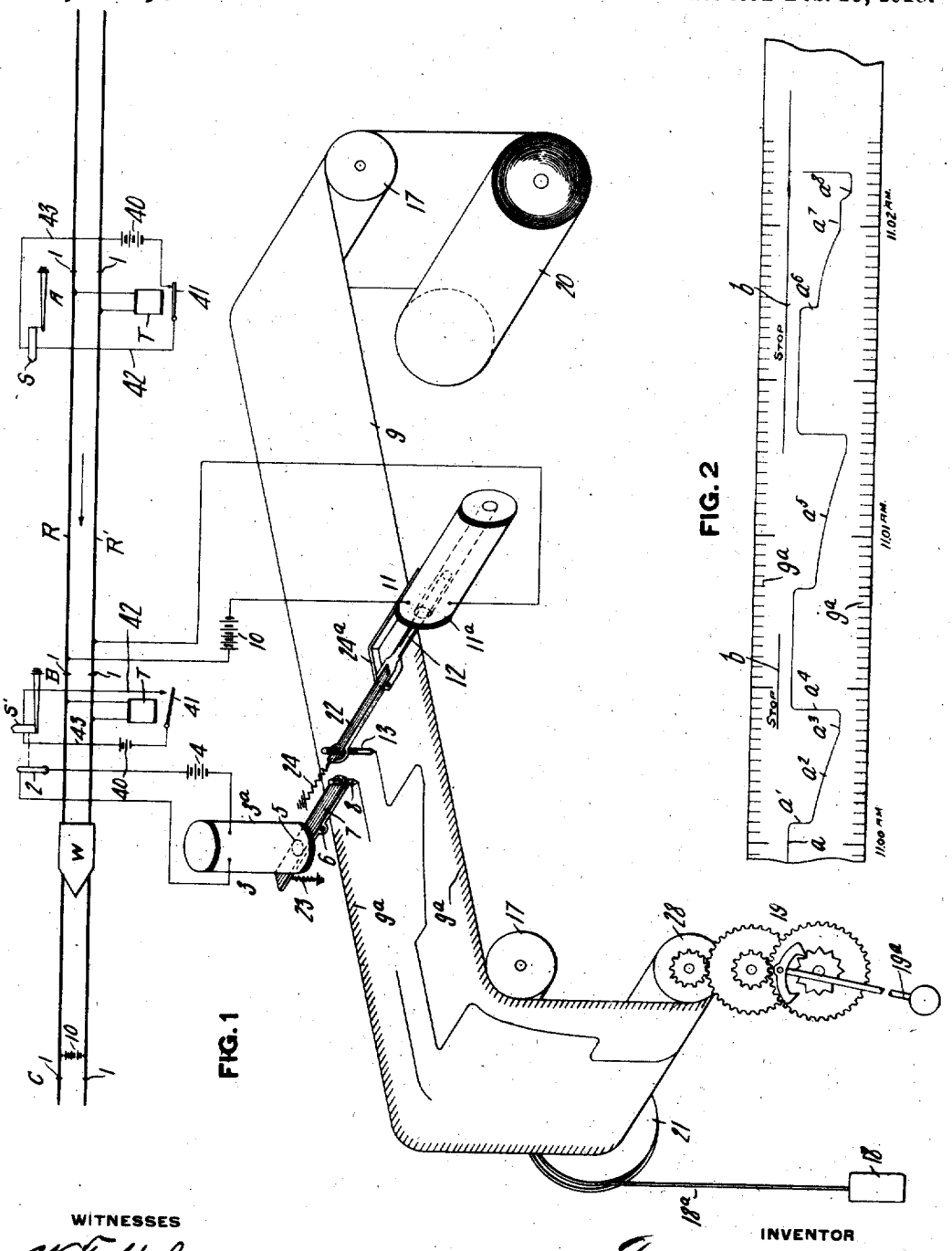


FIG. 1

FIG. 2

WITNESSES

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RECORDING MECHANISM FOR RAILWAY-TRAFFIC-CONTROLLING APPARATUS.

