No. 801,733. PATENTED OCT. 10, 1905.

R. LOGSDON & E. S. STOTTS.

AUTOMATIC BLOCK SIGNAL SYSTEM.

APPLICATION FILED JAN. 18, 1904.

3 SHEETS—SHEET 1.

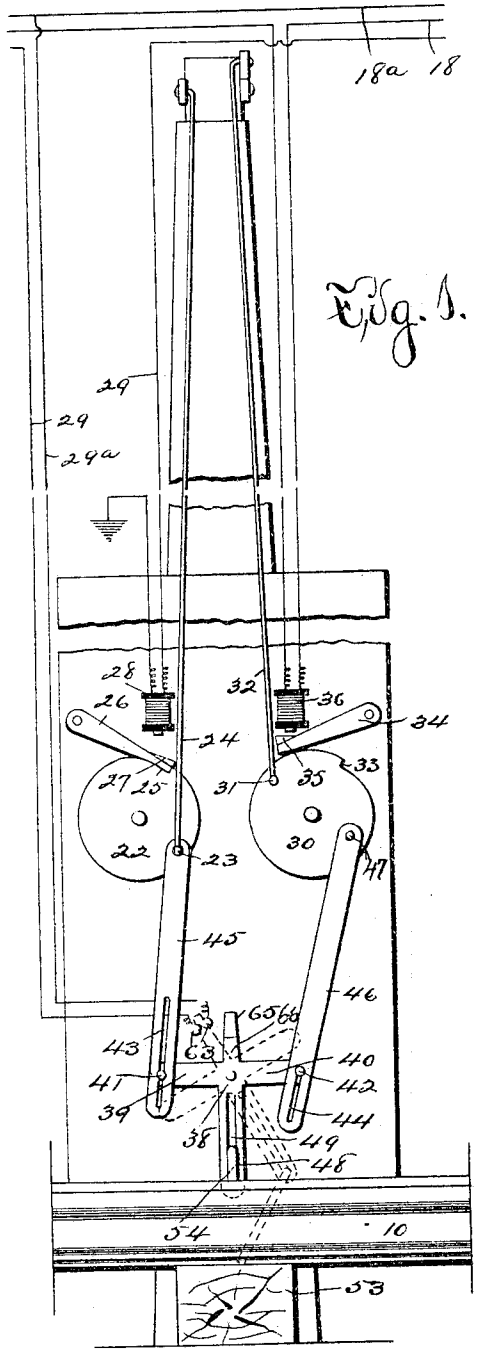

Fig. 1.

