No. 654,851. Patented July 31, 1900.

J. SHOECRAFT.

SEMAPHORE OPERATING MECHANISM.

(Application filed Oct. 10, 1899.)

(No Model.) 2 Sheets—Sheet 1.

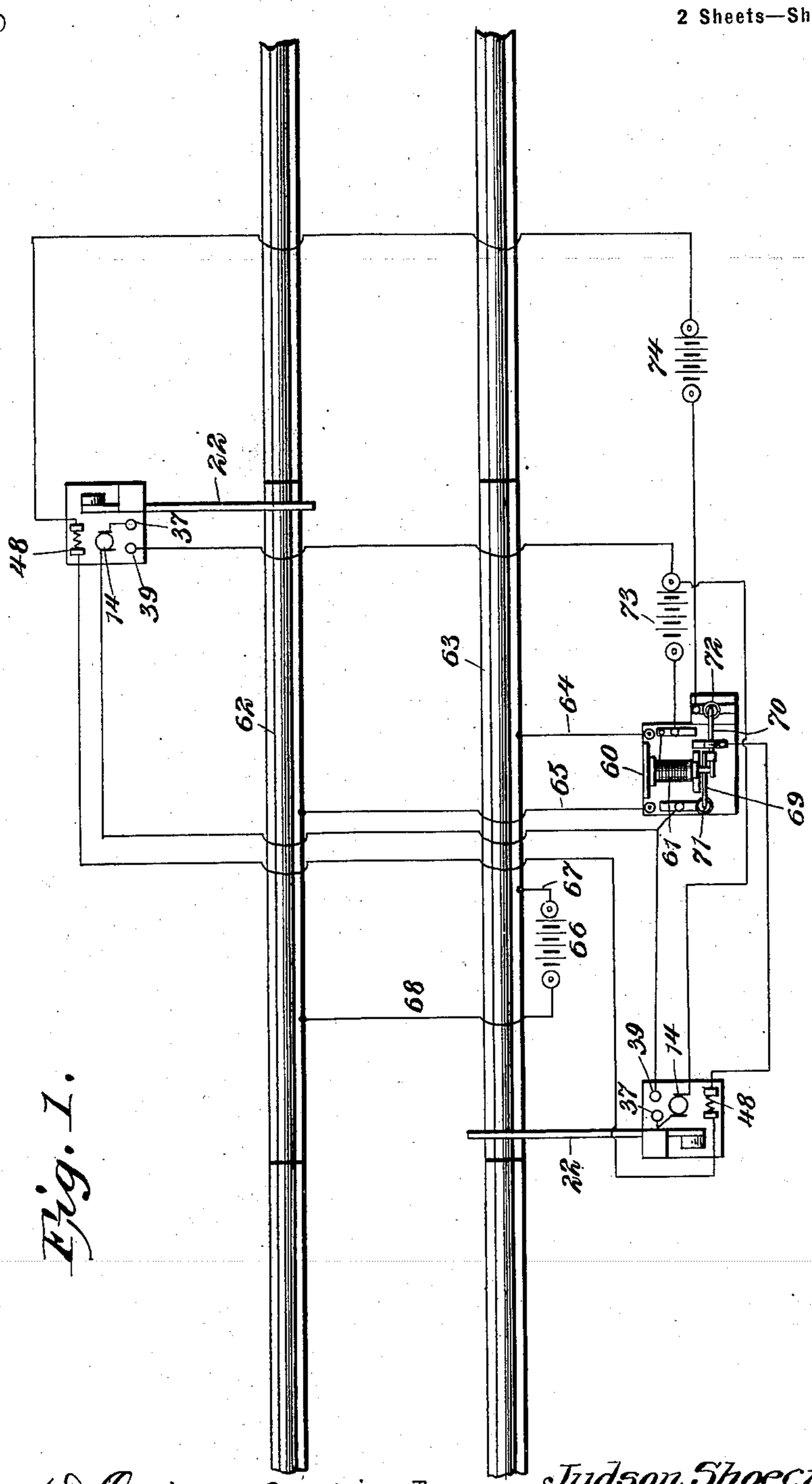

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

Fig. 2.

