(No Model.) 7 Sheets—Sheet 1

E. FONTAINE.

BLOCK SIGNAL SYSTEM FOR RAILWAYS.

No. 494,525. Patented Mar. 28, 1893.

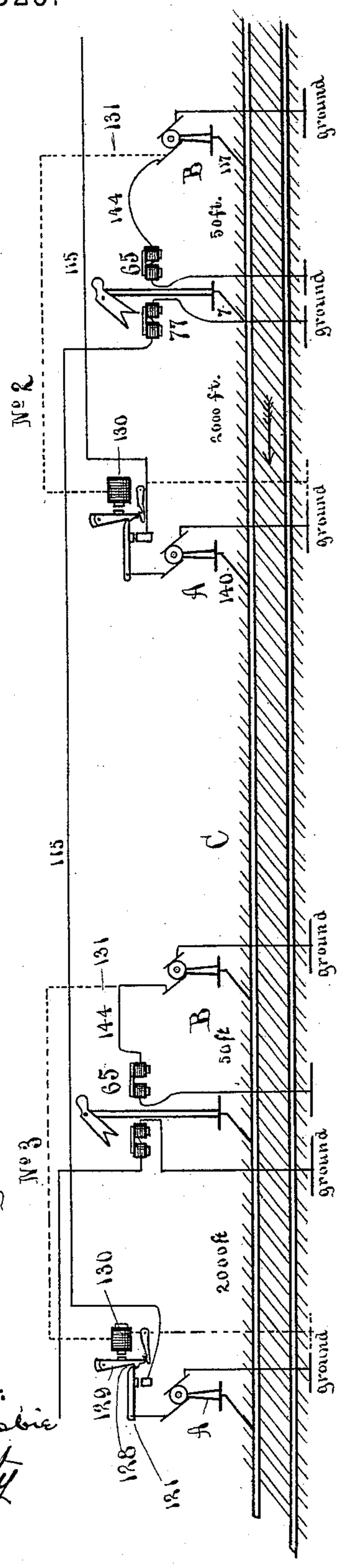

Fig. 1.

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(No Model.) 7 Sheets—Sheet 2.

E. FONTAINE.

BLOCK SIGNAL SYSTEM FOR RAILWAYS.

No. 494,525. Patented Mar. 28, 1893.

Fig. 2

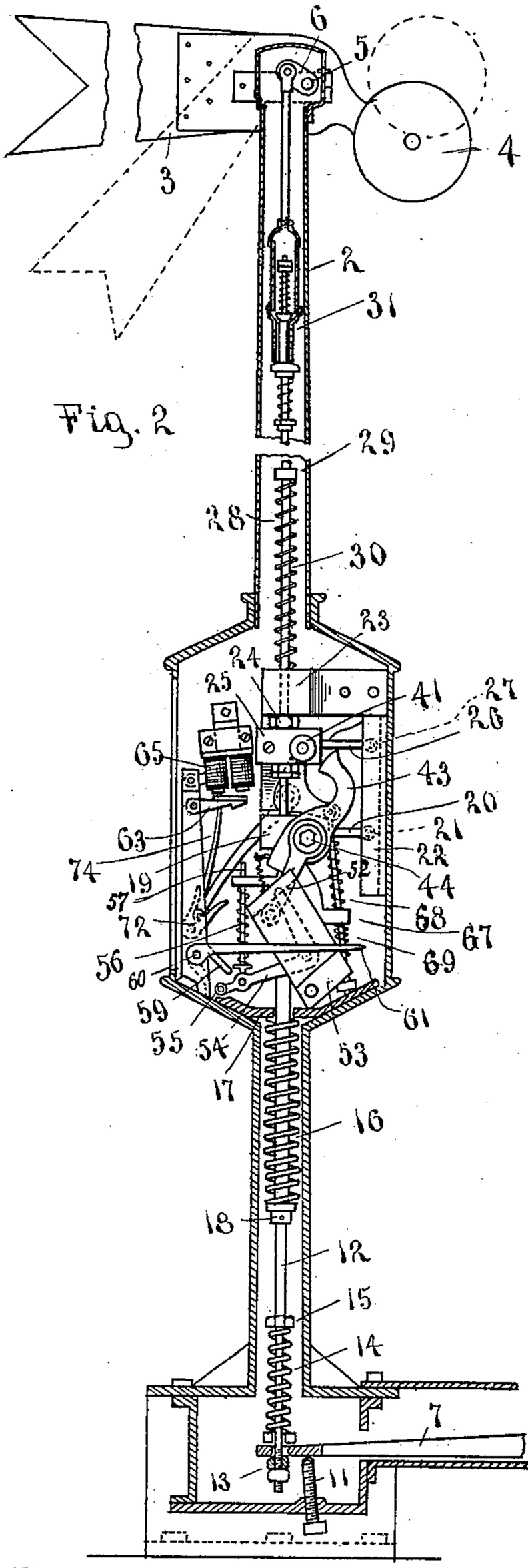


Fig. 13

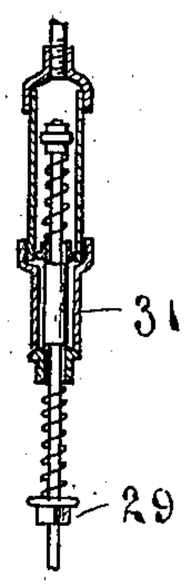
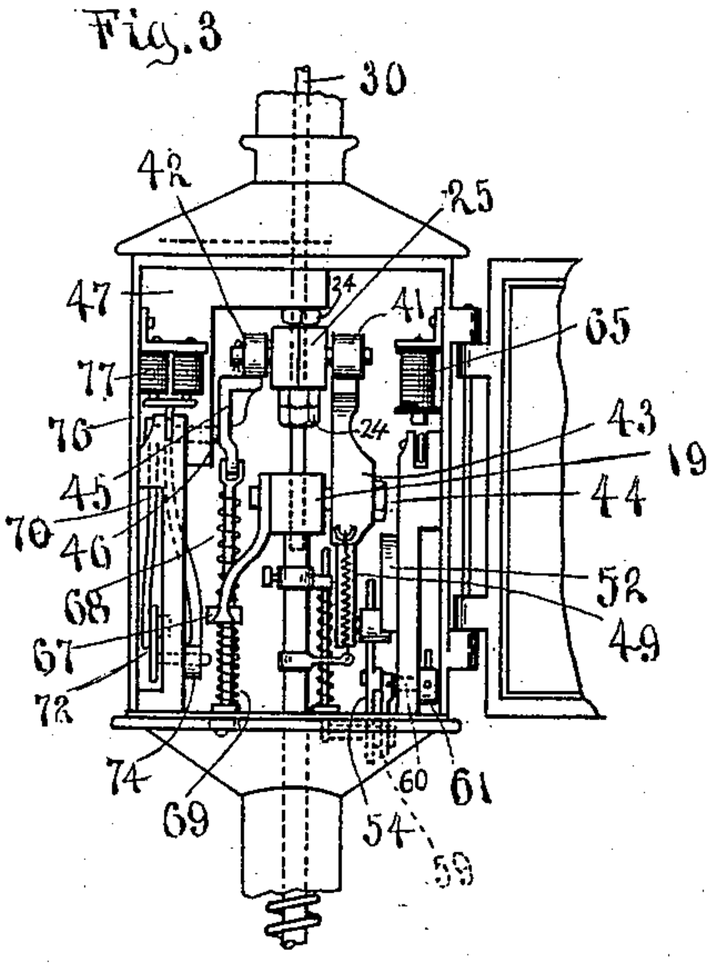
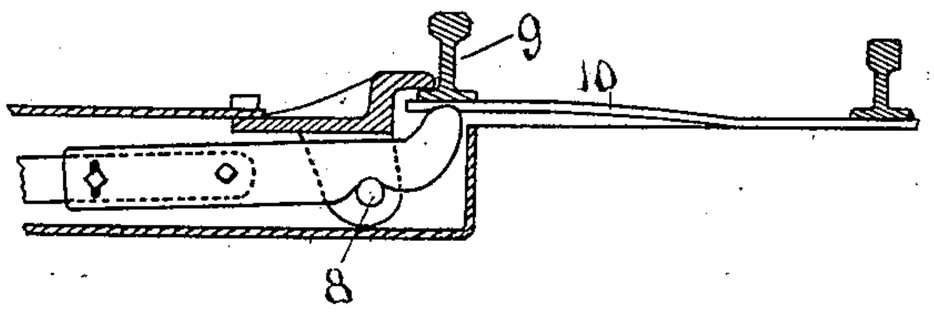


Fig. 3





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E. FONTAINE.

