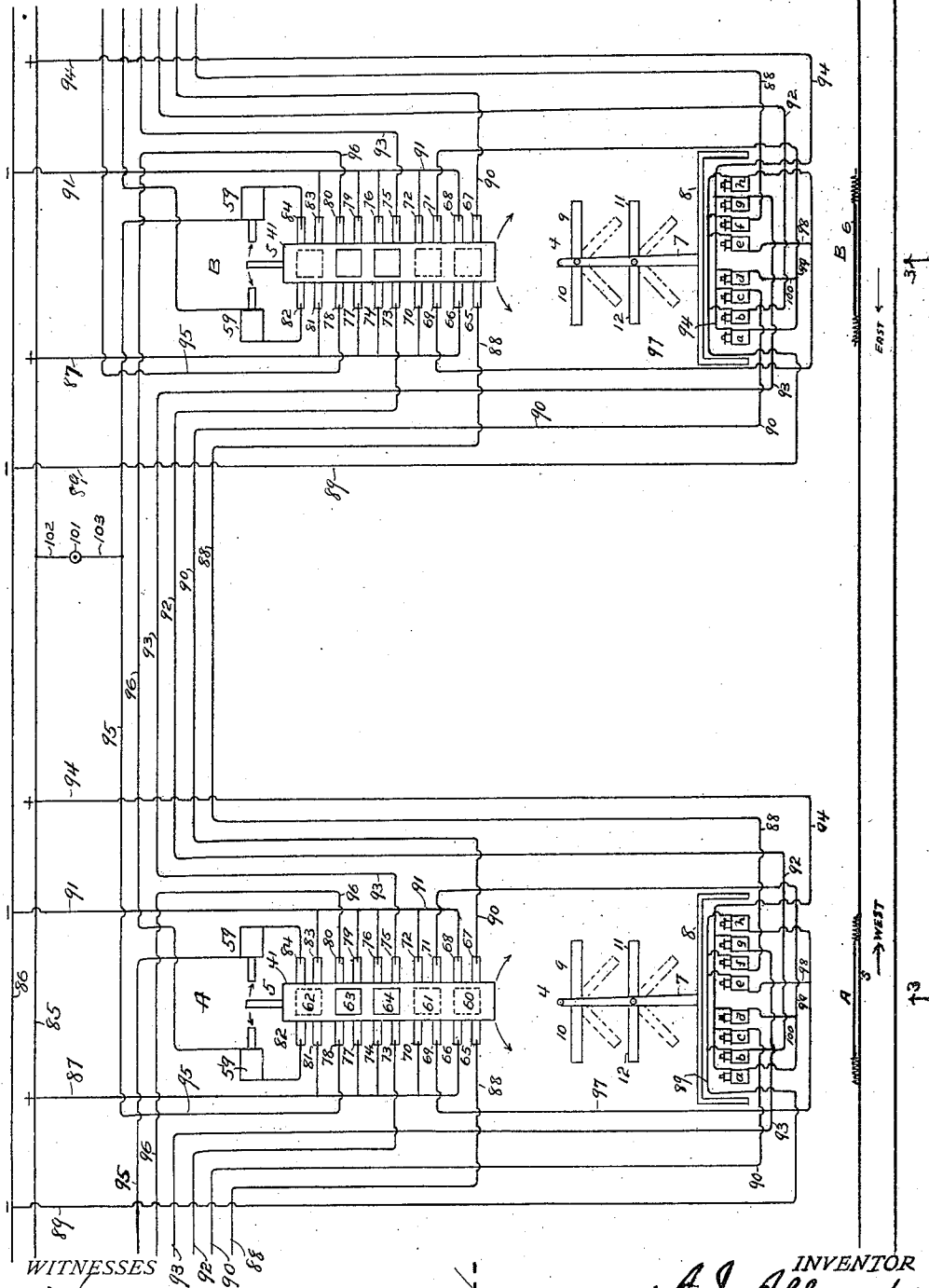


A. J. ALLARD.
ELECTRICAL BLOCK SIGNALING SYSTEM.
APPLICATION FILED FEB. 18, 1911. RENEWED FEB. 3, 1913.

1,060,407.

Patented Apr. 29, 1913.

4 SHEETS—SHEET 1.



WITNESSES
E. Nottingham
G. J. Downing.