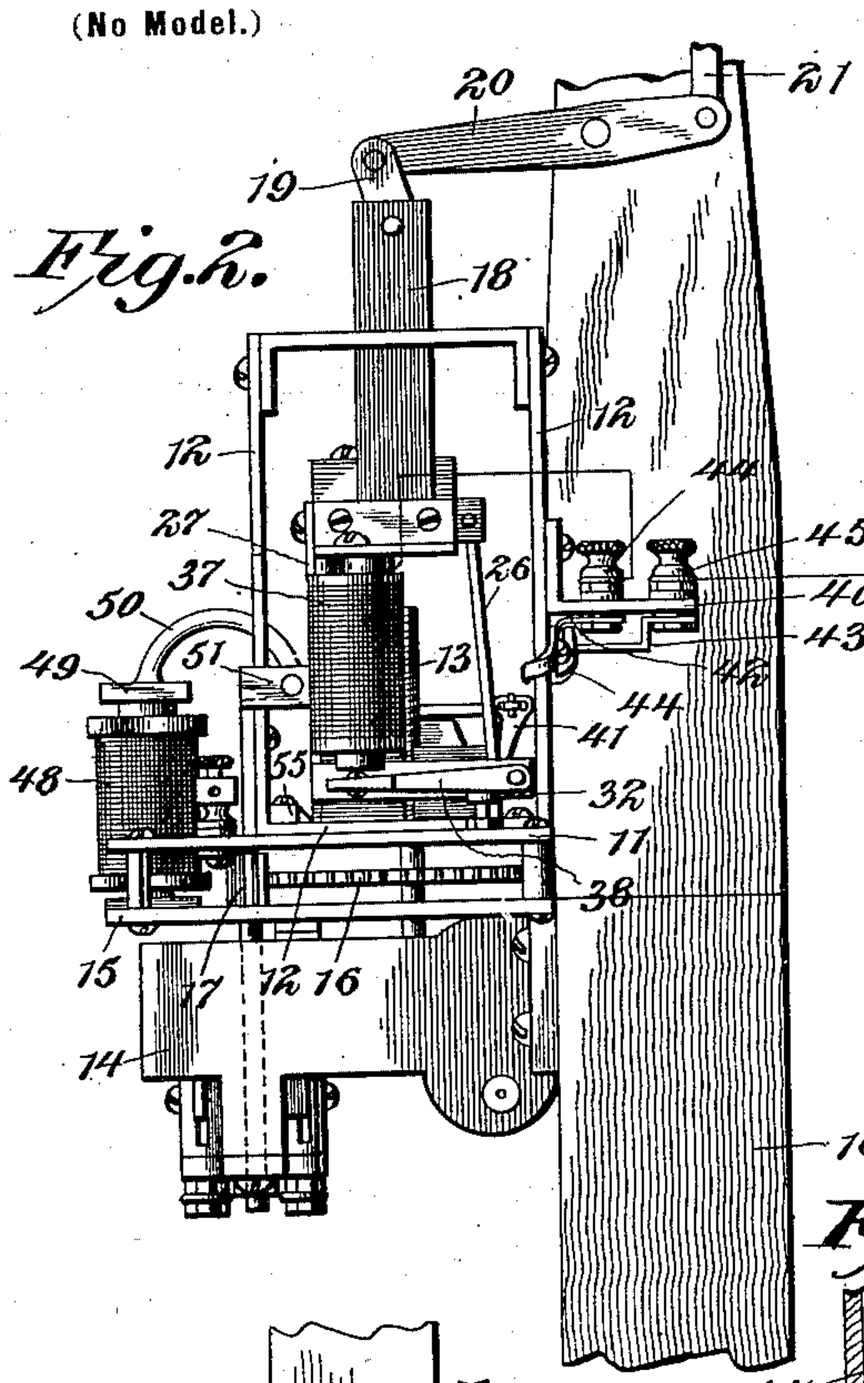


Fig. 3.