BLOCK SIGNAL SYSTEM FOR RAILWAYS.

No. 494,525. Patented Mar. 28, 1893.

Fig. 6

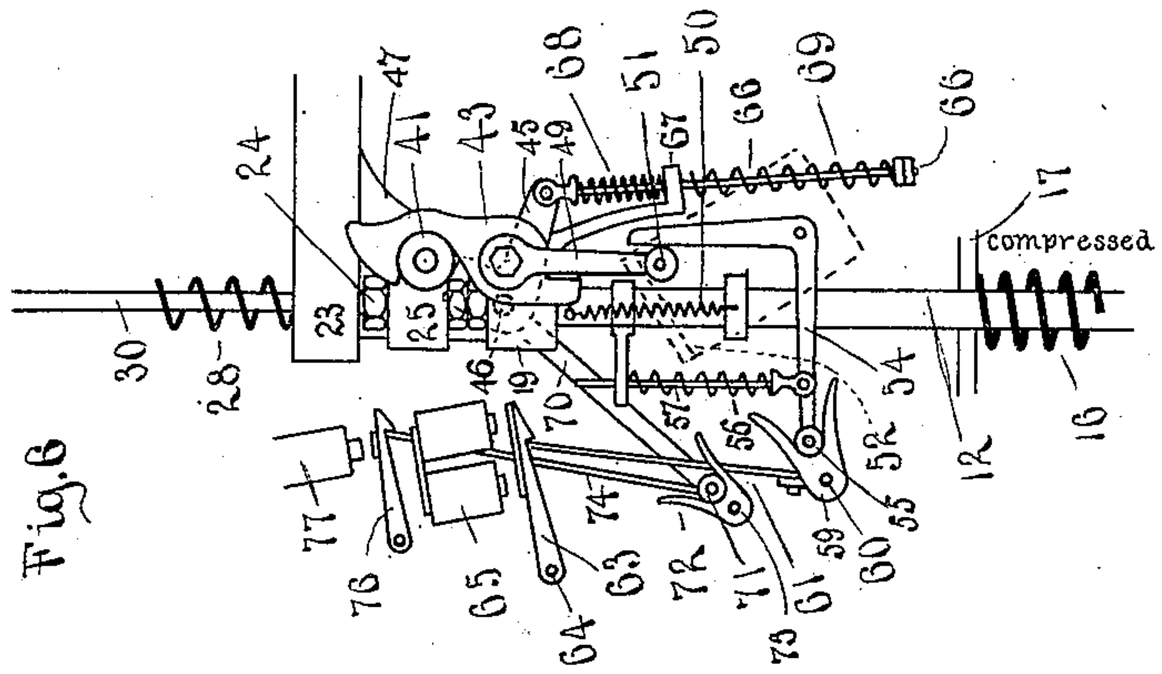


Fig. 5

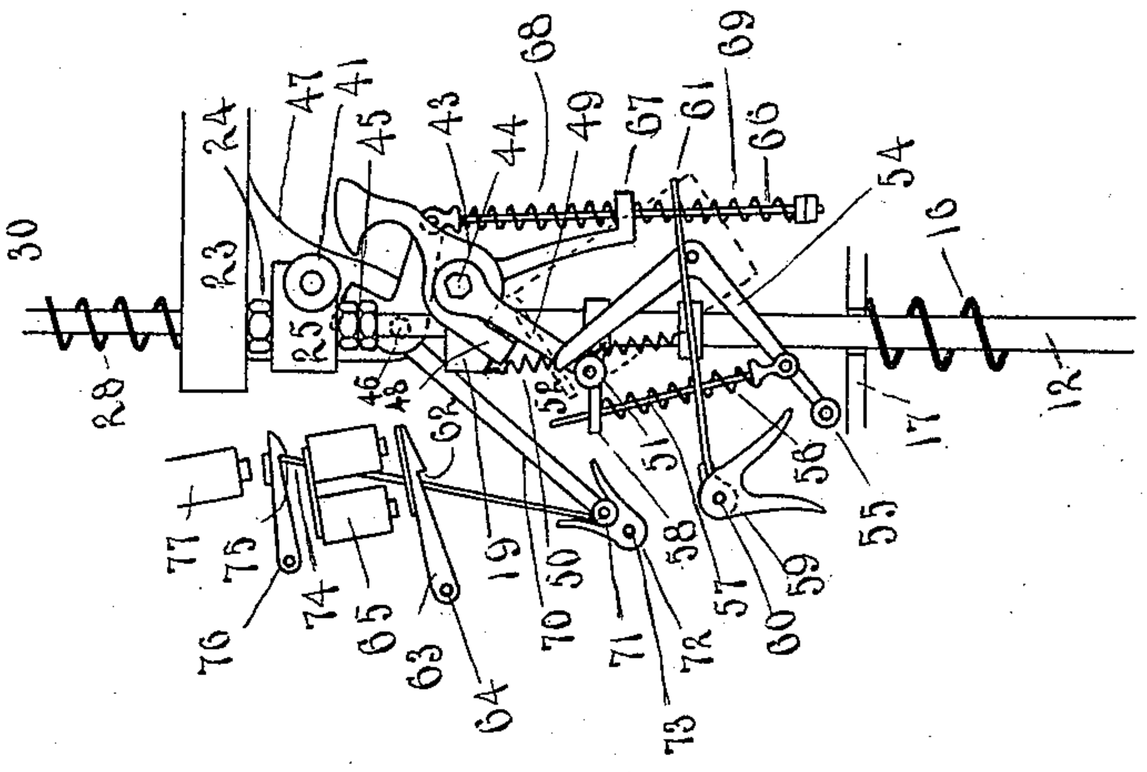
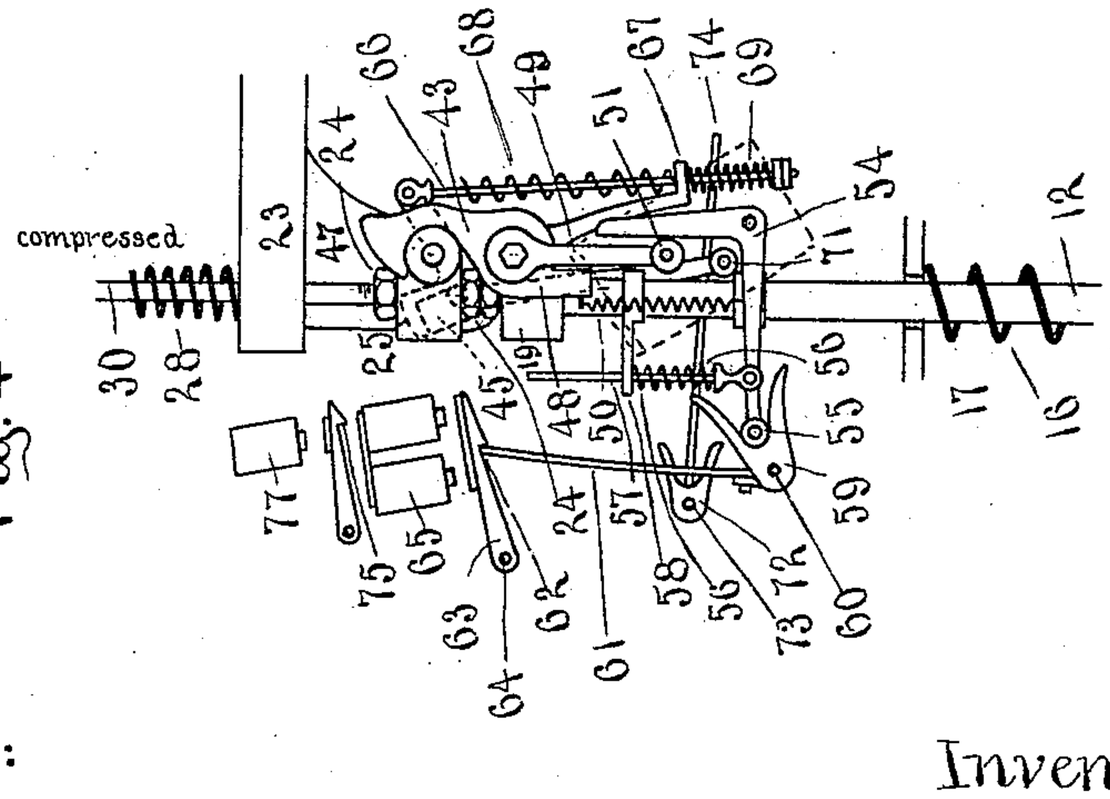


Fig. 4



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E. FONTAINE.

