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RAILWAY TRAFFIC CONTROLLING SYSTEM

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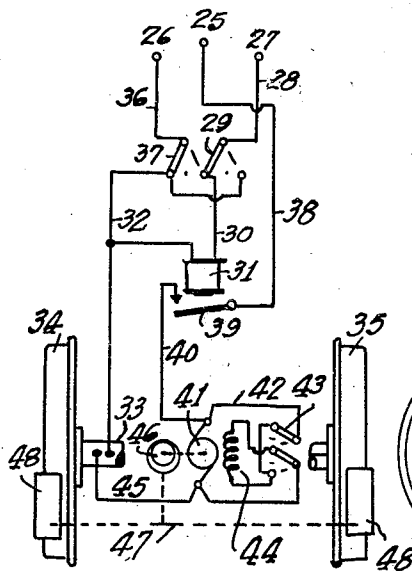


Fig. 2

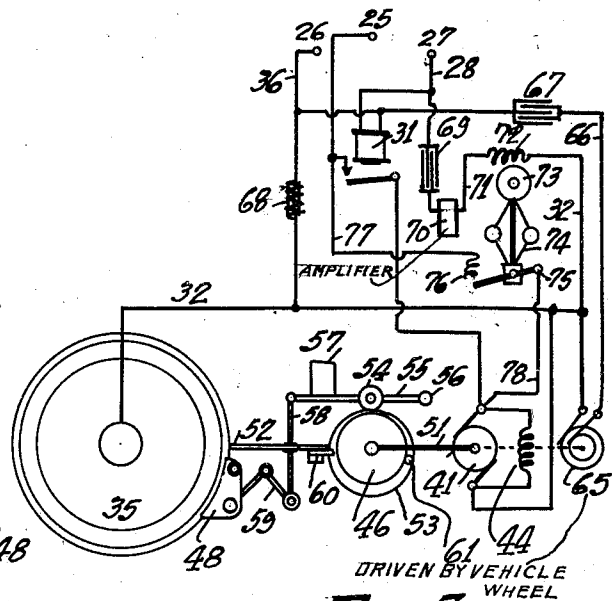


Fig. 3

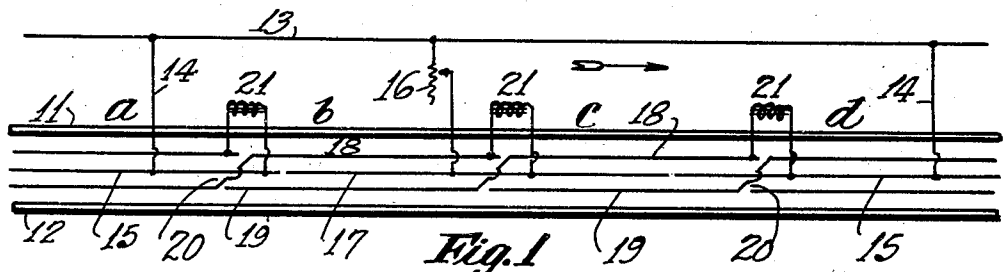


Fig. 1

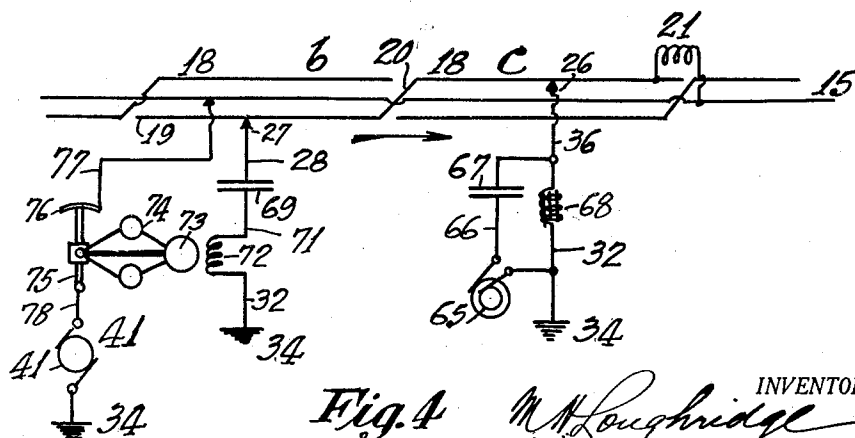


Fig. 4

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RAILWAY TRAFFIC CONTROLLING SYSTEM

Original application filed September 2, 1924, Serial No. 735,276, now Patent No. 1,805,551, dated May 19, 1931. Divided and this application filed July 18, 1929. Serial No. 379,296. Renewed February 8, 1932.