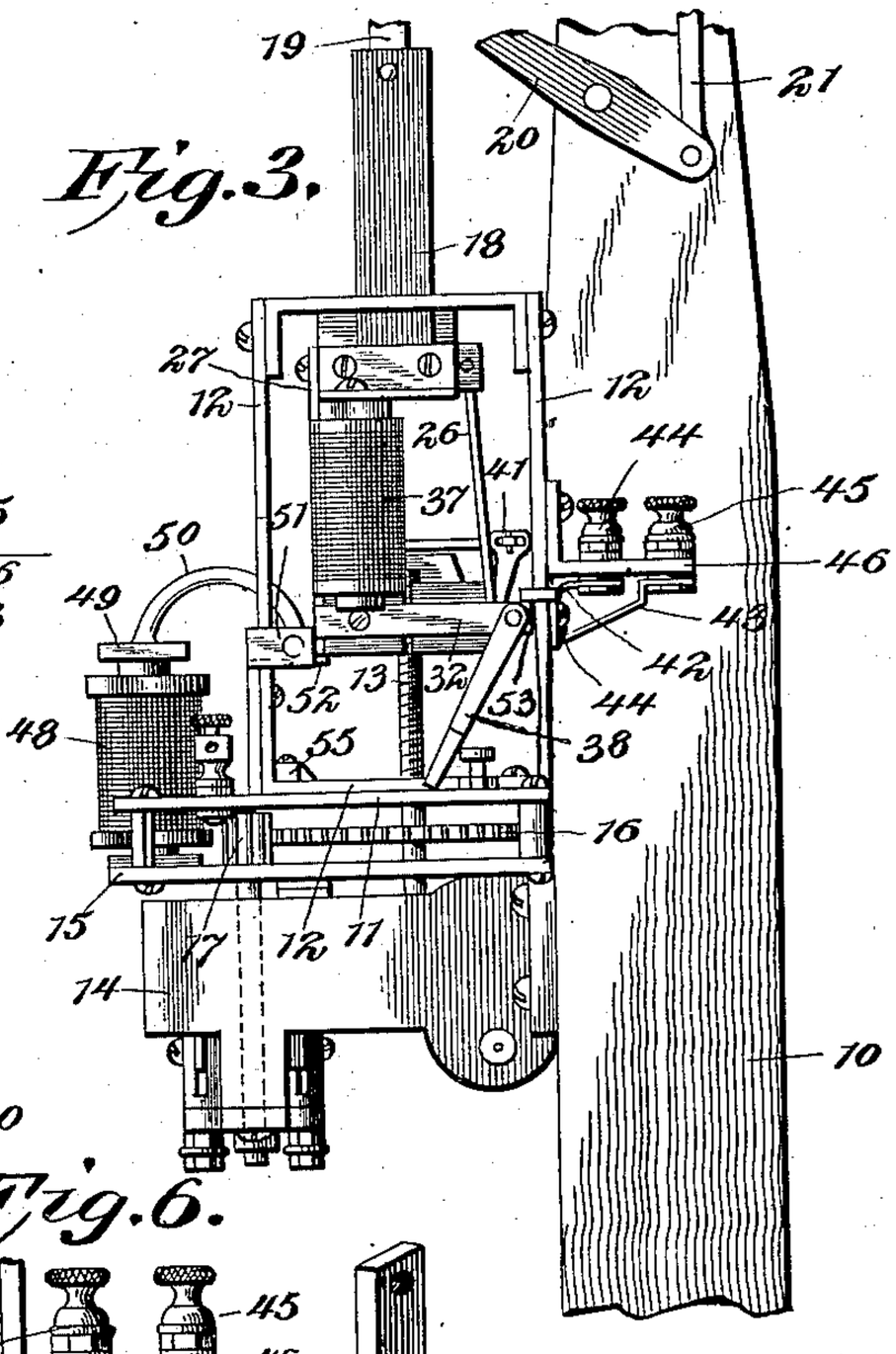


Fig. 6.

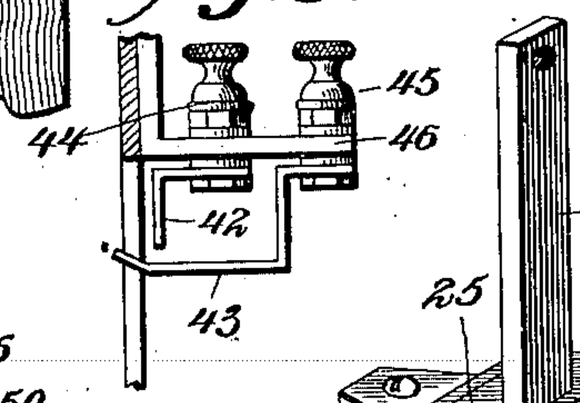


Fig. 4.