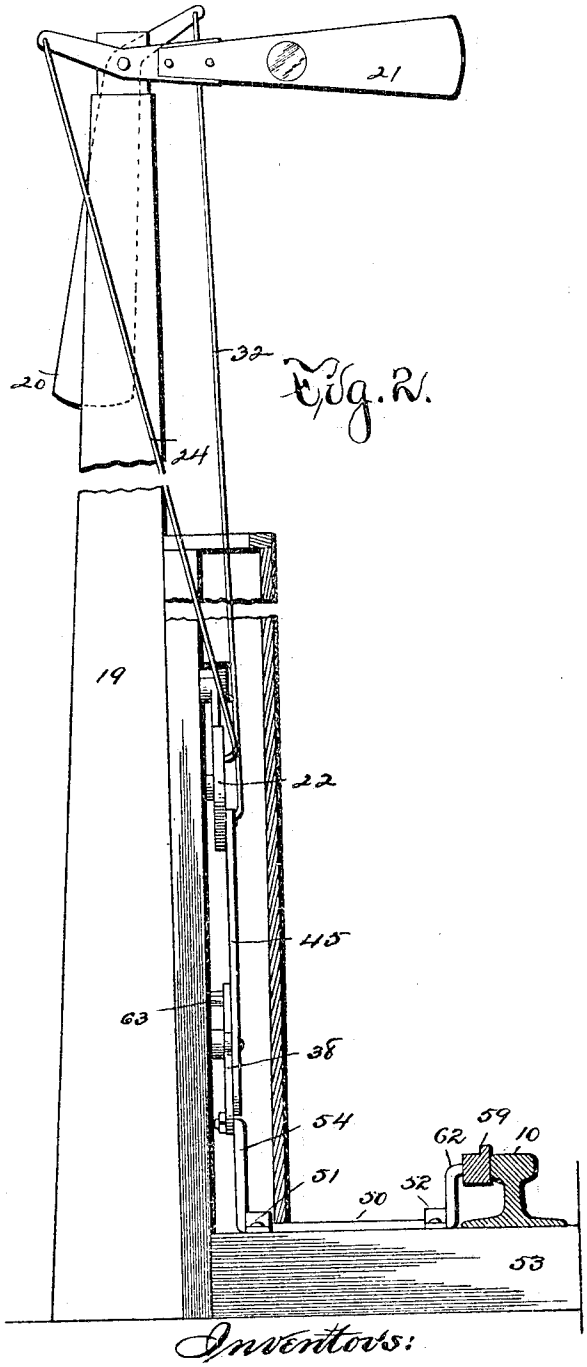

Fig. 2.

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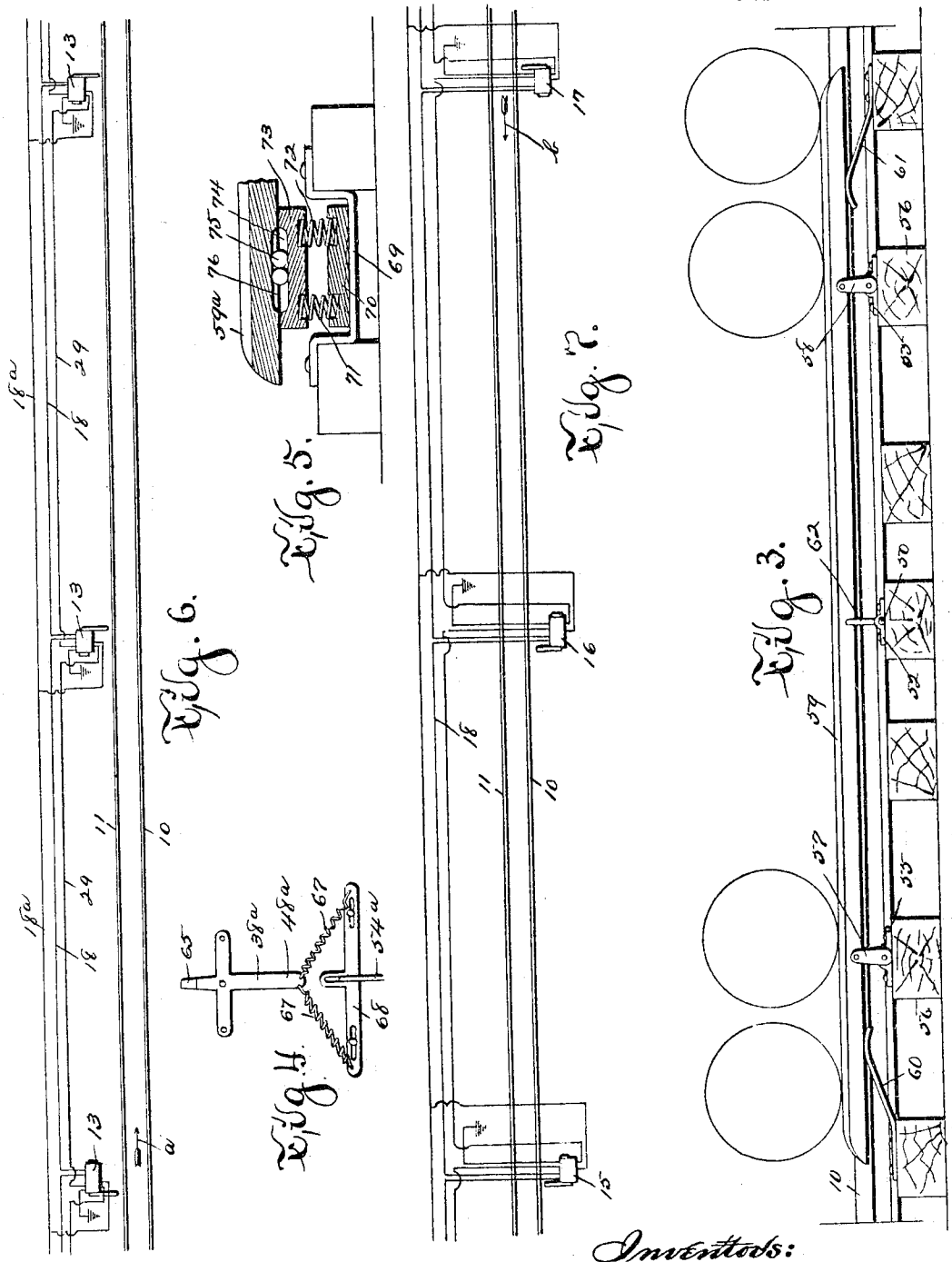