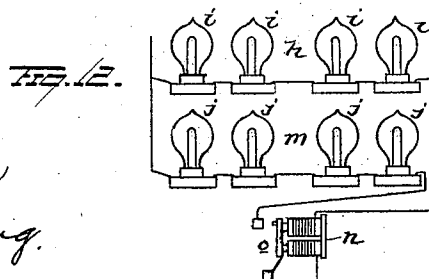
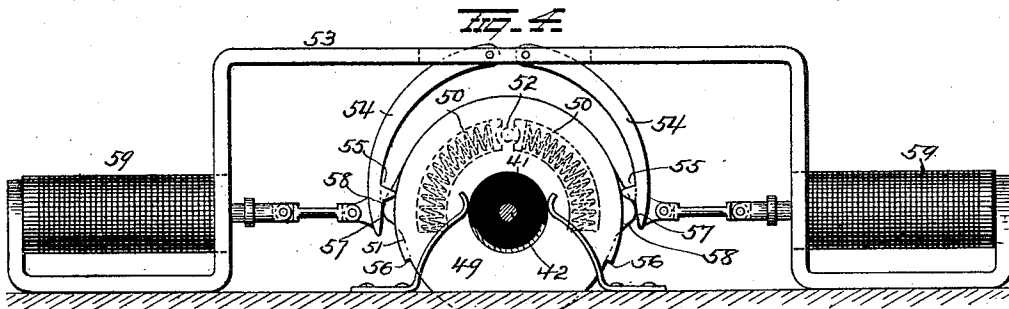
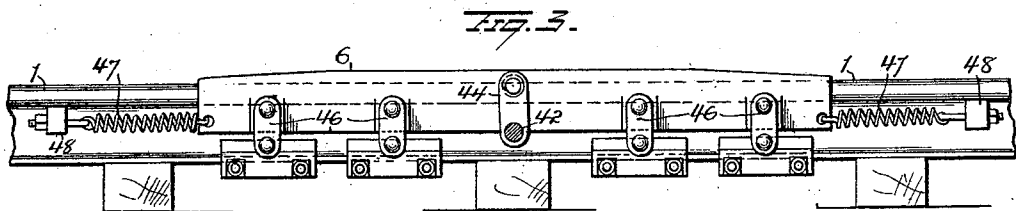
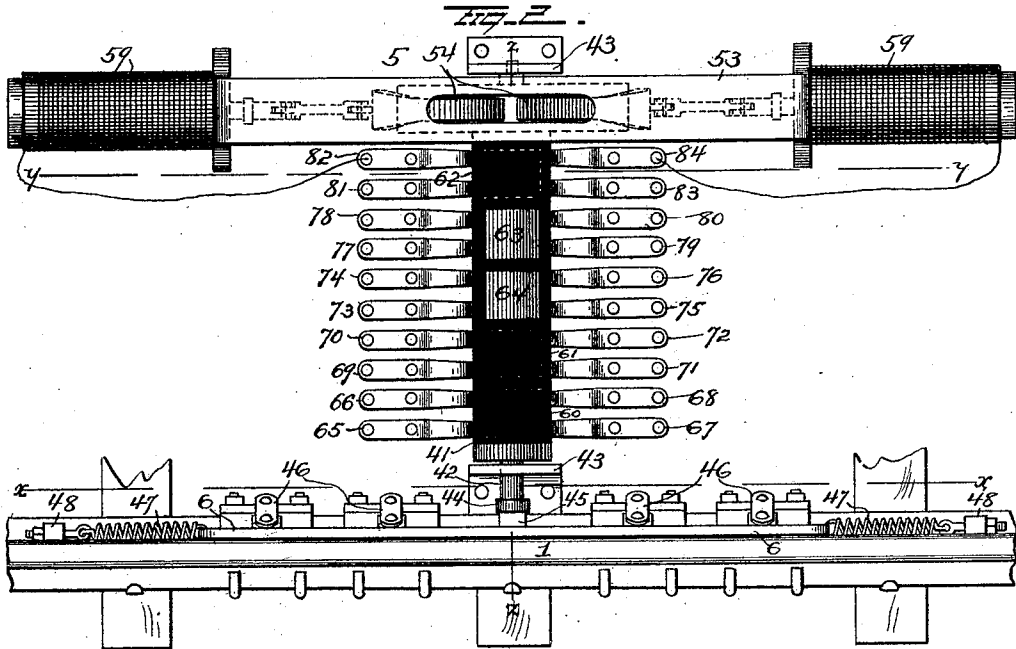
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4 SHEETS-SHEET 2.