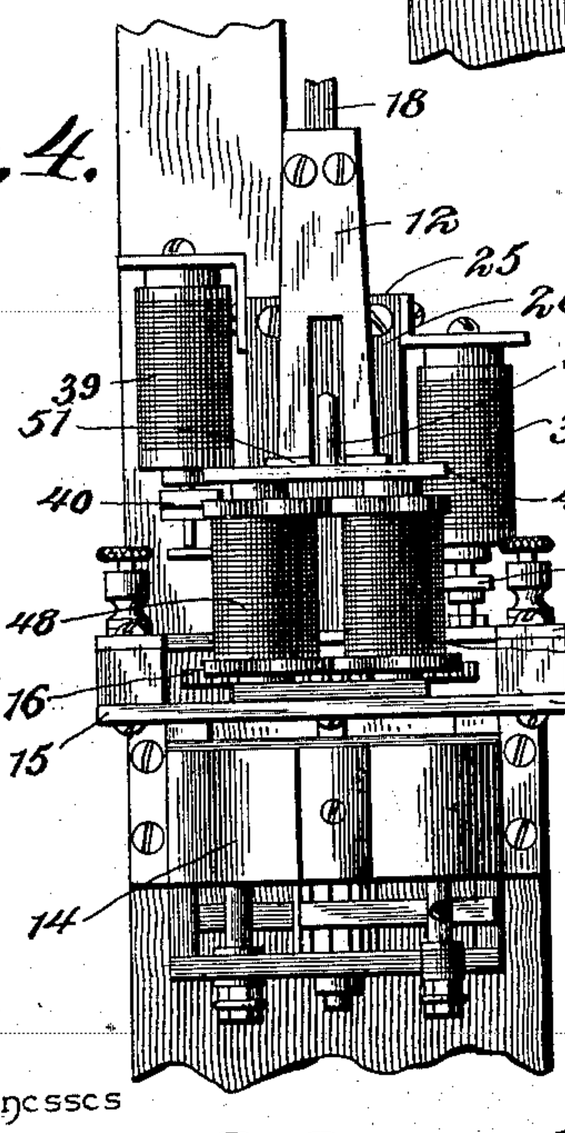
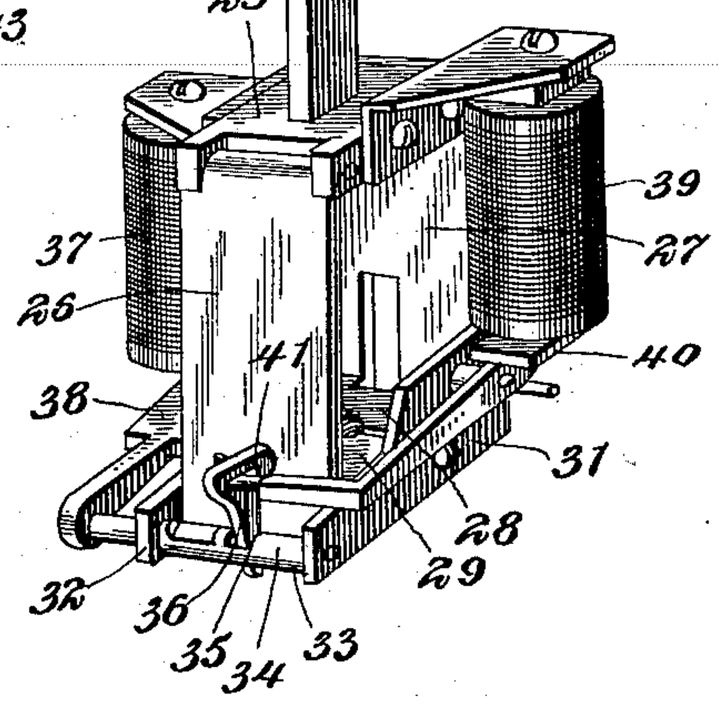


Fig. 5.



Witnesses
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UNITED STATES PATENT OFFICE.

JUDSON SHOECRAFT, OF ESKRIDGE, KANSAS, ASSIGNOR TO CHARLES C. GARDINER, OF BRADFORD, KANSAS.

SEMAPHORE-OPERATING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 654,851, dated July 31, 1900.

Application filed October 10, 1899. Serial No. 733,210. (No model.)

To all whom it may concern:

Be it known that I, JUDSON SHOECRAFT, a citizen of the United States, residing at Eskridge, in the county of Wabaunsee and State of Kansas, have invented a new and useful Semaphore-Operating Mechanism, of which the following is a specification.