This invention relates to railway traffic controlling systems and has for an object to provide a block system continuously controlling the progress of a train in the block; a device on the vehicle continuously moving at a speed corresponding with the speed of the vehicle and cooperating with the block system to control the vehicle; a railway traffic controlling system in which the track is divided into blocks and a continuously moving device on the vehicle is controlled from the trackway at different speeds, said moving device controlling the vehicle through a translating device in accordance with its speed. Another object of the invention is to provide means of communication between vehicles on adjacent blocks whereby a following vehicle is controlled by the speed of the leading vehicle; another object of the invention is to control a speed responsive device on a vehicle by the movement of another vehicle in the adjoining block. Other objects of the invention will appear from the following specification and the accompanying drawing selected to show one embodiment of the invention, in which,

Fig. 1 is a plan view of a track layout embodying one form of block system used with this invention; Fig. 2 is a wiring plan of a vehicle embodying a train control system for operation in connection with Fig. 1; Fig. 3 is another wiring diagram of a vehicle adapted to operate with the block system shown in Fig. 1 and which includes a method of controlling a vehicle by the speed of the vehicle on the adjacent block and Fig. 4 shows the detailed application of the communicating system and speed control between vehicles on adjacent blocks.

In Fig. 1, 11 and 12 are the running rails of a railway track and 13 is a power wire for operating the system by electric propulsion. This wire feeds the trolley wire 15 centrally located on the trackway by the connections 14, also it feeds the trolley wire 17 through the resistance 16, thereby creating a lower voltage and a corresponding lower speed on the section 17 due to the voltage drop through 16.

The trackway is divided into blocks by the block wires 18 and 19 which are placed on

either side of the trolley wire and at the end of each block wire 18, by the jumper 20 connects to the block wire 19, the respective jumpers marking the limits of the blocks which are indicated by *a*, *b*, *c* and *d*. The block wire 18 is energized from the trolley wire 15 through the reactance or resistance 21. The term "trackway apparatus" herein is used to designate the apparatus on the right of way, as distinguished from apparatus on moving cars. In the drawing the conductors on the trackway connecting with the vehicle are shown as located overhead, but any convenient location may be used for these conductors. This block system for operating by either alternating current or direct current is fully described in U. S. Patent 1,617,402 February 15, 1927.

The vehicle indicated in Fig. 2 is provided with a central contact 25 which connects with the trolley wire 15 and with contacts 26 and 27 which connect with the block wires 18 and 19. When the switches 29 and 37 are in the position shown the contact 26 engages block wire 18 and grounds this wire through 36, 37, 32, 33, and wheel 34; also contact 27 engages wire 19 and when this wire is energized a circuit is established through 28, 29, 30, relay 31, wire 32 and wheel 34 to ground, thereby energizing relay 31 and closing the contact 39. When 39 is closed a circuit is established from the trolley wire 15 through 25, 38, 39, 40, motor 41, wire 45 and ground on wheel 34. The field coil 44 of motor 41 is also energized in multiple with the armature 41 by wire 42 and reversing switch 43 to ground through wire 45 and wheel 34.

The motor 41, through connection 51, Fig. 3, drives one side of the differential mechanism 46 and through the opposite side and connection 52 drives the running wheel 35. The planetary member of the differential mechanism operates the vehicle controlling apparatus in the form of the brake shoes 48 as indicated by the connection 47 and more fully described hereinafter. The differential mechanism 46 is of the usual type with a driving and a driven gear connected by a planetary member 53. The planetary member has a free

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movement for at least one half of a revolution and there is a corresponding free movement between the driving and driven gears until the planetary member is locked, as described below. This free, or lost motion in the drive is maintained continuously as the running wheel 35 exceeds the corresponding speed of the motor and, alternately, the motor exceeds the corresponding speed of the running wheel. The gear connected with the motor has a free movement independent of the running wheel 35, but normally runs at a corresponding speed, or if its speed is reduced, it operates the brakes through the planetary member to produce a retarding condition. The motor 41 is controlled by the block relay 31 and the block system.