Witnesses:
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Inventors:
Ross Logsdon and Elza S. Stotts
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3 SHEETS--SHEET 3.

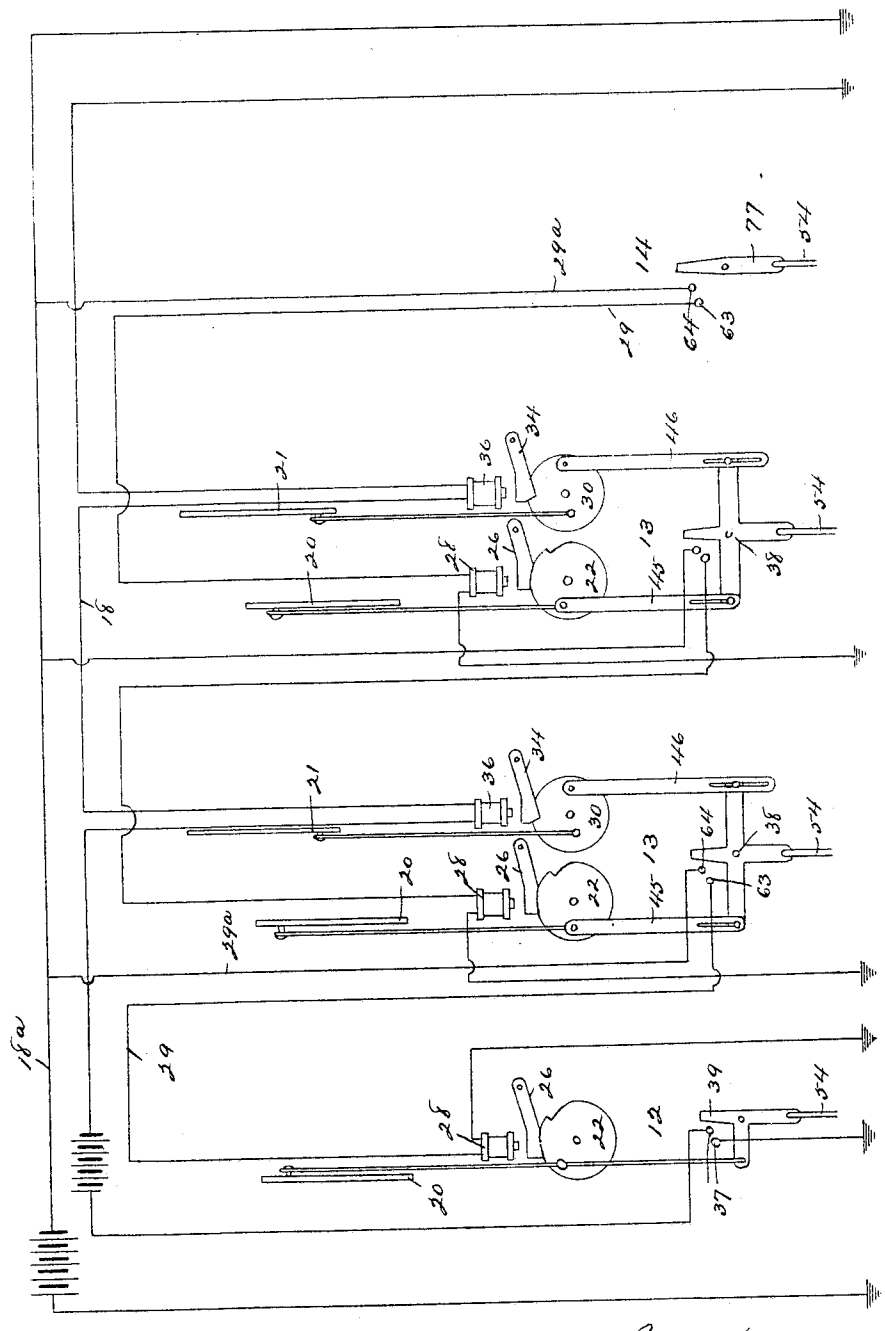

Fig. 3.

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UNITED STATES PATENT OFFICE.

ROSS LOGSDON AND ELZA S. STOTTS, OF PERRY, IOWA, ASSIGNORS OF ONE-THIRD TO BAYARD T. LINDLEY, OF DES MOINES, IOWA.

AUTOMATIC BLOCK-SIGNAL SYSTEM.

No. 801,733. Specification of Letters Patent. Patented Oct. 10, 1905.

Application filed January 18, 1904. Serial No. 189,610.

To all whom it may concern:

Be it known that we, ROSS LOGSDON and ELZA S. STOTTS, citizens of the United States of America, and residents of Perry, in the county of Dallas and State of Iowa, have jointly invented an Automatic Block-Signal System, of which the following is a specification.

The object of this invention is to provide an improved automatic block-signal system for railways.

A further object of this invention is to provide improved means for mechanically establishing signals and electrically withdrawing such signals automatically.

A further object of this invention is to provide means whereby a passing train may withdraw signals mechanically and withdraw signals electrically, the mechanical and electrical operations being synchronous.

A further object of this invention is to provide means whereby a passing train may set signals throughout the entire length of a given set of blocks ahead of it electrically, set a signal at the rear of it mechanically, and mechanically and electrically withdraw such signals progressively.

A further object of this invention is to provide an improved mechanism whereby a passing train may set or withdraw signals mechanically and withdraw some of such signals electrically.