This invention relates to electrically-operated railway-signals, and more particularly to that class known as "semaphore-signals," the object of the invention being to provide a block-signal-operating mechanism in which the semaphore will be set at "danger" when the track is obstructed or when the mechanism may be out of order. In mechanism of this class it is highly important that the semaphore may indicate the condition of the apparatus as well as of the track, and in the present construction if the circuit which operates the semaphore-retracting motor is broken the semaphore will be returned to the danger position; otherwise the mechanism might become inoperative when the semaphore is partially withdrawn and any subsequent closure of the track would not be indicated.

In the drawings forming a portion of this invention, and in which similar numerals of reference designate like and corresponding parts in the several views, Figure 1 is a diagrammatic representation of a block protected by a system of apparatus involving this invention. Fig. 2 is a side elevation of the semaphore-operating mechanism, showing its attachment to the semaphore-post and illustrating the positions of the parts when the semaphore is raised to the danger position. Fig. 3 is a view similar to Fig. 2 and showing the positions of the parts when the semaphore is lowered and the mechanism is ready to be dropped to raise the semaphore. Fig. 4 is a side view of Fig. 2 looking to the right. Fig. 5 is a detail perspective view showing the split nut and its locking mechanism.

Referring now to the drawings, the system involves a plurality of duplicate semaphore-operating mechanism in combination with sources of electricity and means for closing the circuit of the several elements of the mechanism. This semaphore-operating mechanism is connected directly with the semaphore-post 10 and consists of a base-plate 11, upon which is mounted a frame 12, having a central perforation, vertically of which is passed a screw-threaded shaft 13 of an electric motor 14, located below the base 11 and held in proper position upon the semaphore-post. This shaft 13 may constitute the armature-shaft of the motor, or, if preferred, may have suitable bearings in the base 11 and in a diamagnetic plate 15, secured to the motor, and may have mounted thereon beneath the base 11 the gear-wheels 16, meshing with the pinion 17 upon the armature-shaft, as shown. Thus as the armature of the motor rotates the shaft 13 will be rotated, and from the rotation of this shaft the semaphore mounted upon the post 10 is lowered.

In the top of the frame 12 is a slot in which is disposed a rod 18, the upper end of which has a link connection 19 with a lever 20, fulcrumed upon the post 10, and from the work end of which extends a connecting-rod 21, pivoted at its upper end to the semaphore 22 between its fulcrum and the outer end thereof. This semaphore is of the usual construction and need not be described. The lower end of the rod 18 enters the inclosure of the frame 12, and has mounted thereon a block 25, on opposite sides of which are secured the upper ends of hangers 26 and 27, of which the hanger 27 is fixed and is of spring material and the hanger 26 is pivotally connected. To the lower end of the hanger 27 is secured a section 28 of a transversely-split nut, the perforation of which is vertically disposed, the opposite section 29 being fixed to the lower end of the hanger 26. The perforation of the split nut, and which is formed partially in each of the nut-sections, is threaded to receive the threads of the shaft 13, whereby when a nut is in a closed position the rotation of the shaft 13 through the medium of the armature of the motor 14 will act to feed the nut longitudinally of the shaft and move the semaphore 22 on its pivot. In this construction it is intended that the rotation of the screw-shaft 13 will be in a di-

rection to move the nut upwardly, and thus to lower the semaphore-arm into what is known as the "safe" position. When the nut has been fed to the limit of its upward movement, the motor-circuit is broken, and subsequently, under certain conditions, the nut is opened to release the screw, when the weight of the parts will act to drop the nut and to raise the arm to the "danger" position. The spring part of the hanger 27 acts to normally hold its nut-section out of engagement with the shaft 13, and normally the pivotal connection of the hanger 26 will permit its nut-section to swing freely, and thus to be swung outwardly and from engagement with the shaft 13 when the nut descends. In order to hold the parts of the nut together to cause them to grip the shaft 13, there is secured to the opposite ends of the nut-section 28 plates 31 and 32, which inclose the nut-section 29 and between which the nut-section 29 is adapted for swinging movement. The plates 31 and 32 extend beyond the outer face of the section 29 and of the hanger 26, and a shaft 33 is journaled in bearings in the protruding portions of said plates. One end portion of this shaft is flattened, as shown at 34, and in this flattened portion and in the direction of the minor thickness thereof is formed a slot 35, for a purpose which will be presently explained. When the shaft 33 is moved to cause its flattened portion to lie parallel with the hanger 26, a wedge 36, passed between this flattened portion and the hanger 26, will act to move the nut-section 29 in the direction of the section 28, and thus close the sections upon the shaft 13, or if the nut-sections are lying in engagement with the shaft the insertion of the wedge will prevent their disengagement. The slot 35 is of such a depth that when the shaft 33 is turned to hold the slot in the direction of the hanger 26 there will be a sufficient space between the outer surface of the wedge 36 and the base of the slot 35 to permit the movement of the nut-section 29 outwardly to a sufficient extent to draw its threads from engagement with the threads of the shaft 13.