WITNESSES
R. Nottingham
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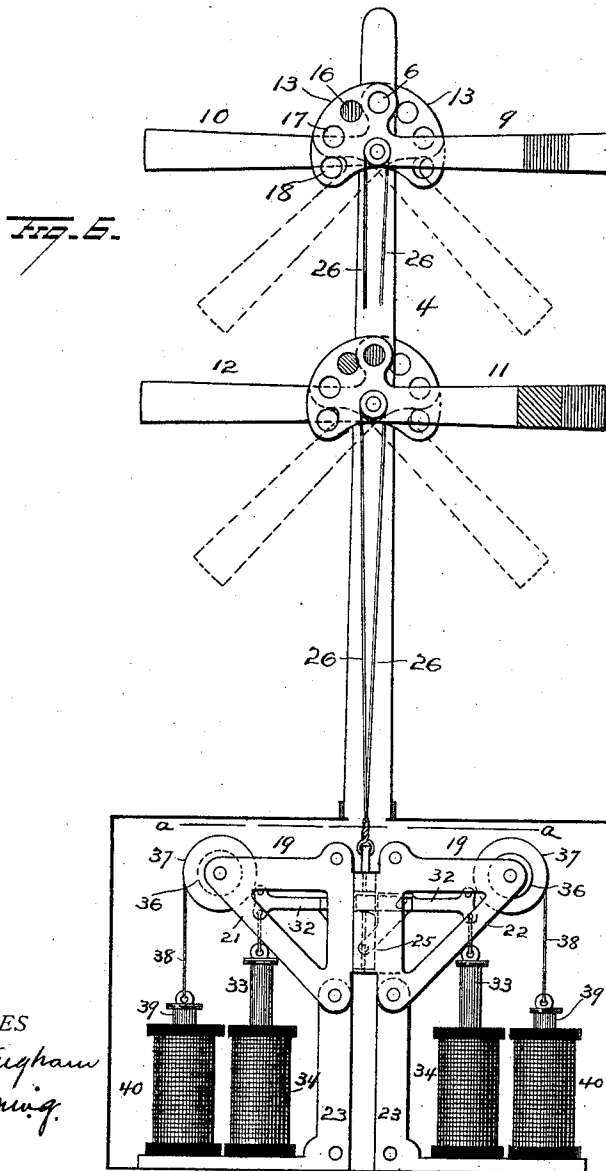
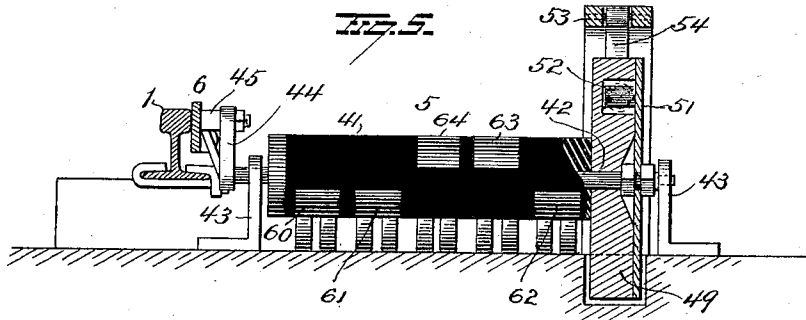
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4 SHEETS—SHEET 3.