Our invention consists in the system hereinafter set forth and the mechanism for carrying such system into effect, as illustrated in the accompanying drawings, in which—

Figure 1 is a detail elevation, partly in diagram, illustrating parts of the mechanism and the circuits employed in carrying out my invention. Fig. 2 is an elevation at right angles to Fig. 1 and of the same mechanism. Fig. 3 is an elevation in detail, illustrating the construction of mechanism adjacent a railway-rail whereby other parts or elements of the system may be operated. Figs. 4 and 5 are detail modifications of parts otherwise illustrated in the remaining figures. Fig. 6 is a diagrammatic view illustrating the signal-stations adjacent a railway and the circuits connecting said stations. Fig. 7 is a diagrammatic view similar to Fig. 6. Fig. 8 is a detail diagrammatic view.

In establishing the system herein described and claimed we contemplate the employment of a plurality of signal-stations between two telegraph-stations. In other words, we propose to divide the space or distance between telegraph-stations, provided with operators who may control the passage of railway-trains through such stations, into blocks of desired length by signal-stations operated exclusively by passing trains, the blocks being of such length that the operator of a given train will at no time be out of sight of signals controlled by such train. In the further description we have applied our system to a single-track railway; but with obvious differences of construction and location of the signal-stations the same system may be applied to multitrack-railways or to different lines crossing each other.