BLOCK SIGNAL SYSTEM FOR RAILWAYS.

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Fig. 7

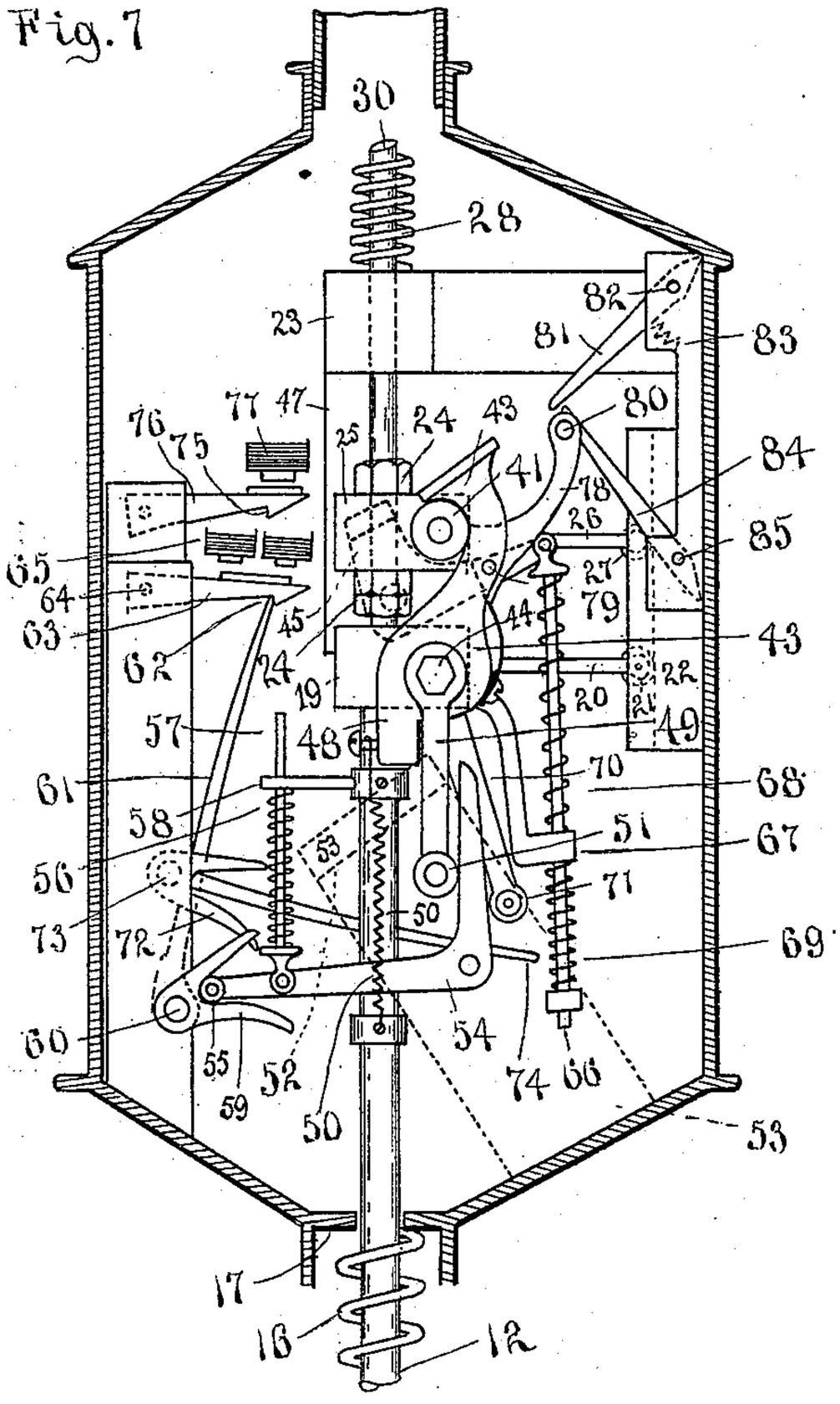
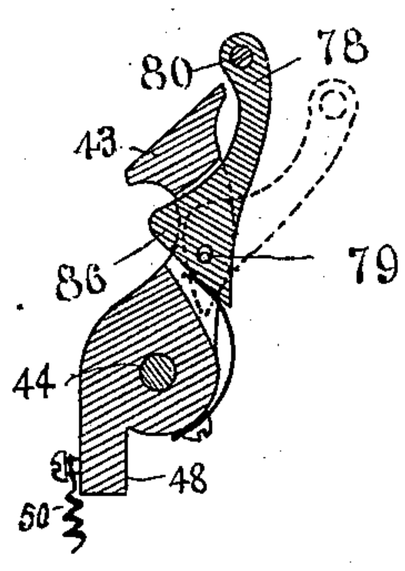


Fig. 8



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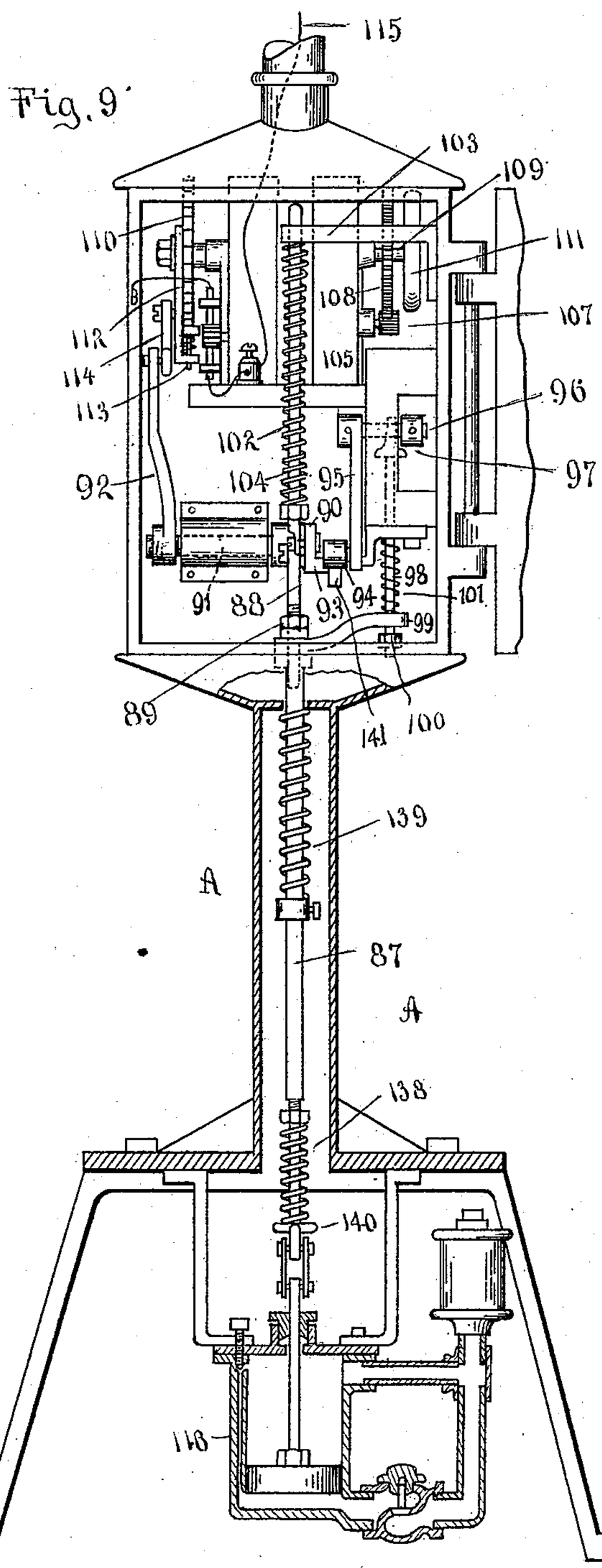
(No Model.) 7 Sheets—Sheet 5.