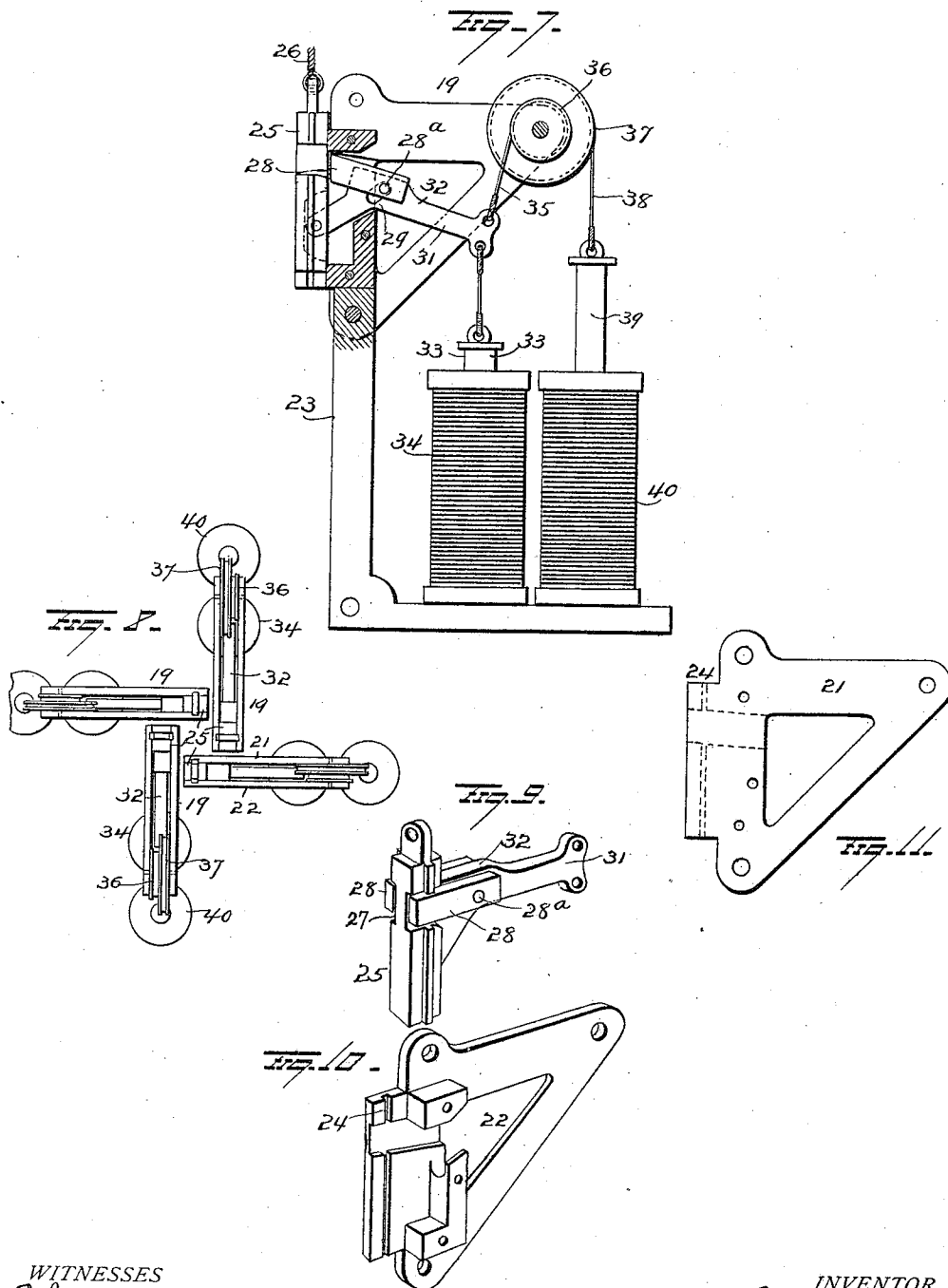


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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

ANDREW J. ALLARD, OF RICHMOND, VIRGINIA, ASSIGNOR OF ONE-THIRD TO T. F. GREEN AND ONE-THIRD TO D. R. CREECY, JR., OF RICHMOND, VIRGINIA.

ELECTRICAL BLOCK-SIGNALING SYSTEM.

1,060,407.

Specification of Letters Patent.

Patented Apr. 29, 1913.

Application filed February 18, 1911, Serial No. 609,355. Renewed February 3, 1913. Serial No. 746,039.

To all whom it may concern:

Be it known that I, ANDREW J. ALLARD, of Richmond, in the county of Henrico and State of Virginia, have invented certain new and useful Improvements in Electrical Block-Signaling Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to railway electrical block signaling systems, one object of the invention being to provide a block system of semaphores and circuits and devices for controlling their operation, whereby engineers of trains will be advised of the possibility of rear-end or head-on collisions, giving to the engineers information as to the presence in a block, of another train and also the direction in which such train may be running.

A further object is to provide simple and efficient means for controlling the various circuits, and for restoring the controlling means and the semaphores to normal position when a train passes from one block to another.

A further object is to so construct an electrical block semaphore system, that a train entering a block will set a "rear end" signal at the entering end of the block and a "head-on" signal at the exit end of the block, and so that, when the train leaves the block and enters the next block, the said signal will be restored to normal, the "head-on" signal being displaced by a "rear-end" signal and a "head-on" signal being established at the forward end of said next block.

With these and other objects in view, the invention consists in certain novel features of construction and combinations of parts and circuits as hereinafter set forth and pointed out in the claims.

In the accompanying drawings; Figure 1 is a diagrammatical view illustrating an embodiment of my invention. Fig. 2 is a plan view of the track instrument embodying the circuit shifting devices arranged at the intersection of two blocks and adapted to be operated by the wheels of a locomotive through the medium of a track bar or shoe; Fig. 3 is a view on the line $w-w$ of Fig. 2 showing the track shoe or

bar; Fig. 4 is a section on the line $y-y$ of Fig. 2, Fig. 5 is a section on the line $z-z$ of Fig. 2, Fig. 6 is a face view of one of the semaphores; Fig. 7 is a view showing normal positions of the semaphore block controlling devices; Fig. 8 is a view on the line $a-a$ of Fig. 6; and Figs. 9, 10, 11 and 12 are detail views.

1—1 represent the rails of a track and the railroad is divided into blocks as indicated by the line 2 and the arrow heads 3 connected therewith.

At the intersection of each two blocks, a semaphore 4, and circuit shifting or controlling means 5 are located, the latter being operable by the wheels of a train through the medium of a track bar or shoe 6 adjacent to the inner track rail and connected with the mechanism 5.