The operation of the system as illustrated in Figs. 1 and 2 will be understood as follows. When the track is clear the block wire 19 is energized through the block wire 18 of the block ahead and connection 21. This energizes relay 31 and applies the power from the trolley 15 to the motor 41 for the propulsion of the vehicle and, at the same time releases the brakes. When a vehicle occupies the block ahead the block wire 18 for said block ahead is substantially deenergized through contact 26 and the ground connection through 32. As the block wire 18 of the block ahead connects with the block wire 19 for the adjoining block in the rear it is apparent that when 18 in one block is deenergized 19 in the block next in the rear is also deenergized. Thus a vehicle entering a block immediately in rear of an occupied block has the block relay 31 thereon deenergized thereby opening the motor circuit at 39, thus cutting off the propulsion power and applying the brakes as hereinafter described. If the vehicle should be turned around on the track so that the position of the contacts 26 and 27 is reversed with relation to the block wires 18 and 19, the switches 29 and 37 should be manually reversed to adjust the vehicle for this condition. The direction of running of the motor is also manually controlled by the reversing switch 43.

It might be observed at this point that should two trains enter upon the same portion of track opposite the same block wire 19, or occupy this portion of the block at the same time, they would both be equally controlled by traffic in the block ahead, through wire 18, but would not control each other. A train occupying this portion of a block does not control a train after it enters the same occupied portion; such control, when required, is usually obtained by a track circuit for each block or portion of a block, which is not disclosed in this application.

This application is a division from my co-pending application, Serial No. 735,276 filed September 2, 1924, now Patent No.

1,805,551, dated May 19, 1931, which describes in detail the braking system shown herein in diagrammatic form. The operation of the braking system will be understood from Fig. 3 in which the planetary member 53 of the differential mechanism 46 is eccentric and engages the roller 54 on the lever 55 pivoted at 56 and supporting the weight or load 57. The end of lever 55 connects by 58 with the crank 59, connected with the brake shoe 48. The eccentric 53 is provided with a stop pin 61 which engages the stop 60 thereby limiting the rotation of the planetary member. When the eccentric is in the lowered position, the weight 57 forces the shoe 48 into engagement with the running wheel 35, and when the eccentric is in the raised position the weight 57 and lever 55 are raised by the eccentric thereby releasing the brake shoe 48 from engagement with the wheel 35. The eccentric 53 is rotated to release the brakes by a preliminary movement of the motor at starting and is maintained in this position by the continued running of the motor and it is rotated in the opposite direction to apply the brakes by the momentum of the vehicle as the motor ceases to run when its current supply is cut off. The motor 41 is thus controlled by the block system on the trackway and is subject to continuous control from the trackway as the vehicle proceeds; further its speed is controlled by the condition of the block ahead, so that when this block is occupied the speed of the train approaching said block is reduced to zero and its speed is also controlled by the voltage of the trolley system and is therefore subject to a lower speed on section 17 including part of blocks *b* and *c* than on section 15. It should be noted that in the arrangements shown and in the parent application above referred to the motor is used for the propulsion of the vehicle as well as for controlling the vehicle and its braking apparatus. It should be noted, however, that the motor may be used for controlling the vehicle by its continuous movement independent of the movement of the vehicle as it proceeds through the block, in cooperation with other vehicle propulsion means. That is to say, the application of the brake controlling system herein described may be applied by itself in a railway traffic controlling system. In order to move the vehicle with the brakes released, the motor speed must correspond with the vehicle speed. If the motor speed is less than the vehicle speed, the brakes will be gradually applied as this condition is continued. When starting, the motor speed exceeds the vehicle speed and moves the planetary member 53 of the differential to the position to release the brakes as the normal running conditions are reached. In the latter position the planetary member is locked by 61 and a positive drive is provided between the

motor and the running wheel 35, but the motor may slow up as controlled or required by the block system, or the running wheel 35 may exceed the corresponding speed of the motor and this free or independent motion between the motor and the running wheel 35 will cause the planetary member 53 to move towards the retarding condition and ultimately stop the vehicle or bring its speed to correspond with the speed of the motor.

When a vehicle stops in a block it is desirable to stop a following vehicle in the block in the rear. This is secured as described in connection with Figs. 1 and 2; however, for closing in purposes or other purposes if the vehicle in the block ahead is running and is overtaken by a vehicle in the next block in the rear it may, under certain circumstances, be desirable to permit the following vehicle to proceed at a controlled speed as long as the first vehicle is running, but subject to being stopped as soon as the first vehicle is stopped in the rear block.

An arrangement for this purpose is disclosed in Figs. 3 and 4 in which a frequency generator on the leading vehicle delivers to the block system a current of a frequency proportional to the speed of the vehicle. This current is picked up by the following vehicle and through a speed responsive translating device is used to establish the running circuit of the motor through a resistance thus enabling the following vehicle to run at reduced speed as long as the preceding vehicle is running within certain speed limits.

In Fig. 3 the frequency generator 65 is operatively connected with a running part of the vehicle and has one brush grounded on wire 32, the other brush through wire 66, condenser 67 and wire 36 connecting to contact 26 and to block wire 18. The reactance coil 68 is inserted between 36 and 32 to prevent grounding the circuit from the generator 65—this is the arrangement on the reading vehicle.

