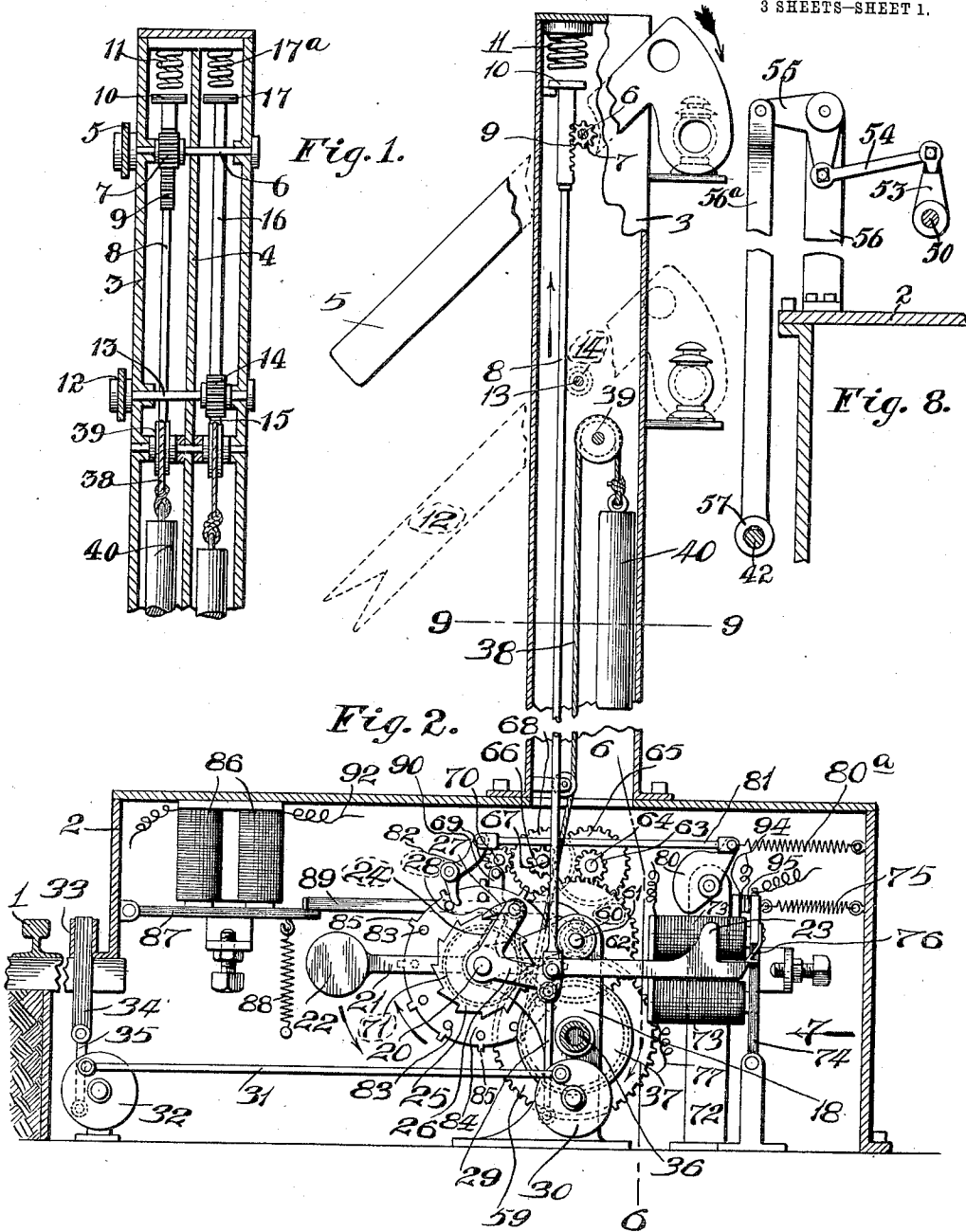


J. BLACKBURN.
 BLOCK SIGNAL AND TRAIN CONTROL SYSTEM.
 APPLICATION FILED SEPT. 21, 1908.

1,049,558.