In order to oscillate the shaft 33 to cause it to assume the position just described, an electromagnet 37 is mounted upon the block 25 and has an armature 38, fixed at one end to the shaft 33, the electromagnet being adapted to hold said armature in the position shown in Fig. 5 of the drawings, and in which the slot 35 is moved from coöperation with the wedge 36, and at which time the wedge will engage the body of the shaft 33 to hold the nut-sections together. In order to hold the wedge 36 in this position and to initially move it into such position, a second electromagnet 39 is mounted upon the block 35 and has an armature 40, pivoted to the plate 31, and the laterally-turned end of which is passed through a slot 41 in the enlarged upper end of the wedge 36. Thus when the armature-pointer is attracted it will move the wedge 36 downwardly and into engagement with the shaft 33 and the hanger 26. The electromagnets 37 and 39 are connected in series mutually and with the motor 14, and thus if the motor be energized the nut-sections will be closed upon the shaft 13 and the shaft will be rotated to elevate the block 25 and the parts carried thereby. In order to arrest the upward movement of this mechanism when the semaphore is lowered, a circuit-breaker is included in the circuit between the motor and the electromagnet above described, and this circuit-breaker comprises a contact-point 42 and a spring-contact 43, which normally lie in mutual contact and which are attached to the binding-posts 44 and 45, mounted upon a bracket 46 upon the outer side of the frame 12. Pivoted to the side of the frame 12 is a lever 44, one end of which lies upon the spring-strip 43 and the other end of which is bent rearwardly around the edge of the frame 12 and into the path of upward movement of the shaft 33 as it is moved with the slip nut. Thus when the mechanism has been raised to the limit of its upward movement the circuit is broken, when the motor stops and the magnets 37 and 39 are deënergized and drop their armatures to release the nut-sections. It is of course necessary that this nut-operating mechanism be held in an elevated position to hold the semaphore lowered and that when the track is obstructed the nut mechanism be released to drop and raise the semaphore-arm. In order to hold this nut-operating mechanism in its elevated position, an electromagnet 48 is mounted upon the plate 15 and is provided with an armature 49, connected with an arc-shaped lever 50, which is fulcrumed to a bracket 51, mounted upon the inner face of the frame 12. The end of the lever 50 opposite to the armature 49 is bent laterally to form a normally-horizontal foot 52, which when the magnet 48 is energized is held in the path of the downward movement of the nut mechanism and holds it elevated. This foot 52 is so positioned that it will arrest the fall of the nut mechanism before it has moved sufficiently far to raise the semaphore-arm, and in order to maintain the operating-circuit of the motor and magnets 37 and 39 open the spring contact-plate 43 is extended inwardly and through a slot in the side of the frame 12, as shown at 53. As shown in Fig. 3 of the drawings, when the nut mechanism is resting upon the foot 52 the armature 38 is in its released position, and upon reference to Fig. 5 of the drawings it will be seen that this position of the armature holds the shaft 33 with the flattened portion lying horizontal, which acts to project the edge of the flattened portion to an extent sufficient to engage its edge with the inwardly-extending tip or end of the plate 43, and thus to hold said plate out of contact with the point 42. If the circuit of the motor and its connected magnets be maintained open