On the following vehicle the condenser 69 connects through wire 28 with the contact 27 and with block wire 19. From condenser 69 connection is made through wire 71 and coil 72 to the ground wire 32. The coil 72 energizes the rotor 73 of the centrifuge 74 which operates the contact arm 75 to engage the resistance coil 76 connected with wire 77 and with the trolley contact 25. A wire 78 connects 75 with the motor 41 so that the motor is energized from the trolley wire through the variable resistance 76 as varied by the action of the centrifuge 74. As the rotor 73 is energized by the frequency generator 65 on the preceding vehicle it is driven in synchronism therewith so that the centrifuge 74 responds to the speed of the vehicle in the block ahead and permits the corresponding speed by the following vehicle through the control resistance 76. An amplifier 70 is in-

dicated in the circuit of wire 71 which, however, is optional and its use is dependent upon the design of the apparatus. The operation of a leading vehicle in block *c* and a following vehicle in block *b* is indicated by the simplified diagram in Fig. 4.

The closing-in system described above is generally used at comparatively low speeds approaching terminals. It will be observed that this system is an addition to the block system and that the latter may be used without the closing-in system for controlling traffic.

The traffic controlling system herein disclosed admits of application in a variety of forms coming within the scope of the appended claims and is not to be construed as limited to the particular application shown.

Having thus described my invention, I claim:

1. In a railway traffic controlling system, the combination, a track divided into blocks, vehicles on said track spaced by said blocks, means for communicating between vehicles on adjacent blocks and a centrifuge device on one of said vehicles controlled by the speed of the vehicle on the adjacent block.

2. In a railway traffic controlling system, the combination, a track, a pair of block wires dividing said track into blocks, vehicles on said track spaced by said blocks, means for communicating by said block wires between vehicles on adjacent blocks and means on one of said vehicles controlling its movement maintained in a continuously moving condition by the movement of a vehicle on an adjacent block.

3. In a railway traffic controlling system, the combination, a track divided into blocks, vehicles on said track spaced by said blocks, means for communicating between vehicles on adjacent blocks and a centrifuge on one of said vehicles continuously controlled by the speed of movement of a vehicle on the adjacent block.

4. In a railway traffic controlling system, the combination, a track, vehicles operating on and spaced on said track, means for communicating between said vehicles as they move along said track, a frequency generator on one of said vehicles and a centrifuge on the vehicle communicating therewith responsive to said frequency generator.

5. In a railway traffic controlling system, the combination, a track, vehicles operating upon and spaced on said track, means for communicating between adjacent vehicles as they move along the track, a frequency generator on one of said vehicles driven in correspondence with the movement of said vehicle and a speed responsive device on the communicating vehicle responsive to said generator and controlling the vehicle upon which it is located.

6. In a railway traffic controlling system, the combination, a track, a pair of block wires dividing said track into blocks, vehicles operating upon and spaced on said track by said blocks, means including said block wires for communicating between adjacent vehicles as they move along said track and means on the leading vehicle operating in accordance with its speed and continuously moving means on the following vehicle responding to the means on the leading vehicle for controlling the speed of the following vehicle.

7. In a railway traffic controlling system, the combination, a track divided into blocks, vehicles on said track spaced by said blocks, a block relay on each vehicle controlling its movement, means for communicating between vehicles on adjacent blocks and means on one of said vehicles controlling the movement of a speed responsive device on the communicating vehicle independently of said block relay.

8. In a railway traffic controlling system, the combination, a track divided into blocks with a vehicle running thereon, a braking system on said vehicle, continuously moving means on said vehicle independent of the movement of the vehicle operating said braking system to apply the brakes independently of the movement of the vehicle and means solely on the trackway for continuously controlling said moving means in accordance with trackway conditions by said block system as the vehicle proceeds along the track, said moving means being operated at its highest speed when the block is clear.

9. In a railway traffic controlling system, the combination, a track divided into blocks, a vehicle on said track, a continuously moving element on said vehicle independent of the movement of the vehicle, means solely on the trackway continuously controlling said moving element by said block system as the vehicle proceeds along the track and a braking system controlled by said moving element independently of the movement of the vehicle to produce a retarding effect on the vehicle, said moving element being operated at its highest speed when the block is clear.

10. In a railway traffic controlling system, the combination, a track divided into blocks, a vehicle on said track, a continuously rotating element on said vehicle independent of the movement of the vehicle, means solely on the trackway continuously controlling said rotating element by said block system and operated at its highest speed when the block is clear and a translating device controlled by said rotating element.