Patented Jan. 7, 1913.

3 SHEETS-SHEET 1.



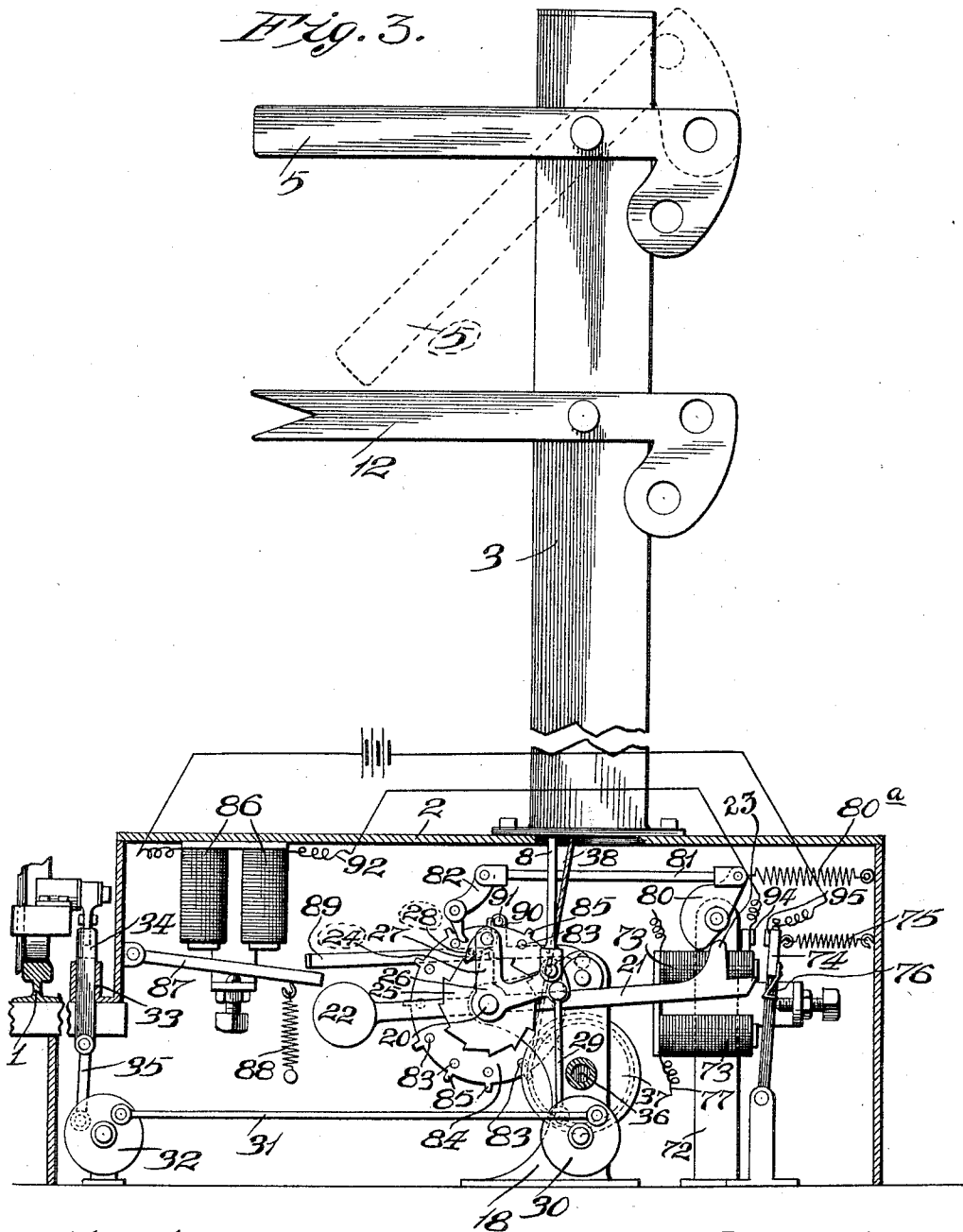
attest.
 L. G. Hatcher.
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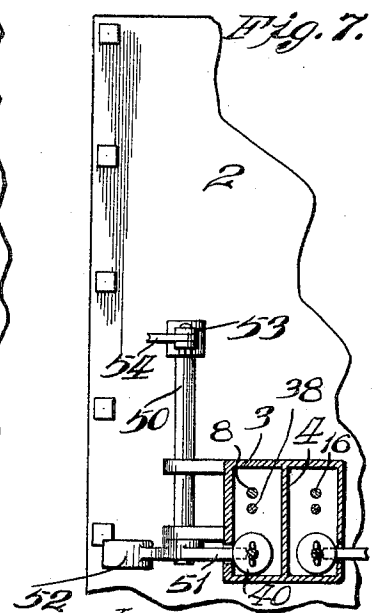
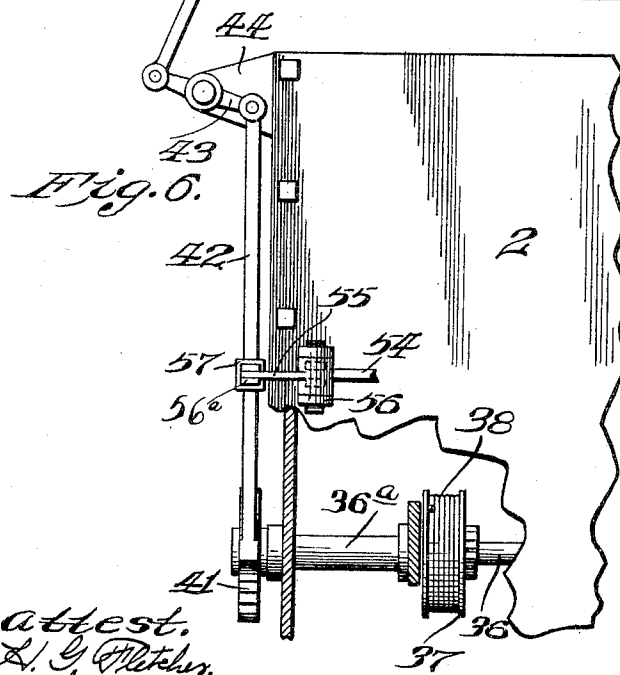