Each semaphore comprises a standard 7 (preferably tubular) rising from a suitable housing 8 located near the track at the intersection of two blocks. Four semaphore or signal blades 9—10 and 11—12 are pivotally supported on the standard 7, the blades 9—10 being located at a higher position than the blades 11—12. Each blade is provided with a segment head 13 having a series of four windows 15—16—17—18 and suitable lamps are provided so as to be in line with these windows when the blade and its head are in position to indicate danger. The upper two windows in the head 13 of each upper blade 9—10 are constructed to show red and white lights while the lower windows in these heads are intended to show two white lights. The upper windows in the head of each lower blade 11—12 are adapted to show green and red lights, while the lower windows of these heads are adapted to show white lights. I prefer to employ at least two electric lamps i, j , for each window of each signal segment, but a pair of such lamps may be spaced between each two parallel segments so as to supply light for both. The lamps are arranged in two sets k, m , as indicated in Fig. 12, the lamps of each being included in series with each other and the lamps of the two sets being arranged in parallel circuits. An electro-magnet n is included in series with the lamps of the set k and a switch o is included in series with the lamps in the other set m . This parallel circuit of

the set is maintained normally open by the action of the magnet *n*. With this construction and arrangement of signal lights, if the lamps of the set *k* should become extinguished, the magnet *n* would permit the closing of the switch *o* and the consequent lighting of the lamps of the set *m*. The blades are so mounted on the standard that they will project therefrom in a direction at right angles to the line of the railroad, and the engineers of trains will obey the semaphore or signal blades which project in a right-hand direction. The upper blades and lights are intended to be "head-on" signals, and the lower blades and lights are used as "rear-end" signals. The upper blade 9 is painted red and white on one face, and white on the other face. One face of the blade 10 is painted red and white and the opposite face of this blade 10 is painted white. Similarly, each lower blade is painted green and red on one face and white on the other face. Thus an upper blade projecting horizontally in a right hand direction when viewed from an approaching train, will give a red and white or "head-on" signal and indicate to the engineer that another train occupies the block and is traveling toward his train, or, in other words, running in the opposite direction. A lower signal blade projecting horizontally in a right hand direction will display a green and red or "rear-end" signal and indicate to the engineer of a following train the presence of a train in the block running in the same direction. One blade of each pair is intended to warn trains running in one direction, and the other blade of each pair is intended to warn trains running in the reverse direction,—the engineers of trains taking cognizance only of signal blades projecting horizontally in a right-hand direction.

Within the housing 8 at the base of the semaphore standard, a plurality of sets of electrically controlled devices (one set for each signal blade) are located and connected with the signal blades. A detail description of one set of these devices will suffice for all.

An arm or frame 19 (preferably triangular in form and comprising two members 21—22 spaced apart but rigidly secured with relation to each other) is secured to a suitable support 23. The arm or frame 23 is provided with guides at 24 for the accommodation of a vertically movable bar 25, to the upper end of which, the lower end of a cable 26 is secured, the said cable extending upwardly through the tubular standard 7 and passing over a segment on the head of one of the semaphore blades, and secured to said segment. The weight of a semaphore blade will overbalance that of bar 25 so that when the latter is not locked, the semaphore blade can drop by gravity to normal position as

indicated by dotted lines in Fig. 6, and raise the bar 25. The bar 25 is provided with recesses 27 for the reception of locking dogs 28 which are mounted in the frame 19 to move longitudinally into and out of said notches in the bar 25. These dogs are connected at one end by a pin 28^a which passes through an elongated slot 29 located at the juncture of two arms 30—31 of a lever 32. The free end of the arm 30 of this lever is pivotally attached to the bar 25, preferably at a point intermediate the ends of the latter. The core 33 of the solenoid 34 is connected with and depends from the arm 31 of lever 32, and a flexible device 35 (preferably a chain or cable) is also secured to the arm 31 and passes upwardly about a pulley 36, to which it is secured. A larger pulley 37 is mounted in the frame 19 to turn with the pulley 36, and a flexible device 38 (preferably a chain or cable) is secured to and partially surrounds the pulley 37—said flexible device 38 depending from the pulley and having its lower end secured to the core 39 of a solenoid 40.

When the signal blade is displayed to indicate a danger signal,—viz.—when said blade is in a horizontal position,—the devices above described will be in the positions shown in Fig. 6, with the dogs 28 in the notches or recesses 27 of bar 25 thus locking said bar and also locking the semaphore blade in danger position. Should the solenoid 34 be now energized, the core 33 would be moved downwardly,—causing the lever 32 to be moved on its pivotal connection with the bar 25 and the locking dogs 28 to be withdrawn. The bar 25 will now have been unlocked and the semaphore blade will drop by gravity, causing the bar 25 to rise; when the parts will assume their normal positions (as indicated in Fig. 7) with the semaphore blade at safety. Should the solenoid 40 be now energized, the core 39 will be drawn down and motion will be imparted through flexible device 38, pulleys 37—36 and flexible device 35, to raise the arm 31 of lever 32. The lever 32 thus will be caused to turn on the pin 28^a and depress the bar 25 and the semaphore blade to be raised. A continued movement of the lever 32 will cause the dogs 28 to engage the recesses of the bar 25 and lock the latter and therefore lock the signal blade in danger position.