E. FONTAINE.

BLOCK SIGNAL SYSTEM FOR RAILWAYS.

No. 494,525. Patented Mar. 28, 1893.

Fig. 9.



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(No Model.) 7 Sheets—Sheet 6.

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BLOCK SIGNAL SYSTEM FOR RAILWAYS.

No. 494,525. Patented Mar. 28, 1893.

Fig. 14

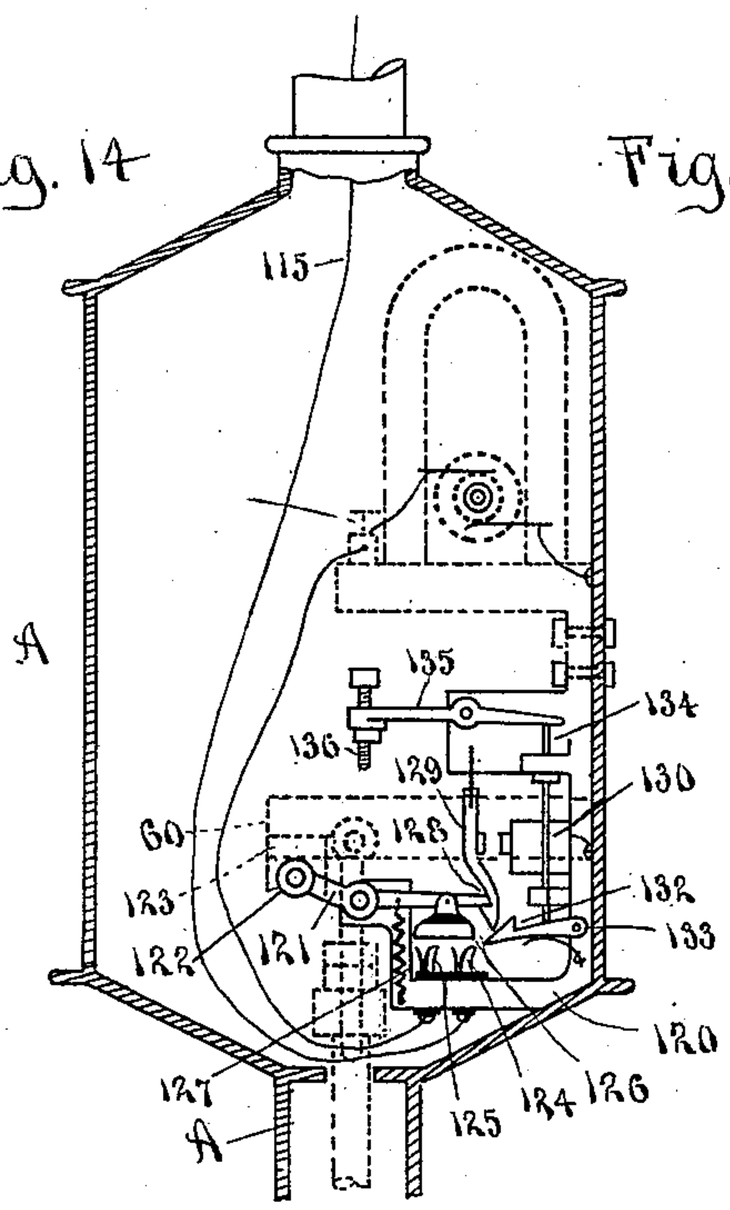
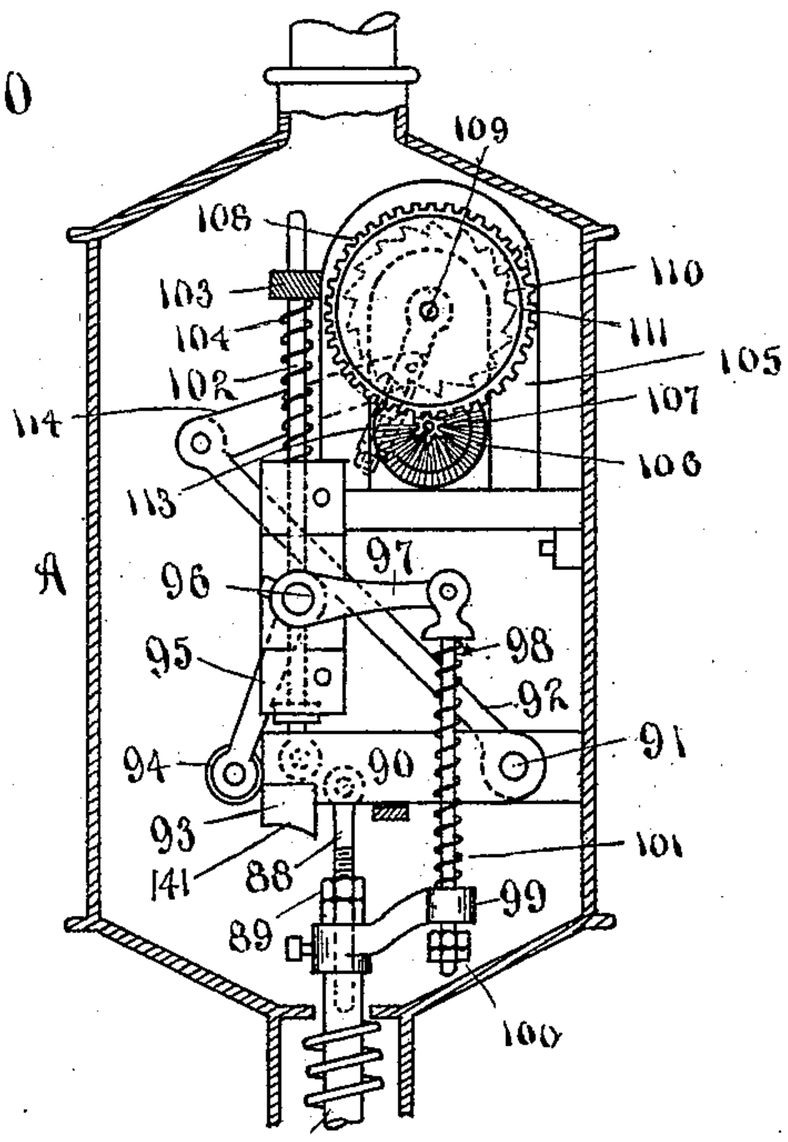


Fig. 10



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(No Model.) 7 Sheets—Sheet 7.

E. FONTAINE.

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No. 494,525. Patented Mar. 28, 1893.

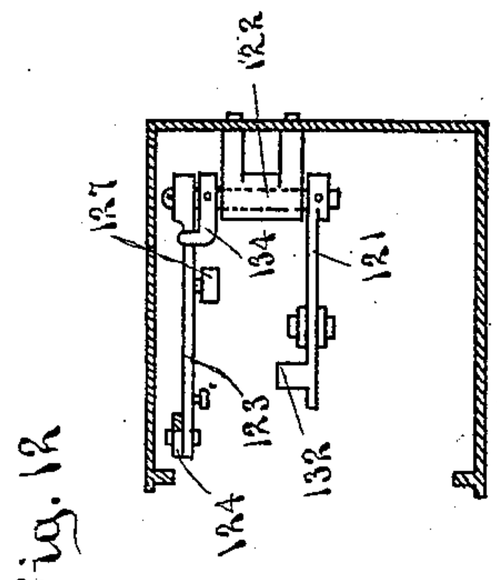

Fig. 12

Fig. 11

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UNITED STATES PATENT OFFICE.

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BLOCK-SIGNAL SYSTEM FOR RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 494,525, dated March 28, 1893.

Application filed July 11, 1892. Serial No. 439,714. (No model.)

To all whom it may concern:

Be it known that I, EUGENE FONTAINE, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Block-Signal Systems for Railways, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to that class of block signals in which the track is divided into sections, or so-called "blocks," each block being provided with a suitable signal automatically controlled by the passage of a train on entering and leaving the block, whereby the signal at the beginning is set to danger till the track is free and clear for the incoming train. Under the most rigid systems of running railroad trains, the display of such danger signal at the beginning of the block is a notice to the engineer to stop his train until the danger signal is removed, but in practical operation it is commonly deemed sufficient to stop the train and have it proceed cautiously after a pause.