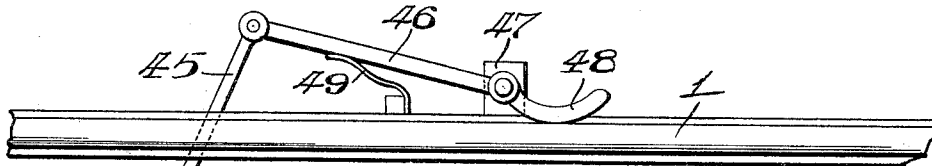
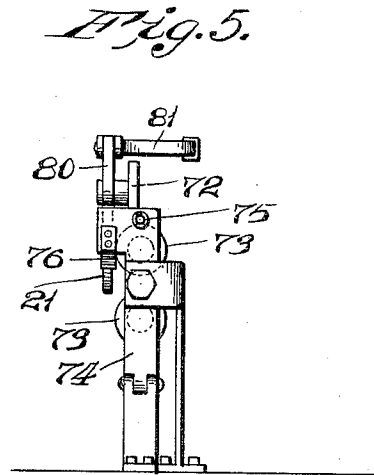
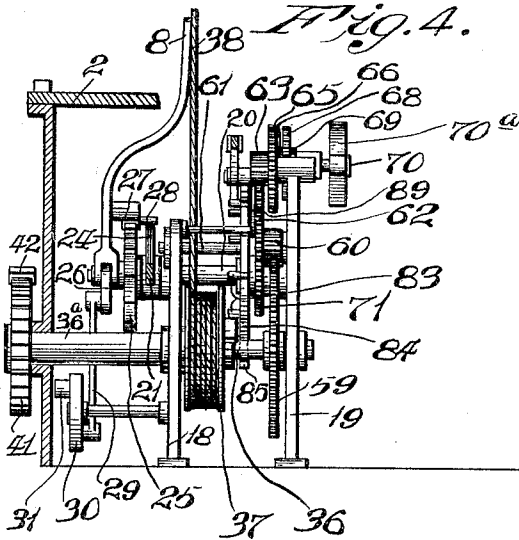
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attest.
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UNITED STATES PATENT OFFICE.