In Fig. 1 of the drawings, I have illustrated diagrammatically, the solenoids of four devices such as above described at respective ends of a block and I have designated these solenoids with the letters *a*, *b*, *c*, *d*, *e*, *f*, *g*, *h*. The solenoids *b* and *d* are for raising the semaphore blades 9—12 and the solenoids at *a* and *c* are for releasing these blades. The solenoids *e* and *g* are for raising the semaphore blades 11 and 10 respectively.

tively, and the solenoids *f* and *h* are for releasing these blades.

The circuits of the various solenoids are controlled by the mechanically operated circuit shifting or controlling mechanisms 5 located at the intersection of the blocks of railway. The construction of this mechanism is shown in Figs. 2 to 6 of the drawing and will now be described in detail.

At the intersection of each two blocks of railway, a drum 41 of insulating material is located at right angles to one of the track rails. This drum or cylinder is mounted to turn on a shaft 42 having bearings near its ends in standards 43. The shaft 42 is provided at one end with a crank arm 44 which is pivotally connected with a pin 45 on an elongated bar or shoe 6 disposed alongside the head of the inner track rail 1. The bar or shoe 6 is beveled at its ends and is supported by means of a series of pivoted links 46 so that said bar or shoe can have an up and down movement in the arc of a circle and thus transmit motion, through the crank arm 44 to the shaft 42. The track bar or shoe 6 is maintained normally in its upper position with its upper edge slightly above the tread of the rail and returned to such position by the action of springs 47. These springs are attached, respectively, to the ends of the bar or shoe and connected adjustably to lugs 48 fixed to track rail 1. The drum or cylinder 41 is provided with a fixed head 49 having slots or recesses in which coiled springs 50 are housed. The shaft 42 passes freely through the head 49 and to said shaft adjacent to the outer face of the fixed head, a disk 51 is secured so as to move with said shaft. The disk 51 covers the springs 50 and the slots containing them, and is provided with a fixed pin 52 which projects into the head 49 and is disposed between the opposing ends of the two springs 50—50. Thus it will be seen that when the shaft 42 is turned, motion will be imparted, through the disk 51, pin 52 and one or the other of the springs 50, to turn the head 49 also, but as the head will be locked in the position to which it may be thus moved (by means presently explained), the spring 50 will act to return the disk 51 to its normal position after the wheels of the train shall have passed the track bar or shoe 6.

A frame 53 extends over the head 50 and pivotally mounted in said frame, are two curved latch arms 54 which partially embrace the head 50 and constructed near their free ends with lugs 55 to engage shoulders 56 on the periphery of the head 49. The latch arms are also provided near their free ends with shoulders 57 to be engaged by cams or projections 58 on the periphery of disk 51 for moving said latch arms out of engagement with the head 49 to release the latter. The frame 53 also supports two

solenoids 59, the movable cores of which are connected with the latch arms 54 for moving the latter to release the head 49 and the drum or cylinder 41 to which it is fixed, as hereinafter explained.

The insulated drum or cylinder 41 has secured thereto a plurality of contact plates, 60—61—62 and 63—64, the latter two plates being located on the diametrically opposite face of the drum from the plates 60—61—62 and out of line therewith as illustrated in Fig. 1.

At respective sides of the drum 41 of each mechanism 5, a plurality of pairs of contact fingers are located, to cooperate with the contact plates on said drums, as follows: Contact fingers 65—66 and 67—68 are adapted to cooperate with the contact plate 60; contact fingers 69—70 and 71—72 are arranged to be engaged by the contact plate 61; contact fingers 73—74 and 75—76 are in position to be engaged by the contact plate 64; contact fingers 77—78 and 79—80 are adapted to cooperate with the contact plate 63, and contact fingers 81—82 and 83—84 are in position to be engaged by the contact plate 62.

Line wires 85—86 from any suitable source of electrical energy, extend along the line of railway, and at each block terminus, a conductor 87 is connected at one end with line wire 85 and at the other end with contact finger 60. The contact fingers 70, 74, 77 and 81 are also electrically connected with the conductor 87. The contact finger 65 is connected, by a conductor 88 with solenoid *f* in the semaphore at the other end of the block to the left and the other terminal of the solenoid is connected with a conductor 89, the latter being connected with the line wire 86. The contact finger 67 is connected, by a conductor 90, with one terminal of solenoid *c* in the semaphore at the other end of the block to the right. The contact finger 68 is connected by means of a conductor 91 with the line wire 86. The contact fingers 72, 76, 79 and 83 are also connected with the line wire 86 through conductor 91. The contact finger 73 is connected by a conductor 92, with one terminal of solenoid *b* in the semaphore at the other end of the block to the left, and the other terminal of this solenoid is connected with the conductor 89. The contact finger 75 is connected by a conductor 93, with one terminal of solenoid *g* in the semaphore at the other end of the block to the right, and the other terminal of this solenoid is connected with a conductor 94, which, in turn, is connected with the line wire 85. The contact finger 78 is connected, by a conductor 95, with one terminal of the right-hand release solenoid 59 at the opposite end of the block to the right and the other terminal of this solenoid is connected with contact finger 84