1,256,723. Specification of Letters Patent. Patented Feb. 19, 1918.

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To all whom it may concern:

Be it known that I, FRANK H. NICHOLSON, a citizen of the United States, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Recording Mechanism for Railway-Traffic-Controlling Apparatus, of which the following is a specification.

My invention relates to recording mechanism for railway traffic controlling apparatus. More particularly, it relates to mechanism for recording the progress and speed of trains along a railway, and to mechanism for recording signal operation. When the two parts of my invention are employed in conjunction, the record thus secured gives a complete graphic account of train movements and of observance of signal indications by train engineers.

I will describe one form of apparatus embodying my invention and will then point out the novel features thereof in claims.

In the accompanying drawings, Figure 1 is a diagrammatic view showing one form of recording apparatus embodying my invention. Fig. 2 is a view showing a portion of tape with the record made thereon by the apparatus shown in Fig. 1.

Referring first to Fig. 1, R, R′ designate the track rails of a railway over which traffic normally moves in the direction indicated by the arrow. The portion of the railway here shown is divided into two successive block sections A—B and B—C through which traffic is governed by signals S and S′, respectively. Each block section is provided with a track circuit comprising as usual the track rails of the section, a source of current 10 connected with the rails adjacent one end of the section, and a track relay T connected with the rails adjacent the other end of the section. Each track relay controls the signal for the corresponding section by the following circuit—from battery 40, through contact 41 of the track relay, wire 42, mechanism of the signal, wire 43, to battery 40. It is obvious that in accordance with the usual practice each signal will indicate "proceed" or "stop" according as the corresponding track relay is energized or deënergized, that is, according to whether the section is free or occupied.

In order to obtain a record of train movements through the block section A—B and of the operations of signal S′, I provide a tape 9, which may be of paper or other suitable material, and which passes over drums 17, 17. This tape is unwound from a roll 20 onto a drum 28 by means of suitable clockwork mechanism operating the latter drum. As here shown, this mechanism comprises a weight 18 attached to a cord 18^a which passes over a pulley 21 fixed to drum 28, and an escapement device including a train of gears 19 connected with the drum and an escapement pendulum 19^a. It is understood, however, that the mechanism here shown for operating the drum 28 is merely diagrammatic.

The tape 9 is preferably provided with time divisions 9^a corresponding to the rate at which the tape is moved by the clockwork mechanism.

In order to secure a record of the progress and speed of trains through block section A—B, I provide a recording device 11, which receives current from the connection between the source 10 and the track rails of block section A—B. As here shown, this recording device comprises a solenoid 11^a, the winding of which is connected between battery 10 and track rail R′ and in which solenoid is a longitudinally movable plunger 12. Pivotally connected to the end of this plunger is a link 22, to which is rigidly attached a stylus 13, which may for example be a pencil, which pencil is adapted to trace a record on tape 9. The solenoid 11^a and plunger 12 are so disposed that the pencil 13 is moved transversely across the tape 9 by the longitudinal movements of the plunger. The plunger 12 and pencil 13 are drawn toward a fixed stop 24^a by a spring 24, and are drawn away from this stop against the action of the spring 24 to a greater or less distance depending upon the amount of current in the solenoid 11^a. The parts of the recording device 11 are so adjusted that when the block section A—B is unoccupied, that is, when the current in solenoid 11^a is minimum, the plunger 12 rests against its stop 24^a, due to the action of the spring 24.

In order to record the operations of signal S′ I provide a recording device 3, comprising a magnet 3^a, which is adapted, when energized, to attract an armature 5 fixed to a lever 7 which is pivotally mounted at point 6. The lever 7 carries at one end a stylus 8, which may for example be a pencil, adapted to trace a record on the tape 9. A spring 23 acts upon the lever 27 to raise the pencil 8 from the tape when magnet 3^a is de-energized, but when the magnet is energized, the action of the spring is overcome and pencil 8 is moved into contact with tape 9. The magnet 3^a is controlled by a contact 2 operatively connected with signal S′, the circuit of this magnet being from battery 4 through magnet 3^a, contact 2 to battery 4. As here shown, contact 2 is closed when signal S indicates stop and is open when this signal indicates proceed, so that the pencil 8 draws a line on tape 9 only when the signal indicates stop.