In the drawings, the numerals 10 11 designate railway-rails, and 12, 13, 14, 15, 16, and 17 signal-stations. The signal-stations are in circuit with each other by means of a conductor 18, leading through each station. The stations 13, 15, and 16 are all alike. Hence we will limit our specific description to one of them, as illustrated in detail in Figs. 1, 2, and 3. A semaphore, post, or tower 19 is provided and located at a point laterally removed from, yet contiguous to, one or the other of the track-rails. Semaphore-arms 20 21 are fulcrumed on the upper end portion of the post or tower 19 and are in signaling position when arranged or held horizontally and out of signaling position or inoperative when dependent or upright relative to said post. A disk 22 is mounted for rotary oscillation on the post or tower 19 or on a base-board or box mounted on said post, and a pin or bolt 23 is fixed in the peripheral portion of said disk and is connected by a draft-rod 24 to the short arm of the semaphore 20. The disk 22 is provided with a notch 25 in its periphery, and a detent 26, pivoted on the post, is arranged to engage at times in said notch and limit movement of the disk in one direction. An armature 27 is formed on or fixed to the free end portion of the detent 26 and is located in opposition to an electromagnet 28, suitably supported on the post. The electromagnet 28 is in broken circuit by means of conductors 29 29^a with a circuit 18^a and the ground, and the circuit 18^a may be grounded at both ends. A disk 30 is mounted for rotary oscillation on the post 19 or other suitable support, and a

pin or bolt 31 is mounted in the peripheral portion of said disk and is connected by a draft wire or rod 32 to the short arm of the semaphore 21. The disk 30 is formed with a notch 33 in its periphery, and a detent 34, pivotally supported on the post, is arranged to engage in said notch at times and limit movement of the disk in one direction. An armature 35 is formed on or fixed to the free end of the detent 34 and is located in opposition to an electromagnet 36, which electromagnet is in circuit with the main conductor 18. A cross-lever or spider 38 is mounted for rotary oscillation on the post 19 and has arms 39 40 extending in opposite directions horizontally. Bolts or pins 41 42 are mounted in and project laterally from the extremities of the arms 39 40 of the cross-lever or spider 38, and said bolts extend through slots 43 44 in the lower end portions of pitmen 45 46. The upper end portion of the pitman 45 is pivoted on the bolt or pin 23 in the disk 22, and the upper end portion of the pitman 46 is pivoted, by means of a bolt or pin 47, to the disk 30 at a point diametrically opposite the bolt or pin 31. The cross-lever or spider 38 also is provided with a downwardly-extending arm 48, formed with a longitudinal slot 49. A crank-rod 50 is journaled in bearings 51 52, fixed to a cross-tie or sleeper 53, extending farther from the track-rails than the ordinary ties or sleepers, and one end portion or crank 54 of said rod is pivotally connected with and arranged for sliding engagement in the slot 49 of the arm 48. Bearings 55 (in this instance two in number) are mounted on sleepers or cross-ties 56 of the railway adjacent a track-rail, (either 10 or 11,) and links 57 58 are pivoted at their lower ends on and rise from said bearings. An actuating bar, plate, or rail 59 is pivotally connected to the upper end portions of the links 57 58 and is supported thereby. Leaf-springs 60 61 are mounted on cross-ties or sleepers and impinge against the lower surfaces of end portions of the actuating rail, bar, or plate 59. The links 57 58 serve to connect the actuating-rail pivotally to suitable supports, and the leaf-springs 60 61 support said actuating-rail yieldingly in such position that the uppermost face of said actuating-rail is in a horizontal plane above and to one side of the tread of the track-rail 10 or 11. That end portion or crank 62 opposite to the crank 54 and also formed on the rod 50 is pivotally connected to the central portion of the actuating rail, bar, or plate 59. The actuating rail, bar, or plate 59 is of material and considerable length in order that it may be engaged at the same time by all of the wheels of a locomotive or tender or car or by part of the wheels of one and part of the wheels of another. Such provision is made in order that the actuating rail or bar may be depressed by the foremost wheels of a railway-train and be held down continuously and without material vibration until the last wheels of such train have passed over it. By mounting the actuating rail, bar, or plate on the links 57 58 provision is made for moving said rail, bar, or plate longitudinally synchronous with the depression thereof by the wheels riding over it, and such movement longitudinally will be in the direction in which the train striking it is traveling, as will be apparent from an inspection of Fig. 3 of the drawings. Contact-posts 63 64 are arranged on the post or tower 19 in close relation to each other. A contact-piece 65 is fixed to or formed on an upwardly-extending arm 66 of the cross-lever or spider 38, and said contact-piece is arranged to engage and bridge the pair of contact-posts 63 64 in the oscillation of the cross-lever or spider in one direction. The contact-posts 63 64 are in broken circuit with the conductors 29 29^a, the magnet 28 of the next post to the rear and the conductor 18^a extending between the signal-stations.