JASPER BLACKBURN, OF KIRKWOOD, MISSOURI.

BLOCK-SIGNAL AND TRAIN-CONTROL SYSTEM.

1,049,558.

Specification of Letters Patent.

Patented Jan. 7, 1913.

Application filed September 21, 1908. Serial No. 454,110.

To all whom it may concern:

Be it known that I, JASPER BLACKBURN, a citizen of the United States, and resident of Kirkwood, St. Louis county, Missouri, have invented certain new and useful Improvements in Block-Signal and Train-Control Systems, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to improvements in electro-mechanical railway signals and particularly to signals adapted to be automatically operated and maintained in operative condition solely by passing trains.

The principal object of my invention is to construct a signal apparatus which is automatic in the fullest sense of the term and which apparatus is placed in electric circuit with the rails of the track way so that a passing car will electrically actuate mechanism to release a semaphore so that the semaphore will be moved to a signaling position, and to arrange mechanical means for resetting the semaphore, which mechanical means are electrically controlled by the circuit including the track rails and to provide mechanical means, a portion of which lies in the path of travel of said car, for automatically maintaining the mechanical semaphore-moving apparatus in operative condition.

Inasmuch as my invention deals only with the signal stations proper, I have not deemed it necessary to illustrate or describe a system for signaling.

To the above purposes, my invention consists in certain novel features of construction and arrangement of parts, which will be hereinafter more fully set forth, pointed out in the claims, and illustrated in the accompanying drawings, in which:—

Figure 1 is a vertical section taken through the upper portion of one of the signal posts; Fig. 2 is a vertical section taken through one of the signal posts, and through the box supporting the same, and containing the signal actuating mechanism; Fig. 3 is a vertical section similar to Fig. 2, and showing the signal actuating mechanism shifted so as to throw the semaphores or signal arms into positions indicating danger; Fig. 4 is a vertical section taken on the line 6—6 of Fig. 2; Fig. 5 is a detail elevation of the parts seen looking in the

direction indicated by the arrow 7 in Fig. 2; Fig. 6 is a plan view, partly in section, of the mechanism employed to rewind the cables carrying the weights utilized in actuating the semaphores or signal arms. Fig. 7 is a detail section taken on the line 9—9 of Fig. 2. Fig. 8 is a detail view illustrating the means whereby the winding mechanism is held inoperative at times.

Referring by numerals to the accompanying drawings: 1 designates the rails of the railway track. Located immediately adjacent the track rails 1, are housings 2, and fixed to each housing and projecting upward therefrom is a hollow post 3, on which the semaphores or signal arms are arranged. There is one or a pair of these semaphores on each signal post, and an independently operating mechanism for each semaphore within the housing 2; and each post is provided with a vertically disposed partition 4, thus forming a pair of compartments within each post for the reception of the connections between mechanisms in the housing and the semaphores. The upper semaphore 5 on each post will be hereinafter designated as the "danger" semaphore, as it is thrown into position to indicate danger at a point adjacent and contiguous to the section of track occupied by a train, and said semaphore is fixed upon the end of a shaft 6 journaled in the upper portion of the post 3, and which shaft is provided with a pinion 7. Arranged for vertical movement in the compartment within the post 3 in which the pinion 7 is positioned is a rod 8, the upper portion of which is provided with a rack 9, which meshes with the pinion 7; and fixed on the upper end of said rod is a plate 10, which strikes against a buffer spring 11 fixed to the top of the signal post.