My improved block system is arranged to operate with all the signals, whatever the length of section or block may be, set normally in such position as to indicate that the track is clear, and the signal at the beginning of the block is set at danger by the entrance of the train upon the section. After the train has passed the block and enters the next one, the signal for the section behind it resumes its position of "clear." Thus a train in advancing over a track continuously sets the signal at the beginning of the block to "danger" and after it has entirely left the block restores it to "safety."

My block signal system is primarily operated by power derived from the passage of a train, but the operation of the signal actuating mechanism is controlled by electric locks which are in electric circuits extending to prescribed points on the track whereby the passage of the train at these points respectively sends a current through the circuit to trip the electric locks to allow the actuating mechanism to operate the signal. Described in a general way each signal thus comprises the signal proper provided with certain actuating mechanism controlled by two electric locks, and two generators located at certain points on the track for generating a current by the passage of a train. The signal proper comprises a stand upon which the signal is mounted, and a signal which for the purpose of illustration, may be represented by the usual semaphore arm, which is turned to safety or danger by the actuating mechanism.

The actuating mechanism of the signal comprises a connecting rod, the upper end of which is connected to the semaphore arm, and the lower end of which is connected to a suitable track lever which is actuated by a passing train. This connecting rod is divided into an upper and a lower section provided at the approximate ends with an automatic coupling device by means of which they are adapted to move jointly when coupled together and independently when separated. The lower section of the connecting rod is provided with a spring which is adapted to be put under compression by raising the lower section of the connecting rod and coupling it with the upper section by an impulse from the passing train. This spring moves the signal from the position of danger into its position of safety. An automatic stop is provided to prevent this spring from actuating the signal until the train has left the block. To this end the stop is provided with a tripping device which is locked until it is electrically released by the passage of the train at a predetermined point beyond the next succeeding semaphore. The coupling is also provided with a tripping device and a lock which is adapted to be electrically released by the passage of the train at a predetermined point in the track in advance of the signal. The upper section of the connecting rod is then adapted to move the signal into its position of danger.

The coupling device and stop together with the electric locks which control them are preferably inclosed in a casing formed by enlarging a portion of the signal stand and are thereby made accessible for examination or repair.

The electric currents for tripping the coupling and stop may be obtained from any desired source of electricity, but I prefer to generate the same by the passage of the train

itself at the prescribed points. To this end I place at each prescribed point on the track a small magneto-electric generator inclosed in a suitable stand and provided with track connection, whereby the train in passing furnishes the power for imparting motion to the generator to generate a current impulse which is transmitted to the signal and trips the lock which it controls. I provide two such generators for each signal, one controlling the electric lock of the coupling device and the other controlling the electric lock of the stop. Thus the passage of a train performs three operations for each signal, namely in approaching the semaphore it trips the coupling by means of an electric current generated by the passage of the train at the first generator, to set the signal to danger, then in passing the semaphore it stores power in the actuating mechanism, and then passing the second generator it trips the automatic stop by means of a current generated by the passage of the train, to set the signal back to safety.

My invention in addition to the devices already described embraces certain safety devices, one of these consists in an electric break in the circuit of the generator which controls the stop in the mechanism of the signal, whereby its operation is made dependent upon the operation of the generator which controls the coupling devices of the signal mechanism. Another safety device is attached to the signal mechanism itself and is intended to mechanically set the signal to danger if the electrical devices should fail to do so at the proper time.

Having now described in a general way the salient features of my invention, I will proceed to describe them in detail in connection with the accompanying drawings in which—

Figure 1 diagrammatically represents a section of track showing the location of the different parts together with the arrangement of the electric circuits connecting the same. Fig. 2 is a vertical, central cross section through the signal stand showing the different parts of the signal actuating mechanism in side elevation. Fig. 3 is a front elevation of that portion of the actuating mechanism inclosed in the casing of the signal stand, the parts being in the same relative position as in Fig. 2. Figs. 4, 5, and 6 diagrammatically represent the signal actuating mechanism in the three different positions of the parts, after the passage of the train at three different points in the track the parts being shown in side elevation corresponding to Fig. 2. Fig. 7 is substantially the same as Fig. 4 with the addition of a "safety" device applied to the actuating mechanism of the signal, which latter is shown on a larger scale to serve as a principal figure of reference. Fig. 8 is a detached vertical section of the hook and safety catch, shown in Fig. 7. Fig. 9 is a front elevation of the generator stand A with the frame partially broken away to show the inclosed mechanism. Fig. 10 is a partial side elevation of the operating parts of Fig. 9. Fig. 11 is a vertical central cross section through the generator stand B showing the inclosed mechanism in elevation. Fig. 12 is a horizontal section on line x—x in Fig 11. Fig. 13 is a detail, vertical, central section of the tension joint in the connecting rod of the signal. Fig. 14 is an elevation of the parts forming the electric safety device adapted to be used in connection with the generator shown in Figs. 9 and 10.

Nos. 2 and 3 in Fig. 1 represent two signal stands placed at the beginning and end of a block respectively.

A and B are the generator stands which control the respective locks of the signals.

C is the track.

The signal proper comprises a suitable hollow stand provided at a certain height above the ground with the casing 1, and an upward extension 2, upon the upper end of which is mounted, at a suitable height above the ground the semaphore arm 3, which is of known construction and provided with a counter weight 4. The semaphore arm has a pivot pin 5 to which is secured the actuating crank 6. To this crank is pivotally secured a two part connecting rod which extends vertically down through the post and engages at its lower end with the free end of the track lever 7. This track lever is fulcrumed at 8 and extends with its short outer arm under the rail 9, which rail is normally held elevated above the track by a spring 10. The track lever is preferably made in two parts adjustably secured together in any desired manner, all so arranged that a train passing over the rail 9 can depress said rail a short distance and thereby cause one end of the lever to be thrown upward. A suitable adjustable stop 11 is provided upon which the track lever normally rests. The connecting rod which connects the free end of the lever with the actuating crank of the signal is made in two separable sections; the lower section 12 passes loosely through an aperture in the free end of the track lever and is provided with adjusting nuts 13. A cushion spring 14 is sleeved upon the lower end of the section 12 and is confined between the end of the track lever and the collar 15. The primary actuating spring 16 of the signal is confined between a suitable guide bearing 17 in the stand through which the upper end of the lower section of the connecting rod passes and an adjustable collar 18. To the upper end of this lower section of the connecting rod is secured a cross-head 19, provided with a rearwardly extending guide arm 20, Fig. 2, which carries the roller 21 on its free end engaging into a guide-way 22 in the rear side of the casing. The upper section 30 of the connecting rod slidingly engages with its lower end through the vertical guide bearing 23 in the upper end of the casing and carries below that guide bearing the cross-head 25, which is adjustably secured thereon by the adjusting nuts 24 placed above

and below. The cross-head 25 has a rearwardly extending arm 26 (Fig. 2) the free end of which has an anti-friction roller 27 engaging into the guide way 22. The lower end of the upper section of the connecting rod is vertically guided in a guide bearing formed in the upper end of the lower section and its cross-head 19 (Fig. 3). A spring 28 is sleeved upon the lower end of the upper section of the connecting rod, it opposes the spring 16, but is of lesser power than that spring, it is adjustably confined between the guide bearing 23 and the adjusting nut 29. Above the spring 28 a tension joint 31 is formed in the connecting rod, as shown in detail in Fig. 13, to compensate for any undue strain in the upward or downward movement of the connecting rod, as will readily appear from its construction.

The cross-head 25 is provided at opposite sides with the roller wrists 41 and 42. The roller wrist 41 is adapted to engage with the hook 43 pivotally secured at 44 to the cross-head 19, and the roller wrist 42 is adapted to be engaged by the stop 45, which is pivotally secured at 46 to a suitable frame 47 in the casing. The hook 43 is provided with a heel extension 48 which forms a stop for the tripping arm 49, which is pivotally secured by the same pivot pin upon the hook 41. The heel extension 48 of the hook is connected by a spring 50 to the lower section 12 of the connecting rod, and the tripping arm 49 has at its lower end the anti-friction roller 51, which is adapted to travel on the under side of the inclined guide bearing 52 formed on the part 53 of the frame (see Figs. 2, 3 and 7).