At station 12 there is a semaphore 20, disk 22, magnet 28, pawl 26, draft-wire 24, pitman 45, lever 38, crank-rod 50, and actuating-rail 59. The semaphore 21 and its special connections and magnet are omitted. The magnet 28 at station 12 is in broken circuit with posts 63 64 at station 13 next in advance of the station 12 and with the circuit 18^a. At station 12 there are contact-posts 37 37, forming the break in circuit 18 and adapted to be bridged by contact-piece 65 on the lever 38.

When the actuating rail, bar, or plate 59 at station 12 is actuated by a train moving into the block in the direction of the arrow *a* in Figs. 6 and 8, the lever 38 is oscillated to bring the contact-piece 65 into bridging contact with the posts 37 37, and the circuit 18 is completed and energizes all the magnets 36. Energizing the magnets 36 throughout the block lifts the armatures 35 and pawls 34 and releases the disks 30 and permits all the (red) signals 21 to fall by gravity into signaling (horizontal) position. At the same time strain is applied (at station 12) to the pitman 45 by the arm 39 to rotate the disk 22 and lift the semaphore 20 (green) into signaling (horizontal) position at the rear of the train, and said semaphore is locked in signaling position by the pawl 26. When the train leaves the actuating-rail at station 12, said rail rises under spring-pressure and removes the contact-piece 65 from posts 37 37, whereupon circuit 18 is broken and is not again closed until a train follows the one above mentioned.

When the actuating rail, bar, or plate 59 at first station 13 is actuated and moved longitudinally by the train moving in the direction of the arrow *a* in Figs. 6 and 8, said bar or rail moves the crank 62, crank-rod 50, and crank 54 in the same direction. The movement of the crank-rod and crank is transmitted through the slotted arm 48 to the spider or cross-lever 38, whereby the arms 39 40 of

said cross-lever or spider are moved downward and upward, respectively. The downward movement of the arm 39 exerts draft on the pitman 45, which moves the disk 22 rotatively into the position shown in Fig. 1, whereupon the detent 26 falls into the notch 25 and locks said disk against reverse movement. The draft of the pitman 45 is transmitted to the rod 24 and through said rod to the semaphore 20 and lifts said semaphore into signaling position at the rear of the moving train. The upward movement of the arm 40 is transmitted through the pitman 46 for the rotation of the disk 36 into such position that the detent 34 will fall into the notch 33 and lock said disk against reverse movement. The movement of oscillation of the disk 36 is transmitted through the rod 32 to the semaphore 21 and lifts said semaphore out of signaling position and upright relative to the post or tower 19. Thus is a second signal established by the semaphore 20 at the rear of the train, and the signal previously established by the semaphore 21 at the head of the train is withdrawn. At the same time the movement of oscillation of the spider or cross-lever 38 brings the contact-piece 65 and the arm 66 thereof into bridging contact with the contact-posts 63 64 and establishes a circuit through the magnet 28 of station 12. The establishing of the circuit through the magnet 28, as just described, energizes such magnet and causes it to attract the armature 27 of the detent 26 and lift said detent out of the notch 25 of the disk 23 and permit the semaphore 20 at said station 12 to fall by gravity out of signaling position. In like manner all semaphores 20 of stations ahead of 12 and in the same block or space between manual stations, as above described, may fall out of signaling positions, being raised successively mechanically and released successively by various magnets corresponding to 28 in the successive stations. Thereupon the train is found to be in a block guarded in front by semaphores 21 and guarded in the rear by a single semaphore-signal in station 13. As the train passes second station 13 it actuates another bar, rail, or plate 59 and releases and withdraws the signal-semaphore 20 at first station 12 and also establishes a signal 20 at second station 13 and withdraws the signal 21 at said second station.