12 designates the lower one of each pair of semaphores, and which is known as the "caution" semaphore, the same being thrown into position to indicate caution at a point on the track section immediately adjacent the track section occupied by a train; and said semaphore 12 is carried by the end of a shaft 13, journaled in the upper portion of the post 3; and fixed on said shaft 13, within the compartment opposite the compartment occupied by the pinion 7 and rod 8, is a pinion 14, which meshes with a rack 15, formed on a vertically moving rod 16, the upper end of which is provided with a plate 17 adapted to engage against the

buffer spring 17^a fixed to the top of the plate. The rear ends of both of the semaphores are weighted so that the normal tendency of said semaphores is to swing into a horizontal position to indicate danger and caution. The lower ends of both rods 8 and 16 extend downward into the housing 2, and are connected to similar parts of independently operating mechanisms which are identical in construction and operation, and, therefore, but one of said mechanisms is shown, the same being connected to the lower end of the rod 8. Each of these mechanisms comprises a pair of standards 18 and 19, in the upper portions of which is journaled a shaft 20, on which is loosely mounted a horizontally disposed arm 21, provided at one end with a weight 22, and at its opposite end with a vertically disposed finger 23. A vertically disposed finger 24 is formed integral with this arm at the point where the same is journaled on the shaft 20; and keyed upon said shaft 20, immediately adjacent this arm 21, is a ratchet wheel 25. Loosely mounted upon the shaft 20, adjacent the ratchet wheel 25, is a bell crank 26; and carried by the end of the vertical arm thereof is a pawl 27, the point of which engages the teeth of the ratchet wheel 25; and said pawl being provided with a laterally projecting pin 28, which is adapted to be engaged by the finger 24. Connected with the free end of the horizontal arm of this bell crank is the lower end of the rod 8, or considering the mechanism which operates the caution semaphore 12, the rod 16 is connected to this arm of the bell crank. Pivotaly connected to the horizontal arm of the bell crank 26 is a vertically disposed link 29, the lower end of which is journaled on a pin carried by a disk 30, which latter is journaled on the lower portion of the standard 18; and journaled to said disk 30 is one end of a connecting rod 31, the opposite end being journaled on a pin carried by a disk 32 located in the end of the box 2, adjacent one of the track rails; and operating through the vertically disposed bearing 33 formed on the housing 2, adjacent the track rail is a pin 34, the lower end of which is connected to the disk 32 by means of a link 35.

The construction just described is for the purpose of throwing the air brakes of a train into service in case the engineer of said train disregards the danger signals, and said construction is only applied to the mechanism utilized for actuating the danger semaphore 5.

Journaled in the lower portions of the standards 18 and 19 and in one of the side walls of the housing 2 is a shaft 36, on which is loosely arranged a drum 37 having a ratchet and pawl connection with said shaft; and arranged to wind upon said drum is a cable 38, which passes upward into the post

3 over a pulley 39 journaled therein; and fixed to the end of said cable is a weight 40. A sleeve 36^a is arranged for rotation on the shaft 36, said sleeve being fixed to the drum 37 and carrying on its outer end a ratchet wheel 41, and adapted to engage the teeth thereof is one end of a horizontally moving rod 42, the opposite end of which is pivotally connected to a lever 43, fulcrumed to a bracket 44 carried by the housing 2; and pivotally connected to the opposite end of said lever is a link 45, the outer end of which is pivotally connected to a lever 46, which is fulcrumed on a block 47 immediately adjacent one of the track rails. The free end of this lever is curved, as designated by 48, and lies immediately against the ball of the track rail in such position as to be engaged by the flanges of the car wheels. A flat spring 49 bears against the rear side of this lever 46, and normally holds the curved end 48 of the lever against the ball of the track rail.