The hook 43 forms the coupling member secured to the lower portion of the connecting rod, and the roller wrist 41 constitutes the other member secured to the upper section of the connecting rod, whereby the two may be hooked together, as shown in Figs. 4 and 6. An electric lock is applied to the tripping arm of this hook, which consists of the bell crank lever 54, one arm of which is adapted to bear against the roller 51 of the tripping arm 49 of the coupling hook, and the other arm of which has an anti-friction roller 55, and a spring 56 upon the compression rod 57, which passes through the guide bearing 58, secured to the section 12 of the connecting rod.

The anti-friction roller 55 is adapted to engage into the forked rock arm 59, which is secured upon the rock shaft 60, to the other end of which is secured the rock arm 61, the free end of which is adapted to engage into a notch 62 formed on the under side of an armature 63, which is pivoted at 64 and adapted to be attracted by the electro-magnet 65.

The stop 45 which when turned underneath the roller wrist 42 upholds the upper portion of the connecting rod forms one arm of a bell crank lever, to the other arm of which is secured the compression rod 66 which passes through a guide bearing 67 connected to or formed with the cross-head 19, and two springs 68 and 69 are sleeved upon this compression rod 66 on opposite sides of the guide bearing 67. The electric lock applied to this stop consists of the rock arm 70 secured to the pivot pin 46 of the stop and a roller 71 at the end of this rock arm is adapted to engage into a forked rock arm 72 secured upon the shaft 73. To the other end of this shaft is secured the rock arm 74 which is adapted to engage into a notch 75 of the pivoted armature 76, which is adapted to be attracted by the electro-magnet 77.

All the parts constituting the signal mechanism are housed within the signal stand and the track lever and its connections located at the signal stand are in a separate housing extending from the signal stand to the track so as to protect them against climatic influences and from malicious tampering.

A safety device is preferably applied to the signal actuating mechanism and this is shown in Figs. 7 and 8. It consists of the spring arm 78 pivotally secured at 79 in a slot in the upper end of the coupling hook. It carries at its free end a pin 80, which at certain positions of the spring arm is adapted to engage with a spring latch 81 pivotally secured at 82 and held outward to the position shown by the spring 83. Below this spring catch is another catch 84 reversely inclined and pivotally secured at 85; it is held in the normal position shown, by gravity. The spring arm 78 is normally adapted to assume the position shown in Fig. 8, whereby a projection 86 at the lower end of this arm protrudes to the inside of the coupling hook.

The generator stand A, shown in Figs. 9 and 10 is placed in proximity to the track and forms a suitable housing for the actuating mechanism. This mechanism consists of a connecting rod 87, provided with a cushion spring 138 upon its lower end, and a retracting spring 139 upon its upper end, all arranged and combined with a track lever 140 in the same manner as heretofore described in the construction of the signal, except that the free end of the track lever is connected to a dash pot 116, the same as shown in connection with the generator B, in Fig. 11 which is also provided with the same parts. The connecting rod 87 has an upper extension 88 which is loosely stepped into a socket in the upper end of the rod and has the adjusting screw nuts 89 for lengthening or shortening it. The upper end of this extension is pivotally connected to the rock arm 90 which is secured upon the rock shaft 91, to the other end of which is secured a rock arm 92. The rock arm 90 is provided at the under side of its free end with a lateral offset 93 provided with a curved bearing or rest 141 for the roller 94, which is secured to the free end of the rock arm 95. The rock arm 95 is secured upon the shaft 96, to the other end of which is secured the rock arm 97. A compression rod 98 is pivotally secured to this rock arm and passes

through a guide bearing 99 on the connecting rod 87. Adjusting screw nuts 100 are applied to the lower end of the compression rod and a spring 101 is sleeved upon it. To the free end of the rock arm 90 is secured the lower end of the vertical compression rod 102, which passes at its upper end through the fixed guide bearing 103 and carries the actuating power spring 104 of the magneto-generator. This magneto generator consists of the permanent magnets 105 and the revolving armature 106, which is driven by a pinion 107 engaging with a large gear wheel 108 upon the shaft 109. This shaft carries upon one end the ratchet wheel 110 and upon the opposite end the fly wheel 111. The ratchet 110 is loosely secured upon the shaft and the vibrating arm 112 carries a suitable pawl 113 adapted to engage with the ratchet. The arm 112 is pivotally connected by means of the connecting link 114 with the rock arm 92 hereinbefore described. The current from this generator is transmitted over the conductor 115, the other pole of the dynamo being grounded by suitable connection with the frame or otherwise. The dash pot 116, may be of any desired construction for the purpose of insuring the slow return of the track lever to its normal position.

The parts being arranged as described and shown, the generator stand A operates as follows; Upon the passage of a train over the track in proximity to the generator A, the lever 140 is actuated thereby imparting an upward movement to the connecting rod 87 and compressing the spring 139, the blow of the wheels being modified by the action of the cushion spring 138 on the lower end of the connecting rod. The connecting rod 87 through its connection with the rock arm 90 imparts an upward movement to the rock arm and simultaneously therewith also compresses the spring 101. This imparts to the rock arm 95 a movement to engage under the bearing 141 of the rock arm 90 as soon as the latter is elevated high enough. When this occurs the roller 94 moves under the bearing 141 and upholds the rock arm 90. After the train has passed over the elevated rail in the track the spring 139 retarded by the action of the dash-pot returns the connecting rod and the track lever to their normal position. Before this is fully accomplished (which requires more or less of an interval depending on the adjustment of the dash-pot), the arm 99 impinges against the adjusting nuts 100 and pulls on the compression rod 98, thereby moving the rock arm 95 back into the position shown in Fig. 10 and releasing the rock arm 90 which holds the power spring 104 under compression. The power spring 104 being now suddenly released will impart a quick movement through the rock arms 90 and 92 and link 114 to the vibrating arm which carries the pawl 113, thereby imparting a sudden rotation to the shaft 109. This rotation of the shaft 109 is amplified into a rapid revolution of the armature shaft by the connections described and generates a current impulse which passes over the conductor 115 to the electro-magnet 65 of the signal and energizes it, thereby attracting the armature 63 and releasing the trip mechanism of the coupling hook. It will be seen that the generation will only take place after the dash pot has allowed the connecting rod to move toward its normal position, after the entire train has passed over the track lever of the generator.

The generator B which is shown in Figs. 11 and 12 is substantially of the same construction as the generator A, but is adapted to generate the current as soon as the first wheel of the train passes over the track lever of the stand. To this end its construction is as follows: The track lever 117, its connection with a dash pot 118 and connecting rod 119, retracting spring 120 and cushion spring 142 is the same as for the generator stand A, except that its connecting rod 119 is in one piece, pivotally secured at its upper end to the rock arm 121. This rock arm is secured on the shaft 122 journaled in suitable bearings, and is provided at its opposite end with the rock arm 123 which is loosely secured upon the shaft 122. This shaft has also secured upon it an arm 134, which bears on top of the rock arm 123. The free end of the rock arm 123 connects by a link 124 to the vibrating arm 125 of the magneto-electric generator 126, which is a duplicate of the other generator. A roller wrist 127 is secured on the rock arm 123, and this is adapted to be engaged by the lower end of the rock arm 128. The rock arm 128 is secured upon the rock shaft 129 which is secured in suitable bearings, and has at its front end a rock arm 130 which is provided with an adjusting screw 121, the lower end of which is adapted to be struck by a projection 132 on the rock arm 131. The power spring 133, which is now under tension is secured to the rock shaft 123.

In practice the parts being arranged as shown and described, their operation is as follows: The train as soon as it strikes the elevated rail in the track will transmit motion to the track lever 117 and thereby produce an upward movement of the connecting rod 119, the blow being modified by the cushion spring, at the same time the retracting spring 120 is compressed and the rock arm 121 elevated. As soon as the latter strikes the lower end of the adjusting screw 131 it will rock the arm 130 and thereby withdraw the rock arm 128 against the tension of the spring 143 from its engagement upon the roller wrist 127. This frees the rock arm 123 and the power spring 133 being under tension will impart a sudden movement to the vibrating arm 125, which through the medium of the ratchet wheel and connection with the armature shaft will quickly revolve the armature and thereby generate an electric current which is transmitted through a grounded conductor 144 to

the electro-magnet 77 and trips the stop 45. The rock arm 121 remains elevated until the train has entirely passed over the track lever, when the spring 120 being under compression will restore the parts gradually to their normal position. During such action it will be seen that the rock arm 134 by bearing upon the loose arm 123 will carry the latter back into its normal position thereby renewing the tension of the spring 133 while the arm 128 is drawn into engagement, by its spring with the roller wrist 127, thus restoring all the parts back to their normal position.