The pencils 8 and 13 are preferably so located that the records made thereby on the tape at any given instant are directly opposite each other.

The operation of the apparatus is as follows:

When block section A—B is unoccupied, the track circuit for that section includes the internal resistance of battery 10, the resistance of solenoid 11^a, the resistance of relay T, the resistance of the track rails, the resistance of the connections, and the leakage resistance between the track rails; and as hereinbefore stated, the current which then flows in solenoid 11^a is not sufficient to draw the plunger 12 away from the stop 24^a. When, however, a train moving in the direction of the arrow enters block section A—B, the wheels and axles thereof shunt out the resistance of track relay T, thereby decreasing the total resistance in the track circuit so that the current which flows in solenoid 11^a is increased; this increased current is sufficient to draw the pencil 13 a short distance away from the stop 24^a. Then as the train proceeds through the block it shunts out more and more of the track rail resistance, thereby progressively increasing the current in solenoid 11^a so that the pencil 13 is progressively drawn farther across the tape. As the train enters block section B—C, it causes signal S′ to change to stop position, thereby closing contact 2 so that pencil 8 is brought into contact with the tape and remains there as long as signal S′ remains in stop position. It will be seen, therefore, that a straight line is traced on the tape 9 as long as signal S indicates stop.

In the drawing the apparatus is shown in the positions corresponding to a train W in section B—C.

Referring now to Fig. 2, the portion of the tape here shown bears a record which may be explained as follows: At 11 A. M. the plunger 12 was against its stop 24^a, so that pencil 13 was drawing a longitudinal line a, indicating that block section A—B was unoccupied; and there was no line traced by pencil 8, thus indicating that signal S′ was in the proceed position. About four seconds after 11 A. M. a train W entered block section A—B, as indicated by the transverse line a' drawn by pencil 13 across the paper. As the train proceeded through the stretch the current in the solenoid 11^a increased progressively so that the pencil 13 traced the curve a^2. At about 22 seconds after 11, the train entered block section B—C, so that signal S′ changed to stop indication as indicated by the line b drawn by pencil 8, and for the following 4 seconds the train bridged the rail insulations 1 between the two block sections, so that the current in solenoid 11^a remain constant, as indicated by the longitudinal portion a^3 of the curve traced by pencil 13. As the rear end of the train left block section A—B, the current in solenoid 11^a dropped abruptly to its initial value, as indicated by the transverse portion a^4 of curve A. About 40 seconds after 11, the train passed out of block section B—C, so that signal S′ then changed to proceed position, as indicated by the cessation of the longitudinal line b traced by pencil 8. Then about 50 seconds after 11 another train entered block section A—B and proceeded through the section at a lower speed than the preceding train, as indicated by the more gradual slope of portion a^5 of the curve traced by pencil 13. At about 16 seconds after 11.01 this train entered block section B—C, and signal S′ then changed to stop position. At about 44 seconds after 11.01, and while the last-mentioned train was still in block section B—C, a following train entered block section A—B, as indicated by portion a^6 of curve A. The third train proceeded through the block section until about 11.02 A. M., when it came to a stop in the rear of signal S′ and remained standing, as indicated by the longitudinal line a^7, until signal S′ changed to proceed position. Then at about 5 seconds after 11.02 the third train started as indicated by curve section a^8, and entered block section B—C about 3 seconds later.