11. In a railway traffic controlling system, the combination, a track divided into blocks, a vehicle on said track, a continuously rotating element on said vehicle independent of the movement of the vehicle, means solely on the trackway for operating said rotating element

at different speeds by said block system as the vehicle moves along the track and a translating device operated to produce unrestricted conditions on said vehicle by said rotating element as the speed of movement of said element is increased.

12. In a railway traffic controlling system, the combination, a track divided into blocks, a vehicle on said track, a continuously rotating element on said vehicle independent of the movement of the vehicle, means solely on the trackway for operating said rotating element at different speeds by said block system as the vehicle moves along the track and a translating device operated to produce restricted conditions on said vehicle by said rotating element as the speed of movement of said element is decreased.

13. In a railway traffic controlling system, the combination, a track divided into blocks having sections arranged for high speed and other sections arranged for lower speeds, a vehicle on said track, a continuously moving element on said vehicle, means solely on the trackway operating said moving element at a speed in correspondence with the speed of the vehicle and reducing the speed of said moving element when traffic conditions are restricted by said block system and for increasing the speed of said element when traffic conditions are unrestricted by said block system as the vehicle moves along the track and a translating device operated by said moving element to produce restricted conditions on said vehicle when said moving element is reduced in speed and to produce unrestricted conditions on said vehicle as the speed of movement of said element is increased.

14. In a railway traffic controlling system, the combination, a track divided into blocks, a vehicle on said track having a braking system, a continuously moving element on said vehicle independent of the movement of the vehicle, means solely on the trackway for varying the movement of said moving element by said block system as the vehicle moves along the track and means operatively connecting said moving element with said braking system for applying a progressive retardation to said vehicle as the speed of the moving element is reduced.

15. In a railway traffic controlling system, the combination, a track divided into blocks having sections arranged for high speed and other sections arranged for lower speeds, a vehicle on said track having a circuit controlled by said blocks, a continuously moving element on said vehicle independent of the movement of said vehicle, means controlling said moving element by said circuit in correspondence with the speed of the vehicle and a translating device on said vehicle controlled by said moving element to produce restricted speed conditions on the vehicle as the speed of said element is reduced.

16. In a railway traffic controlling system, the combination, a track divided into blocks, a vehicle on said track having a braking system, a continuously moving element on said vehicle controlled at a speed in correspondence with the speed of the vehicle by said block system as the vehicle passes along the track and having its movement stopped when the block ahead of the vehicle is occupied and means for applying the brakes of said braking system independently of the movement of the vehicle as said moving element is stopped.

17. In a railway traffic controlling system, the combination, a track divided into blocks having sections arranged for high speed and other sections arranged for lower speeds, a vehicle on said track having a braking system, a continuously moving element on said vehicle independent of the movement of the vehicle controlled at a speed in correspondence with the speed of the vehicle by said block system as the vehicle passes along the track and having its movement unrestricted when the track ahead of said vehicle is clear and means for releasing the brakes of said braking system when said moving element is moving at unrestricted speed.

18. In a railway traffic controlling system, the combination, a track divided into blocks having sections arranged for high speed and other sections arranged for lower speeds, a vehicle on said track having a braking system, a continuously moving element on said vehicle controlled at a speed in correspondence with the speed of the vehicle by said block system as the vehicle passes along the track and arranged to have its speed of movement reduced when the block ahead of the vehicle is occupied and means for applying the brakes of said braking system independently of the movement of the vehicle as the speed of movement of said element is reduced.

19. In a railway traffic controlling system, the combination, a track, a block system dividing said track into blocks, a vehicle moving on said track, a continuously moving element on said vehicle moving in correspondence with the movement of the vehicle but free to move independently thereof, a braking system operated to cause a retarding condition on said vehicle independently of the movement of the vehicle as the speed of movement of said element is reduced, means on the vehicle controlled by said block system for controlling the movement of said element and means on the trackway for changing the speed of said moving element from one speed to another as the vehicle moves along the track.

20. In a railway traffic controlling system, the combination, a track, a block system dividing said track into blocks, a vehicle moving on said track, a continuously moving element on said vehicle moving in correspondence with the movement of the vehicle but free to move

independently thereof and causing a retarding condition on said vehicle as its speed of movement is reduced, means on the vehicle controlling the movement of said element and means on the trackway controlled by said block system and operating through said vehicle means for changing the speed of movement of said moving element from one speed to another.

In testimony whereof I affix my signature.
MATTHEW H. LOUGHRIDGE.

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