The mechanism just described provides means for winding the cable 38 upon the drum 37 by the action of the flanges of the car wheels against the curved end of the lever 46; and for the purpose of automatically throwing this automatic winding mechanism into operation, the following mechanism is employed: A shaft 50 is journaled on the post 3, and fixed on one end thereof is a lever 51, one end of which passes through a slot formed in the post and said end occupies a position in the path of downward travel of the weight 40, and the opposite end of this lever is provided with a counterbalancing weight 52. Fixed on the opposite end of this shaft 50 is a vertically disposed arm 53, and connected thereto is one end of a rod 54, the opposite end of which is pivotally connected to the lower end of a bell crank 55, fulcrumed to a bracket 56 on the housing 2; and the end of the opposite arm of said bell crank is pivotally connected to the upper end of an arm 56^a, the lower end of which is provided with a sleeve 57 loosely arranged on the rod 42. When the weight 40 is elevated, the various parts just described are so held by the weight 52 as that the forward end of the rod 42 is held away from the teeth of the ratchet wheel 41. Fixed on the shaft 36, adjacent the standard 19, is a gear wheel 59, which meshes with a pinion 60 carried by a shaft 61 journaled in the upper portions of the standards 18 and 19; and fixed on said shaft 61 is a gear wheel 62, which meshes with a pinion 63 carried by a shaft 64 journaled in the upper end of the standard 19; and fixed on said shaft 64, adjacent the pinion 63, is a gear wheel 65, which meshes with a pinion 66 carried by a shaft 67, and which shaft also carries a gear wheel 68, and which latter meshes with a pinion 69 carried by a shaft

70; and said shaft 70, together with the shaft 67, is journaled in suitable bearings formed on the standard 19. A fan 70^a is fixed on the end of the shaft 70, which, when said shaft rotates, acts as a governor to regulate the speed of the train of gearing just described.

Fixed on the shaft 20 is a gear wheel 71, which meshes with the gear wheel 62; and all of the meshing gear wheels and pinions just described are driven when the shaft 36 is rotated, as a result of the unwinding of the weight carrying cable from the drum 37. Arranged within the housing 2, adjacent the forward end of the arm 21, is a standard 72, on which is fixed a pair of magnet coils 73, which coils are located in a circuit 77 including the rails of the track way, in front of which coils is arranged an armature 74, normally held away from the ends of said coils by a weak retractile coil spring 75; and carried by said armature is a spring finger 76, which engages on top of the forward end of the arm 21 when the armature is in a closed position and against the ends of the coils 73. Journaled on the upper end of the standard 72, and immediately above the finger 23, is a segmental cam 80, to which is connected one end of a rod 81, the opposite end being journaled to one arm of a bell crank 82, which latter is fulcrumed on an extension bracket carried by the standard 19; and the opposite arm of the bell crank 82 is adapted to engage between the pins 83 projecting from the face of a wheel 84, which is keyed on the shaft 20; and the periphery of said wheel being provided with teeth 85. A retractile coil spring 80^a connects one end of the rod 81 with the side of the housing 2, the tendency of which coil spring is to maintain the parts just described in such position as that the end of the bell crank 82 is held in the path of travel of the pins 83. Located in the housing 2, opposite the end in which the coils 73 are located, is a pair of magnet coils 86, and arranged for operation below the lower ends thereof is an armature 87, actuated in one direction by a weak retractile coil spring 88. A lever 89 is fulcrumed at its rear end to the standard 18, the free end of which lever bears on top of the free end of the armature 87, and formed integral with said lever is a finger 90, which carries a pin 91 adapted to engage between the teeth 85 on the wheel 84. The magnet coils 86 are located in a circuit 92, provided with a battery (not shown) and the terminals of said circuit being connected to a contact 94 adapted to be engaged by a contact 95 carried by the armature 74, and to which armature the opposite terminal of the circuit 92 is connected. It is to be understood that the circuit 77 and the circuit 92 are interconnected so that they will electrically actuate the semaphores to dis-

play caution and danger signals simultaneously, and electrically release mechanically-operated means for automatically resetting the semaphores to their normal non-signaling positions. In this connection it is to be understood that there are mechanical means operated by the passing trains for automatically maintaining the mechanical semaphore-setting means in an operative condition.