The magnet 28 in the last of the stations 13 is in broken circuit with posts 63 64 at stations 14, and said posts are bridged at times (to close said circuit) by a switch 77, actuated in the same manner as the spiders 38. When the switch 77 is operated to bridge the contact-posts in station 14, (as the train leaves the first series of blocks and enters a manual station,) the semaphore 20 at the last of the stations 13 is released and falls out of signaling position.

When a train is moving in a direction opposite to the arrow *a* in Fig. 6, or as indicated by arrow *b* in Fig. 7, it will oscillate the cross-levers or spiders of an independent duplicate of the block-signal system above described.

In Fig. 4 we show a cross-lever or spider 38^a, having its arm 48^a connected by coil-springs 67 67 to opposite end portions of a rod or plate 68, which rod or plate is mounted for longitudinal reciprocation through engagement therewith of a crank 54^a. The crank 54^a is operated in like manner as the crank 54, above described, and end portions of the plate or bar 68 are slotted to receive bolts or pins, whereby said bar or plate may be connected to a suitable support.

In Fig. 5 we show a hanger 69, on which is mounted a bed-plate 70, carrying springs 71 72, which springs in turn support and cushion the cap-plate 73. A raceway 74 is formed in the upper surface of the cap-plate 73, and balls 75 are carried in said raceway and engage in a raceway 76 in the lower surface of one or the other end portions of an actuating rail, bar, or plate 59^a. Through the use of the hanger, bed-plate, coil-springs, and cap-plate we are enabled to support and cushion either end portion of the actuating bar, plate, or rail 59^a, and through the use of the raceways and balls 75 we provide for longitudinal movement of said bar or rail with a minimum of friction on its supports.

The springs 60 61 and 71 72 are of such strength as to sustain the rails 59 59^a and prevent depression thereof by a hand-car or other object lighter than a railway-car.

We claim as our invention—

1. An automatic block-signal system, comprising means whereby a passing train may set signals electrically, lever mechanism whereby a passing train may set signals mechanically, the electrical and mechanical operations being synchronous.

2. An automatic block-signal system, comprising means whereby a passing train may withdraw signals electrically, lever mechanism whereby a passing train may withdraw signals mechanically, the mechanical and electrical operations being synchronous.

3. An automatic block-signal system, comprising mechanism for electrically releasing signals in advance of an engine, train or car, lever mechanism for successively withdrawing said signals, lever mechanism for setting signals in the rear of an engine, train or car, and means for successively withdrawing said rear signals electrically.

4. An automatic block-signal system, comprising lever mechanism for setting a signal in signaling position and setting another signal out of signaling position, and electrical devices for releasing each of said signals, whereby one of said signals may fall from signaling position and the other may fall into signaling position.

5. An automatic block-signal system, com-

posed of independent sections, each of which sections has a series of signal-stations, each station comprising a post or tower, semaphores on said post or tower, rotating devices connected with said semaphores and arranged to move them in one direction, a train-operated actuating-rail acting on said rotating devices, locking devices acting on said rotating devices, and electromagnetic devices acting on said locking devices at times.

6. An automatic block-signal system, comprising a rail of abnormal length adapted to be depressed by a passing engine, train or car, means connected with said rail for setting signals electrically, lever mechanism connected with said rail for setting signals mechanically, the electrical and mechanical operation being synchronous.

7. An automatic block-signal system, comprising a rail of abnormal length adapted to be depressed by a passing engine, train or car, means connected with said rail for withdrawing signals electrically, lever mechanism connected with said rail for withdrawing signals mechanically, the mechanical and electrical operation being synchronous.