In combining the different devices which I have now described into a system, they are arranged as shown in Fig. 1 in connection with two semaphore signals Nos. 2 and 3 placed along the track C which is supposed to be one of the two tracks of a double track road, and on which the trains are supposed to run in the direction of the arrow.

The signals Nos. 2 and 3 are at the beginning of two succeeding blocks and in advance of each is placed at a distance of about fifty feet more or less, one generator of the description B while another generator of the description A is placed beyond the signal at a distance equal to the whole length of the block plus two thousand feet more or less, thus placing the same beyond the next succeeding signal. The circuit 144 from the generator stand B is connected to the electro-magnet 65 of the signal with a return circuit preferably arranged through the ground. The circuit 115 from the generator stand A is connected to the electro-magnet 77 of the signal, the return circuit being made preferably through the ground. The parts being thus arranged and constructed as described and shown they are adapted to operate as follows:

When no train is on the track all the signals are at safety and the signal actuating mechanism is in the normal position shown in Fig. 4. As soon as a train approaches and strikes the track-lever of the generator B in advance of signal No. 2, it will generate a current which will energize the electro-magnet 65. Referring to detail drawing (Fig. 4) it will be seen that the armature of this magnet engages the rock arm 61 and thereby holds the coupling hook 43 in engagement with the roller wrist 41. In this position it will be noticed that the spring 56 is under compression and therefore if the armature is attracted by the magnet 65 it will free the rock arm 61, and the spring 56 acting through the bell crank 54 will press against the roller wrist 51 of the tripping arm 49. This arm bears against the heel 48 of the coupling hook and therefore the hook being only held in position by the inferior power of the small coil spring 50 will be disengaged from the roller wrist 41 and thus dissolve the coupling between the upper and the lower sections of the connecting rod. The upper section of the connecting rod is thus freed and is moved upward a short distance until the nut 24 strikes against the bearing 23 by the spring 28 which has been under compression. The semaphore is thus moved to "block" and the parts are now in the position shown in Fig. 3. This action of setting the signal to "block" will take place before the entrance of the train into the block. Simultaneously with this throwing off of the hook, the stop 45 will be moved automatically underneath the wrist 42 by the spring 69 which has been under compression. Thus the upper section of the connecting rod after having moved the semaphore to "block" is locked into position. The stop 45 is also locked in position at the same time by means of its arm 70 which is moved to engage with its roller 71 into the bifurcated arm 72 thereby rocking the same on its shaft and carrying the arm 74 into engagement with the notch on the armature of the magnet 77. As soon as a train now arrives at the signal proper it will actuate the track lever 7 of the signal and impart an upward movement to the lower section of the connecting rod 12, through the medium of the spring 14 which cushions the blow struck by the wheel. This upper movement of the connecting rod 12 accomplishes first the compression of the signal actuating spring 16 and furthermore carries the coupling hook upward till it is sufficiently raised to enable it to engage with the roller wrist 41. The coupling of the hook with roller wrist 41 is brought about by the tension of the spring 50 which is enabled to rock the coupling hook upon its pivot by reason of the tripping arm 49 being simultaneously moved out of the way of the heel 48 of the hook by its engagement on the inclined guide bearing 52, and at the same time the bell crank 54 is rocked upon its pivot by the roller wrist 51 also impinging against one arm thereof, and this compels the engagement of the rock arm 61 with the armature 63 and the electro-magnet 65. Further, the upward movement of the lower section of the connecting rod 12 which accomplishes its coupling with the upper section also compresses the spring 68, and relieves the spring 69 by reason of the guide bearing 67 moving with the connecting rod 12. Thus the stop is placed in a condition to be tripped by the spring 68. The parts are now in the position shown in Fig. 6 from which it will be seen that the two parts of the connecting rod are not only coupled but are locked in position by the stop 45 holding the actuating spring 16 under compression while no change has taken place in the position of the signal. While the train is now passing through the block the signal No. 2 remains at "block" and no changes take place until the train arrives at the generator A beyond the next succeeding signal. This signal No. 3 however has by this time actuated in the same manner as signal No. 2. As soon as the train strikes the generator stand A belonging to signal No. 2 it will actuate its track lever 140 but the current will not be generated until

the train has passed over it, as has been explained heretofore. The mechanical means by which the operation of the generator A is thus delayed, I shall call a "delay;" its object is to allow the train to pass beyond the generator before the latter operates. The circuit from this generator stand energizes magnet 77 of signal No. 2, and by attracting the armature 76 releases the arm 74 and frees the arm 70 from its engagement with the forked rock arm 72. The spring 68 being under compression then acts to rock the stop 45 upon its pivot and moves it from underneath the roller wrist 42. The whole of the connecting rod is thereby free to move downward and will be so moved by the compression of the actuating spring 16 until the parts have moved into the normal position shown in Fig. 4 with the signal at "safety." It will be observed also that by this movement of the connecting rod, the spring 30 has been put under compression by the power of the spring 16 combined with the weight of the parts and at the same time the spring 69 has been put under compression to move the stop 45 as soon as the wrist 42 which is now in its way is moved up again at the next actuation of the signal by another train following.

I will now proceed to describe the safety attachments referred to hereinbefore. The mechanical safety attachment shown in connection with Fig. 7, does not come into operation except when the generator stand B should fail to trip the electric lock, whereby the signal would remain at "safety," and would therefore fail to notify a succeeding train. In this case the train in approaching the signal would find the actuating mechanism of the signal in the relative positions shown in Fig. 7, that is, with the hook still engaged upon the roller wrist 41, and with the catch 78 tripped rearwardly by the impingement of the roller against the projection 86. The result would be that if the train in passing the signal now elevated the connecting rod 12 the pin 80 of the spring arm 78 would engage under the overhanging end of the latch 81 and would thereby be pushed still farther rearward and draw the hook with it, thus releasing it from engagement with the roller 41 and allowing the upper section of the connecting rod to move the signal to danger. The connecting rod 12 then in falling back again would carry the hook with it and the pin 80 of the spring arm would be engaged by the latch 84 and thus be permanently engaged and held rearwardly, whereby the hook may be repeatedly raised by the track lever as each wheel strikes it without the hook being able to engage upon the roller wrist. The signal mechanism of course is now rendered inoperative and the parts disabled must be repaired; the arm 78 can be readily released from its engagement as the part 84 is pivotally secured.

In the regular operation when the hook 43 is moved up from the position shown in Fig. 4 into the position shown in Fig. 5, the arm 78 is held by its spring against the back of the hook as shown in full lines in Fig. 8, and the pin 80 cannot engage with the latch 81, and when it moves down again into the position shown in Fig. 4, the pin 80 strikes on top of the latch 81 and moves the latter and the latch 84 easily out of the way.

The electric safety device which I employ consists of an electric break in the circuit of the generator A, an electric lock for the movable contact of the break and means for tripping the same by a current impulse from the generator B. This break comprises the following construction and arrangement of parts shown in detail in Fig. 14 in full lines.

Within the casing of generator A is pivotally secured to a frame 120 the contact lever 121 one end of which carries a pin or roller 122 which engages on the under side of the rock arm 90, a suitable offset 93 being secured to or formed on said rock arm. This contact lever is adapted to make and break contact with two spring jacks 124 125 which constitute a break in the conductor 115 of the generator, by means of an insulated metal bridge 126 pivotally secured to the contact lever 121 and adapted to be drawn in contact with the spring jacks by a spring 127. The contact lever is adapted to be withheld from closing the contacts by engaging with its free end on an offset 128 formed on the latch bar 129 which carries an armature adapted for the electro-magnet 130. This electro-magnet is adapted to be energized by the current generated in the generator stand B, through a conductor 131 the terminals of which are grounded, leading from each generator stand B to the next succeeding generator stand A as shown in Fig. 1. The latch bar 129 is adapted to be engaged, when attracted by the magnet 130, on an off-set 132 formed on the latch bar 133, and the latch bar 133 is adapted to be moved out of engagement therewith by a sliding rod 134 held in suitable guide bearings on the frame. The sliding rod 134 is adapted to be moved by the lever 135 pivotally secured to the frame and provided at its opposite end with an adjustable screw 136 the lower end of which is adapted to be struck by the rock arm 90 in the operation of the latter.