of the instrument 5 in which said solenoid 59 is located. The contact finger 80 is connected by a conductor 96 with one terminal of the release solenoid 59 at the opposite end of the block to the left, and the other terminal of this solenoid is connected with the adjacent contact finger 82. The contact finger 69 is connected by a conductor 97, with one terminal of semaphore solenoid *h* and the other terminal of this solenoid is connected with the conductor 89. The solenoid *e* is in a circuit indicated at 98 between the conductors 89 and 97 and therefore in parallel with the solenoid *h*. The contact finger 71 is connected, by a conductor 99, with one terminal of semaphore solenoid *a* and the other terminal of this solenoid being connected with the conductor 94. The solenoid *d* is in a circuit 100 between the conductors 94 and 99.

It will be observed by reference to Fig. 1 of the drawing that the solenoids *a* and *d* are arranged in parallel between the conductors 94 and 99 and that the solenoids *e* and *h* are in parallel circuits between the conductors 89 and 97, so that when solenoid *d* is energized to display a "rear-end" signal 12, the solenoid *a* will be energized to release a "head-on" signal 9, and so that when the solenoid *e* is energized to display a "rear-end" signal 11, the solenoid *h* will be energized to release a "head-on" signal 10.

In Fig. 1 of the drawings, one complete block and the terminal conductors of two other blocks are shown. For convenience in describing the operation of the system, reference will be made to the complete block shown in the drawing,—one end of this block being designated "A" and the other end "B." Let it be assumed that a train has entered the block and is running "west" or from left to right, and that the wheels of the train have depressed the track bar or shoe 6 at A, so as to turn the drum 41 of controller 5 to the right—said drum becoming locked in the position to which it has thus been moved, by means of the devices hereinbefore described. The drum 41 having been turned as just described, the following operations will result: A circuit will be established at "A" from line wire 85, by conductor 87 to contact finger 70; then through contact plate 61 to finger 69; then by conductor 97 to conductor 98; through solenoid *e* to conductor 89, and then, by said conductor 89 to the line wire 86. The solenoid *e* will thus be energized to cause the raising of a "rear-end" semaphore blade 11 at A and thereby protect the train which has entered the block A—B from a following train, and indicating to the engineer of a following train that another train occupies the block and is running in the same direction. The solenoid *h*, being in parallel with the solenoid *e* between the conductors

89 and 97, will also be energized, with the result of releasing a "head-on" signal blade 10 at A, said "head-on" signal having been set when the train entered the block at the left of A. The shifting of the controller 5 by a train entering the block from the "A" end thereof will also establish a circuit for displaying a "head-on" signal 10 at the "B" end of the block,—said circuit being traced as follows: from line wire 85, by conductor 94 (at the B-end of the block) to and through solenoid *g*, at B to conductor 93; by said conductor 93 to the contact finger 75 at A; then through contact plate 64 to finger 76, and then by conductor 91 to line wire 86. The train in block A—B is now protected from a train running in the opposite direction, and the engineer of the last mentioned train will be notified that a train occupies the block and that such train is running toward him.

When the train (running from left to right) passes the B-end of the block, the controller 5 there located will be shifted as the wheels of the train pass over the track shoe or bar 6, and a "rear-end" signal 11 will be displayed at B and a "head-on" signal 10 will be displayed at the end of the block beyond B to the right, by reason of the establishing of circuits as have already been traced. When the controller 5 at B has been shifted as just mentioned, a circuit will be established through solenoid *f* at A for releasing the "rear-end" signal 11 at A. This circuit may be traced as follows: from line wire 85, by conductor 87 at B to contact finger 66 of controller 5 at B; then through contact plate 60 to finger 65; then by conductor 88 to the A-end of the block; then through coil of solenoid *f* at A to conductor 89, and by the latter to the line wire 86. The solenoid *f* at A being now energized, will operate to release the "rear-end" semaphore blade 11 at A.