and the circuit of the magnet 48 be opened, the armature 49 will be released and the nut mechanism will press the foot 52 downwardly and rearwardly and will pass from the foot to its lowered position (shown in Fig. 2) and raise the semaphore. In other words, it is only necessary to provide a relay or other mechanism to open the circuits just described when the track is obstructed to indicate such obstruction. When the nut mechanism drops to the position shown in Fig. 2, the armature 38, which has previously rested upon the plate 11, is swung upwardly and into the field of its magnet, so that when its magnet is energized the armature will be moved to operate the shaft 33 in the manner above described. When the nut mechanism drops, it has been found expedient to positively move the sections together, so that the armatures 38 and 40 will have only to overcome the friction of their connected parts to rotate the shaft 33 and insert the wedge 36, and to accomplish this result a beveled block 55 is mounted upon the base of the frame 12 and in such a position that the nut-section 28 will strike it and be moved into engagement with the screw-shaft 13. The hanger 26 being pivotally hung, it will swing to engage its nut-section 29 under the influence of gravity. The parts will thus be in their proper positions to lower the semaphore-arm and set the mechanism as soon as the several circuits are again closed.

In order to open the circuits of the motor 14 and the magnet 48 when the block governed thereby is occupied, a relay 60 has the terminals of its magnet 61 connected with the rails 62 and 63 of the block through the medium of conductors 64 and 65. Connected also with the rails 62 and 63 are the terminals of an electric battery 66, through the medium of conductors 67 and 68. Thus so long as the rails 62 and 63 are unoccupied the current of the battery 66 will act to energize the relay, and as soon as a train comes upon the rails 62 and 63 the battery 66 will be short-circuited through the wheels and axles of the train and the relay will be deënergized. This relay operates two levers 69 and 70, one of which dips into a mercury-cup 71 and the other into the mercury-cup 72. In the drawings there are shown two semaphores and their operating mechanisms, the magnets 48 being connected in series through a common battery 74, and the motors 14 with their magnets 37 and 39 being connected in multiple through a battery 73. Thus when the relay 60 is energized the levers 69 and 70 will dip into the mercury-cups 71 and 72 and all of the circuits will be closed, and when the battery 66 is short-circuited the remaining circuits will be broken, and if the mechanism be then in the position shown in Fig. 3 it will drop to the position shown in Fig. 2 to set the semaphore.

The operation of the mechanism is as follows: The mechanism being in the position shown in Fig. 2, with the block occupied and the semaphore raised, when the train passes from the block the current of the battery 66 will flow through the magnet 65 of the relay and the levers 69 and 70 will be dipped into the mercury-cups 71 and 72. The motors and magnets will then be energized from their respective batteries and the split nut and the parts carried thereby will ascend, the nut-sections being drawn inwardly and into engagement with the screw-shaft 13, so that they will not strike the foot 52, which lies in its projected position. When the mechanism reaches its upper limit of motion, it strikes the lever 44 and moves the plate 43 from the point 42 to break the circuit of the motor and the magnets 37 and 39. The nut and its mechanism then descend, as the movement of the armature releases the nut-locking mechanism and permits the nut-sections to move from the shaft 13. The foot 52 being projected, the nut-section 29 strikes upon it and the nut mechanism is held supported. In its descent the shaft 33 also strikes the inner end of the plate 43 and holds the motor-circuit open. If a train then comes upon the rails 62 and 63, the battery 66 is short-circuited, the magnet 65 of the relay releases the levers 69 and 70, and they swing out of the mercury-cups 71 and 72 and break the circuits of the semaphore mechanisms, when the foot 52 is released and the nut mechanism drops and raises the semaphore.

It will of course be understood that any desired form of two-point relay may be employed, and for this reason it has not been found necessary to show the relay in detail.

What is claimed is—

1. The combination with a semaphore, of a follower connected therewith and comprising two separable parts movable toward and away from each other, electrically-operated means in the path of movement of the parts of the follower for engagement by the parts of the follower, said electrically-operated means being adapted to move the follower and to move the semaphore in one direction, electrically-operated means for locking the parts of the follower to the moving means and for releasing the parts of the follower from the moving means for subsequently breaking the circuit of the moving means, means for holding the follower intermediate of the limits of its motion, means for releasing the follower to allow it to reach the limit of its continued movement, and means for moving the parts of the follower into engagement with the moving means.

2. The combination with a semaphore, of a follower connected therewith and comprising a plurality of separate parts, said follower having a definite path of movement, electrically-operated means for moving the follower in one direction to the limit of its movement, electrically-operated means for moving the parts of the follower into engagement with

its moving means, electrically-operated means for releasing the parts of the follower from its moving means at said limit of movement, means in the path of the return movement of the follower for engagement thereby to break the circuit of the moving means, means for supporting the follower to hold the circuit broken, electrically-operated means for releasing the follower to permit its movement, means for simultaneously closing the circuit of the moving means, and means for subsequently throwing the parts of the follower into operative relation with the moving means.