It will be noted that the portions a^2, a^5, etc. of the line traced by pencil 13 are not straight. The curvature of these portions of the line does not indicate that the speed of the trains increased while passing through the section A—B, but is due to the fact that as a train approaches the exit end of the section the leakage current normally supplied to the rails of the section approaches zero and the curve traced by

pencil 13 tends to follow more closely the straight line determined by the constant rate of decrease in resistance of the rails R and R'. If there were no leakage between rails, the portions a^2, a^5 of the line traced by pencil 13 would be straight; provided of course the speed of the trains were constant.

It will be seen from the foregoing that by means of mechanism embodying my invention the progress and speed of trains along the track may be indicated by a graphic record, and that simultaneously a graphic record of the operation of the signals may be secured. A glance at this record will show whether or not any train has passed a signal indicating stop.

Although I have herein shown and described only one form of apparatus embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In combination, two successive sections of a railway track, a signal for the forward section, means for recording the indications of said signal, means for recording continuously the progress and speed of trains through the rear section, and means for receiving said records in correlative positions to give a graphic account of the observance of said signal indications.

2. In combination, a block section of a railway track, a source of current connected with the rails adjacent one end of the section and a relay connected with the rails adjacent the other end, a signal controlled by said relay, and a recording device responsive to variations of current and receiving current from the connection between said source and the rails for making a continuous record indicative of the speed and progress of trains through the section.

3. In combination, a section of railway track, a source of current connected with the rails of said section, and a recording device responsive to variations of current and receiving current from the connection between said source and the rails for making a continuous record of the positions of a train in the section.

4. In combination, a section of railway track, a source of current connected with the rails of said section, a record tape, means for moving said tape, an electromagnetic device responsive to variations of current, said device receiving current from the connection between said source and the rails, and a recording stylus movable transversely across said tape by said electromagnetic device.

5. In combination, a railway signal adapted to give a stop indication and a proceed indication, a contact controlled thereby and closed or open according as the signal gives one of said indications or the other, a constantly moving record tape, an electromagnetic device controlled by said contact, and a stylus controlled by said electromagnetic device for making a line on said tape or not according as the signal gives one of said indications or the other.

6. In combination, two successive sections of a railway track, a signal governing traffic through the forward section, a record tape, means for moving said tape, means for recording the positions of said signal on said tape, and means for also making on said tape a continuous record of the position of a train in the rear section.

7. In combination, two successive sections of a railway track, a signal governing traffic through the forward section, a source of current connected with the rails of the rear section, a record tape, means for moving said tape, a stylus controlled by said signal for making a line on said tape or not according as the signal is in one position or another, an electromagnetic device responsive to variations of current and receiving current from the connection between said source and the rails, and a stylus movable transversely across said tape by said electromagnetic device.

8. In combination, two successive sections of a railway track, a track circuit for each section comprising a source of current and a relay connected with the rails of the section, a signal for each section controlled by the corresponding relay, a record tape, means for moving said tape, a stylus controlled by the signal for the forward section for making a line on said tape or not according as the signal is in one position or another, an electromagnetic device responsive to variations of current and receiving current from the connection between said source of current and the rails of the rear section, and a stylus movable transversely across the tape by said electromagnetic device.

9. In combination, a railway signal, time-controlled means for receiving a record, means for registering thereon the indication of the signal, and means for registering thereon the speed and the approximate position of a train approaching the signal.

10. In combination, a railway signal, time-controlled means located in the trackway for receiving a record, means for producing thereon a continuous record indicative of the position of the signal, and means for producing thereon a record indicative of the speed of a train approaching the signal.

11. In combination, a railway signal, time-controlled means for receiving a record, means for producing thereon a record of the indication of the signal, and means for producing thereon in correlation to the afore-

mentioned record a continuous record approximately indicative of the progress of a train approaching the signal.

12. In combination, a stretch of track, a signal guarding the entrance thereto, and means for producing a continuous record showing correlatively the signal indications, the approximate distance of a train from the entrance of the stretch, and the approximate speed of the train.

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

FRANK H. NICHOLSON.

Witnesses:

A. HERMAN WEGNER,

CORWIN C. WHITE.