When the controller 5 at B has been actuated by the passage of a train moving from left to right as above described, a circuit will be established which will energize the left-hand solenoid 59 at A, for releasing the drum 41 of controller 5 at A and permitting the same to assume its normal position. This circuit will be traced as follows: from line wire 85, by conductor 87 (at A) to contact finger 81 (at A), then through contact plate 62 to contact finger 82; then through the coil of the left-hand release solenoid 59 (at A); then by conductor 96 to the B-end of the block and to contact finger 80 of controller 5 at B; then through contact plate 63 to contact finger 79 and then, by conductor 91 to the line wire 86. When the left-hand solenoid 59 at A is energized by the establishment of the circuit above traced, the latch 54 which it controls will be withdrawn to release the drum 41 of con-

troller 5 and permit it to assume its normal position with all the circuits which it controls, open.

It will be understood that when a train is running in a direction reverse to that hereinbefore described, or in other words, is running from right to left as viewed on Fig. 1 of the drawing, the semaphore blades 9—12 will be raised and released by the establishing of circuits by the controllers 5 (which would then be turned in the opposite direction to that above described), through the solenoids *a*, *b*, *c*, and *d*, and the release of the drums 41 of the controllers would be effected by the energizing of the right hand solenoids 59.

It will be observed that each semaphore comprises four signal blades;—two "rear-end" signals and two "head-on" signals, thus providing a "rear-end" and a "head-on" signal for trains running in one direction and similar signals for trains running in the opposite direction, and the blades are so arranged that the signals to be obeyed by the engineer of an approaching train always projects in a right hand direction as viewed by such engineer. It has been hereinbefore explained how, when a train enters one end of a block, a "head-on" signal will be displayed at the other end of the block. This signal will be in position when the train approaches the exit end of the block, but it will be projecting in a left hand direction as viewed by the engineer of this train and hence he will know that it is the signal which his train caused to be set when he entered the block, and therefore he will ignore it. As this train passes to the next block, this "head-on" signal will be released and a "rear-end" signal displayed, as has been explained.

In order to permit one train to pass another, sidings may be located at suitable places, and when a train takes a siding, the drum of the circuit shifting mechanism will be released and permitted to return to normal. This may be accomplished, by closing the circuit of one of the releasing solenoids by means of a suitably located manually operated circuit closer 101 which may be included for example, in a circuit 102—103 across the line conductor 85 and the conductor 95 as shown in Fig. 1.

Having fully described my invention what I claim as new and desire to secure by Letters-Patent, is:—

1. An electrical block signaling system, comprising two "head-on" signals and two "rear-end" signals at the junctions of blocks of railway, electro-magnetically operated signal raising devices and electro-magnetically operated signal releasing devices connected with each of said signals, switch devices at each block junction, means operable by the rolling equipment for shifting said

switch devices, two sets of electric circuits controlled by the switch devices and including the raising and releasing means, each of one set of circuits including a "head-on" signal raising device at one block junction and a "rear-end" signal raising device at the next block junction, and each of the other set of circuits including a "head-on" signal releasing device at one block junction and a "rear-end" signal releasing device at the next block junction, whereby rolling equipment running in either direction will operate to shift the switch devices successively at block junctions and cause the setting of a "head-on" signal and a "rear-end" signal at respective ends of a block into which the rolling stock enters and simultaneously releasing said signals when the rolling equipment enters another block.

2. An electrical block signaling system, comprising two "head-on" signals and two "rear-end" signals at the junctions of blocks of railway, electro-magnetically operated signal raising devices and electro-magnetically operated signal releasing devices connected with each of said signals, switch devices at each block junction, each switch device comprising a drum having contacts and contact fingers to coöperate with the drum contacts, means operable by the rolling equipment for shifting said drums, means for locking each drum in shifted position, means for automatically releasing each drum, means for returning each drum to its normal position, two sets of electric circuits controlled by the switch devices and including the raising and releasing means, each of one set of circuits including a "head-on" signal raising device at one block junction and a "rear-end" signal raising device at the next block junction, and each of the other set of circuits including a "head-on" signal releasing device at one block junction and a "rear-end" signal releasing device at the next block junction.

3. An electrical block signaling system, comprising two "head-on" signals and two "rear-end" signals at the junctions of blocks of railway, electro-magnetically operated signal raising devices and electro-magnetically operated signal releasing devices connected with each of said signals, switch devices at each block junction, said switch devices each comprising a drum having contacts and contact fingers to coöperate with the drum contacts, means operable by the rolling equipment for shifting said drums, means for locking each drum in shifted position, electro-magnetically operated means for unlocking the locking means, means for returning each drum to normal position, electric circuits including certain of the switch fingers of each switch device and also including the electro-magnetically operated unlocking means for controlling

the latter, two sets of electric circuits controlled by the switch devices and including the raising and releasing means, each of one set of circuits including a "head-on" signal
5 raising device at one block junction and a "rear-end" signal raising device at the next block junction and each of the other set of said circuits including a "head-on" signal releasing device at one block junction and a

"rear-end" signal releasing device at the 10 next block junction.

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

ANDREW J. ALLARD.

Witnesses:

WM. P. REDD,
PERCY SMITH.

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