8. An automatic block-signal system, comprising a rail of abnormal length adapted to be depressed by a passing engine, train or car, mechanism connected with said rail for electrically releasing signals in advance of said engine, train or car, lever mechanism connected with said rail for successively withdrawing said signals, said lever mechanism also adapted to set signals in the rear of said engine, train or car, and means connected with said rail for successively withdrawing said rear signals electrically.

9. In a block-signal system, signal-setting mechanism, a crank-rod acting on said mechanism, and an actuating-rail of a length at least equal to the distance between the centers of the trucks of a car, said actuating-rail yieldingly mounted and adapted to be depressed by a passing train.

10. In a block-signal system, a semaphore, a disk, a rod connecting said semaphore and disk, lever mechanism, means for actuating said lever mechanism by a passing train, a rod connecting said lever mechanism and disk, a detent arranged to lock said disk in a given position, and an electromagnet arranged to disengage said detent when energized.

11. The combination of a signal station or tower, semaphores mounted normally in different positions on said tower, disks mounted on said tower, one of said disks locked and the other unlocked, rods connecting said semaphores and disks respectively, lever mechanism adapted to be operated by a passing train, rods connecting said lever mechanism to said disks respectively, and electromagnets which when energized will release either of the disks from locked position.

12. An automatic block-signal system, comprising a plurality of rails each of abnormal length adapted to be depressed by a passing engine, train or car, and held continuously during the passage of said engine, train or car, mechanisms connected with said rails for electrically releasing signals in advance of said engine, train, or car, lever mechanisms successively connected with said rails for successively withdrawing said signals, said lever mechanisms also adapted to set signals in the rear of an engine, train or car, and means connected with said rails for successively withdrawing said rear signals electrically.

13. An automatic block-signal system, comprising a rail of abnormal length adapted to be depressed and held down continuously by and during the passage of an engine, train or car, lever mechanism connected with said rail for setting a signal in signaling position and setting out another signal, and electrical devices for releasing each of said signals, whereby one of said signals may fall from signaling position and the other may fall into signaling position.

14. An automatic block-signal system, composed of independent sections, each of which sections has a series of signal-stations, each station composed of a post or tower, semaphores on said post or tower, lever mechanism connected with said semaphores and arranged to move them in one direction, a train-operating actuating-rail adapted to be depressed and held down by and during the passage of an engine, train or car, acting on said lever mechanism, locking devices acting on said lever mechanism, and electromagnetic devices acting on said locking devices at times.

15. An automatic block-signal system, comprising means whereby a passing train may set signals electrically, lever mechanism whereby a passing train may set signals mechanically and lever mechanism whereby a passing train may release all of said signals electrically.

16. An automatic block-signal system, comprising initial means whereby a passing train may set signals electrically, terminal means whereby a passing train may cut out signals electrically and intermediate means whereby a passing train may set signals mechanically and cut out signals mechanically and electrically.

17. An automatic block-signal system, composed of a series of independent sections, each of said sections comprising initial means whereby a passing engine, train or car, may set signals electrically in advance thereof, terminal means whereby said engine, train or car, may release all signals to the rear thereof electrically, and intermediate means whereby said engine, train or car may set signals mechanically and cut out signals mechanically and electrically.

18. In an automatic block-signal system, a signal-post, a semaphore on said post, means whereby a passing train may set said sema-

phore electrically, and means whereby a passing train may withdraw said semaphore mechanically.

19. In an automatic block-signal system, a signal-post, semaphores on said post, means whereby a passing train may set one of said semaphores mechanically and withdraw the other of said semaphores mechanically, and train-operated means for withdrawing the first semaphore electrically and setting the second semaphore electrically.

Signed at Des Moines, Iowa, this 7th day of January, 1904.

ROSS LOGSDON.
ELZA S. STOTTS.

In presence of—
B. T. LINDLEY,
R. G. ORWIG.