As previously stated each of the boxes 2 is divided, and located in each box is a mechanism for operating a "home" danger signal actuated upon by the electrical devices controlled by the magnets 73 and 86. In the other compartment of the box 2 is a mechanism of identically the same construction as the mechanism in the opposite compartment for operating a caution signal arranged on the same post as the danger signal just described. This latter mechanism, for the caution signal, is acted upon by the electrical devices connected with a "distant station," and the magnets therefor are in circuit and controlled by electrical devices connected with distant stations. By this arrangement when a track section is bridged or short-circuited by a moving car, the circuits 77 and 92 are broken so that the home danger signal may be operated to a signaling position. Simultaneously with the action of the home danger signal, through the medium of line wires, a distant caution signal is set to a signaling position.

The operation is as follows: When in a normal condition, the various parts of the mechanism occupy the positions as seen in Fig. 2, both circuits being closed, and with the semaphore arms swung downward into the positions shown. As soon as a train enters the track section of circuit 77, the engine short circuits said circuit 77 between the track rails; and, as a result the armature 74 is drawn away from the ends of the magnet coils 73 by the action of the spring 75; and simultaneous with this movement, the circuit 92 is opened, as the contact 95 carried by the armature 74 leaves the opposite contact 94; and, as a result the armature 87 is drawn away from the magnet coils 86 by the coil spring 88. As soon as the finger 76 is drawn away from the end of the arm 21, the weight on the opposite end of said arm rocks the same upon the shaft 20, and the finger 24 formed on said arm engages the pin 28 on the pawl 27, thus throwing the point of said pawl out of engagement with the ratchet wheel 25; and, by thus freeing said ratchet wheel, the same, together with the shaft 20, is free to rotate a short distance as a result of the pull of the weight 40, which is exerted upon the drum 37 and shaft 36, and through the intermediate gearing to said shaft 20. As soon as the pawl 27 is freed from the ratchet wheel 25, the

bell crank 26 and connecting rod 8 will be free to move, and thus the corresponding semaphore arm will swing into a horizontal position, owing to the gravity of its weighted rear end, and thus the semaphores 5 swing into horizontal, or danger indicating positions; and at the same time; the semaphores 12, are shifted into horizontal positions to indicate caution, which action is brought about by the arrangement of the circuits 77 and 92. As the semaphores swing into horizontal positions, the pinions 7 and 14 engage respectively with the racks 9 and 15, thus elevating the rods 8 and 16; and this vertical movement of said rods is cushioned at the ends of its stroke by the arrangement of the springs 11 and 17^a in the upper end of the signal post.

At the time the bell crank 26, which is connected to the rod 8, is operated, the disk 30 will be partially rotated, and by reason of the rod 31 the disk 32 will be likewise partially rotated, thus elevating the pin 34 into position to strike against a portion of the air brake mechanism carried by a train, should the engineer of the train disregard the danger signal and run past the post displaying the same. Simultaneous with the opening of the track circuit 77, the circuit 92 will be likewise opened, owing to the opening of the contacts 94, and as the armature 87 is drawn downward by the spring 88, the free end of the arm 89 will move downward, bringing the pin 91 into position between two of the teeth 85 on the wheel 84, and thus said wheel 84 is held against rotation. After the movement just described takes place, the various parts of the operating mechanism occupy the positions as seen in Fig. 3, and said parts maintain these positions as long as a train occupies the circuit 77, and after said train passes off the said circuit the circuit 77 is closed, thus bringing the armature 74 against the ends of the coils 73, and at the same time closing the circuit 92 by bringing the contacts 94 into engagement and thus elevating the armature 87. As this action takes place, the free end of the lever 89 is elevated, thus moving the pin 91 away from the teeth 85, against which it has been engaged, and the wheel 84, together with the ratchet wheel 25 and shaft 20, now rotate a short distance, owing to the pull of the weight 40 on the cable 38, which passes onto the drum 37, and which pull is transmitted to the shaft 20 by means of the train of gearing hereinbefore described. As the ratchet wheel 25 is thus partially rotated, movement is imparted to the bell crank 26, by reason of the engagement of the pawl 27 with the teeth of said ratchet wheel, and as a result the rod 8 is drawn downward, thus swinging the corresponding sema-