3. The combination with a semaphore, of an electric motor, a circuit including said motor, a screw-shaft adapted for rotation by the motor, a separable follower adapted to move alternately with and independently of the screw-shaft, electrically-operated means for closing the follower upon the screw-shaft, means for releasing the follower from the shaft, connections between the follower and the semaphore, and a circuit-breaker for breaking the circuit of the motor and the follower-operating means, said circuit breaker being adapted for operation by engagement of the follower.

4. The combination with a semaphore, of an electric motor, a circuit including said motor, a screw-shaft adapted for rotation by the motor, a separable follower adapted to move alternately with and independently of the screw-shaft, electrically-operated means for closing the follower upon the screw-shaft, said means being in the circuit of the motor, connections between the follower and the semaphore, a circuit-breaker for breaking the motor-circuit and the circuit of the follower-closing means, said circuit-breaker being adapted for operation by engagement with the follower.

5. The combination with a semaphore, of an electric motor, a circuit including said motor, a screw-shaft adapted for rotation by the motor, a separable follower adapted to move alternately with and independently of the screw-shaft, means for holding the parts of the follower normally separated and free from the screw-shaft, electrically-operated means for closing the follower upon the screw-shaft and for holding it in operative relation to the screw-shaft, said means being in the circuit of the motor, and a circuit-breaker for breaking said circuit.

6. The combination with a semaphore, of an electric motor, a screw-shaft adapted for rotation by the motor, an electric circuit for the motor, a separable follower adapted for engagement with the screw-shaft to move alternately with and free thereof, electrically-operated means for closing the follower upon the screw-shaft and for holding it in engagement with the screw-shaft, said means being in the motor-circuit, means in the path of the follower for engagement thereby to open the circuit of the closing and holding means and for initially opening the motor-circuit, means in the path of free movement of the follower for engagement of the follower to subsequently open the motor-circuit, means for holding the follower to maintain said circuit at a different point open, and means for releasing the follower to permit closing of the circuit.

7. The combination with a semaphore, of an electricmotor, a circuit including said motor, a screw-shaft adapted for rotation by the motor, a split nut adapted to move alternately free of and with the shaft, means for engaging the nut with the shaft, means for holding the nut in engagement with the shaft, means for releasing the nut with respect to the shaft, and connections between the nut and semaphore.

8. In a semaphore-operating mechanism, a block, connections between the block and a semaphore, hangers carried by the block, nut-sections carried by the hangers, a screw-shaft adapted for engagement by the nut-sections, means for rotating the shaft, means for moving the nut-sections into engagement with the shaft, and electrically-operated means for holding the nut-sections in engagement with the shaft.

9. In a semaphore-operating mechanism, the combination with a screw-shaft, and means for rotating it, of a block, connections between the block and semaphore, hangers connected with the block, a nut-section connected with each hanger, means for moving the nut-sections into engagement with the shaft, a cam-shaft adjacent a nut-section, a wedge adapted for insertion between the cam of the cam-shaft and the adjacent nut-section to hold the nut-section in engagement with the screw-shaft, an armature connected with the cam-shaft for moving it into and out of operative relation to the adjacent nut-section, an armature connected with the wedge for moving it into and out of its operative position, and an electromagnet for each armature.

10. In a semaphore-operating mechanism, the combination with a shaft and means for operating it, of a follower having connections with a semaphore and adapted for movement into and out of operative relation to the shaft, a cam-shaft adjacent the follower, a wedge adapted for insertion between the cam-shaft and the follower, to hold the follower in operative relation with the first-named shaft, an armature connected with the cam-shaft for moving its cam into and out of operative position, an armature connected with the wedge for moving it into and out of operative position, and an electromagnet for each armature.

11. The combination with a follower adapted for connection with a semaphore, of means for moving the follower, said follower being movable into and out of operative relation to its moving means, a cam adjacent the follower, a wedge adapted for insertion between the cam and the follower to hold the follower

in operative relation to its moving means, an armature operatively connected with the cam for moving it into and out of operative position, an armature connected with the wedge for moving it into and out of operative position, and an electromagnet for each armature.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JUDSON SHOECRAFT.

Witnesses:

J. ROSS COLHOUN,

M. PERRY HAHN.