phore downward into a position indicating 65 safety or a clear track. As the wheel 84 is partially rotated, one of the pins 83 will engage against the lower end of the bell crank 82, thus shifting the rod 81 laterally and causing the cam 80 to bear against the 70 upper end of the finger 23, thus depressing the same, which movement swings the arm 21 into a horizontal position and moves the right hand end of said arm into position beneath the spring finger 76. Thus the cir- 75 cuits are closed, the semaphores are swung downward to indicate safety, and the various parts of the mechanism are set for another operation, which takes place when a succeeding train enters the circuit 77. 80 After several successive operations of the actuating mechanism, as hereinbefore described, the cables 38 will have been unwound from their drums to such a degree as that the weights 40 will bear upon the 85 ends of the levers 51, and as a result each shaft 50 will be slightly rocked, in turn actuating the bell crank 56, thus permitting the free end of the rod 42 to engage on the ratchet wheel 41, and the flanges of the 90 wheels of the next train passing along the track will successively engage the grooved end 48 of the lever 46, thus actuating said lever and in turn imparting movement to the rod 42, the end of which engages the 95 ratchet wheel 41, and by reason of the ratchet and pawl engagement of the drum 37 with the shaft 36, said drum will be rotated and the cable wound thereon, thus elevating the weight 40. Thus the weights 100 which are instrumental in actuating the semaphores are automatically elevated at certain intervals, and all of the parts of the actuating mechanism located within the housing 2 are released and set in position 105 by the opening of the electric circuits, which opening is brought about by the passage of a train, and the semaphores, indicating both danger and caution, are displayed at points immediately adjacent the track section in 110 circuit with the circuit 77 occupied by the train. The mechanism which automatically winds up cables 38^a by the action of the passing car, in some instances may be dispensed with, and the sleeve 36^a and parts 115 carried thereby can be manually rotated, and thus wind up said cables and in turn elevate the weights. The cable of the drum may be wound by hand if desired with a lever, key or wheel. 120

I claim:

1. An electro-mechanical signaling station, comprising a weighted semaphore arranged to automatically move to a signaling position, mechanical devices for holding said 125 semaphore in a non-signaling position, a weight acting on said mechanical devices for moving the semaphore to a non-signaling

position, electrically controlled devices for the release of said mechanical devices from the weight to permit the semaphore to move by gravity to a signaling position, a cable
5 connected with said weight, a winding device for said cable, and means operable by a passing car for winding said cable upon said winding device, for the purposes stated.

10 2. An electro-mechanical signaling station, comprising in combination a weighted semaphore arranged to automatically move to a signaling position, a motor in which energy is stored by winding, means for con-
15 necting the semaphore with the motor whereby when the motor is in operation the semaphore will be moved to a non-signaling position, electrically controlled devices for releasing said connecting means from the
20 motor, and means operable by passing cars for maintaining the motor in a wound condition.

3. An electro-mechanical signaling station, comprising a weighted semaphore arranged to automatically move to a signaling
25 position, a motor in which the energy is stored by winding, means for connecting the motor with said semaphore so that the semaphore may be moved by the motor to a non-signaling position, and electrically con-
30 trolled devices for the release of said connecting means from said motor to permit the semaphore to move by gravity to a signaling position.

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

JASPER BLACKBURN.

Witnesses:

M. P. SMITH,

H. G. FLETCHER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."