The parts being arranged as shown and described they are intended to operate as follows: The normal position of the parts is the one shown in Fig. 14, therefore at the moment a current is generated by B as the train strikes its track lever the magnet 130 in A is energized and attracting thereby its armature it will engage the latch bar 129 on the shoulder 132 of the latch bar 133 thereby freeing the contact lever 121 from its engagement on the latch bar 129. The train in actuating then, in the manner described, the generator A next succeeding, will permit the contact lever 121 to close the break in the conductor 115 as soon as the rock bar 90 is pushed upwardly by its connecting rod, the current gen-

erated therefor at A will be transmitted to the signal with which it is connected and set it to safety. At the same time the rock arm 90 strikes against the end of the screw 136 thereby depressing the sliding rod 134 and latch bar 133 which thereby disengages the latch bar 129 and allows it to go back to its normal position. The contact lever 121 is returned to its normal position by the rock arm 90. Without this safety attachment the following state of things might occur.

Suppose a train from any cause should have to stop before it has entirely passed over the track lever of the generator A and then after a sufficient pause start up again, the generator A would transmit a second current impulse generated by the same train to the signal with which it is connected. Now supposing a new train had already entered the block before this second current impulse is transmitted it would set the signal to safety and thus allow a third train to advance into the block while the second train may still be detained; the system would thus fail under these conditions, exceptional as they may be, to do its duty. With my safety attachment however this cannot occur as the generator A after having transmitted one current impulse to the signal with which it is connected cannot transmit a second one unless a train has first passed over B which controls the break in the circuit.

My attachment will also operate as a safety device when a similar condition is created as above described by a train breaking in two. It will be seen that this electric safety device forms an integral part for itself and is adapted for both generators, and, if it should be desired to use in my system only generators of one kind, either of the construction A or of the construction B (which is perfectly permissible by adjusting them in relation to the signal so as to operate the signal at the proper time) the safety device may be combined with either generator to be operated by the respective rock arms 90 or 121 thereof.

The electric conductors connecting the generators with themselves and with the signals may be carried on poles in the ordinary manner, and if there is any danger of induction from proximity with other lines I preferably apply to the generator not so provided the circuit breaking device that is the contact lever 121 and jack springs 124, 125 shown in Fig. 14, whereby the lines are kept normally open.

The advantages of my system are:

First, when the signal is in its normal condition of safety the signal mechanism has the force or power stored in it which brings the signal to danger, therefore in case of any break down in the signal mechanism itself, with the exception of a few parts, the signal would set itself to danger and this feature has been indorsed by practical railroad men as a very decided improvement in signals of this kind.

Second, the signal cannot be operated by hand or push cars going over the track, as the weight of such cars is not sufficient to actuate the track levers of either the signal or the generators, the spring which upholds the rail being made sufficiently strong to require the weight of a locomotive or heavy car to press it down.

Third, there are no primary batteries, generators or motors, of any kind as the power for operating my system is altogether derived from the movement of the train which the signal is intended to control.

Fourth, the signal is essentially a mechanical one, electrical currents are employed merely to trip certain mechanical devices (or what I have called electric locks) and the power required to do this is so very small that it is always ample to do its work.

Fifth, the only electric conductor of any length is the one from the generator stand A to the signal preceding the last one, but this conductor if provided with the safety attachment has a normally open break and no earth currents or induced currents can have any effect. If the electric safety device is omitted the contact lever 121 in connection with the spring jacks 124, 125 can be added to the mechanism of the generator to keep the lines normally open.

Sixth, everything is housed and protected from injury by malicious tampering as well as from the weather.

Seventh, the failure of one signal mechanism to operate properly does not render the system as a whole inoperative, local calamities such as floods therefore disable the system only locally.

Obvious modifications may be applied to my construction, such as substituting for some of the springs, the action of gravity or other equivalent force, this may be done for instance by substituting for the spring 28 a weight such as making the counterweight 4 of the semaphore correspondingly heavier.

What I claim as my invention is—

1. The combination with a semaphore, of a connecting rod composed of an independently movable upper section adapted to hold said semaphore in one position, and of an independently movable lower section constructed and adapted to automatically couple therewith and a spring on said lower section adapted to move the semaphore into its other position when the two sections are coupled together, substantially as described.

2. The combination with a semaphore, of a connecting rod composed of an independently movable upper section provided with a spring to move said semaphore into one position and hold it there, and of an independently movable lower section provided with a spring and a coupling device, whereby when the two sections are coupled together the lower section is adapted to move and hold said semaphore in its other position, substantially as described.

3. The combination with a semaphore and its actuating connecting rod composed of an independently movable upper section constructed to move the semaphore into one position, and of an independently movable lower section constructed and adapted to couple with said upper section and move the semaphore into its other position and hold it there, of means operated by the passing train to raise said lower section of the connecting rod to couple it with the upper section, and an automatic stop adapted to uphold it in such raised position, substantially as described.

4. The combination with a semaphore and its actuating connecting rod composed of an independently movable upper section constructed and adapted to move the semaphore into one position, of an independently movable lower section constructed and adapted to couple with said upper section and move the semaphore into its other position and hold it there, of means operated by the passing train to raise said lower section of the connecting rod to couple it with the upper section, an automatic stop adapted to uphold it in such position, and means for tripping such stop, substantially as described.

5. The combination with a semaphore and its actuating connecting rod composed of an independently movable upper section constructed and adapted to move the semaphore into one position and of an independently movable lower section constructed and adapted to move the semaphore into its other position, and hold it there when the two sections act united together, of automatic coupling means on the two sections, means operated by the passing train to raise the lower section into coupling engagement with the upper section, an automatic stop adapted to uphold it in such position, means for tripping said stop and means for tripping said coupling, substantially as described.

6. The combination with a semaphore and its actuating connecting rod composed of an independently movable upper section constructed and adapted to move the semaphore into its other position and hold it there when the two sections act united, of an automatic coupling uniting the two sections, a tripping device for said coupling and an electric lock controlling such tripping device, substantially as described.

7. The combination with a semaphore and its actuating connecting rod composed of an independently movable upper section constructed and adapted to move the semaphore into one position and of an independently movable lower section constructed and adapted to move the semaphore into its other position and hold it there when the two sections act united, of automatic coupling means on the two sections, means operated by the passing train to raise the lower section to cause it to couple with the upper section, an automatic stop to uphold the sections when coupled together, a tripping device for such stop and an electric lock controlling such tripping device, substantially as described.

8. The combination with a semaphore and its actuating connecting rod composed of an independently movable upper section constructed and adapted to move the semaphore into one position and hold it there and of an independently movable lower section constructed and adapted to move the semaphore into its other position and hold it there when the two sections act united, of an automatic coupling adapted to unite the two sections, means operated by a passing train to raise the lower section to cause it to couple with the upper section, an automatic stop adapted to uphold it, means for tripping said stop controlled by an electric lock and means for tripping the coupling controlled by an electric lock, substantially as described.

9. In a block signal system, the combination for each block, of a semaphore actuated by a connecting rod constructed and adapted to move said semaphore from its position of danger to a position of safety by mechanical power received and stored from an impulse of the train in passing said semaphore, an electric lock controlling the release of said power, an electro-magnetic generator in circuit therewith, mechanism for operating said generator by an impulse derived from the passage of the train at such generator and a delay in said mechanism, substantially as described.

10. In a block signal system, the combination for each block of a semaphore actuated by a connecting rod constructed and adapted to move said semaphore from its position of danger to a position of safety by mechanical power received and stored from an impulse of the train in passing said semaphore, an electric lock controlling the release of said power, a circuit extending from said electric lock to a predetermined point in the track beyond the next succeeding semaphore, means for transmitting a current through said circuit to operate the lock by the passing of the train at such point and a normally open break in said circuit electrically controlled by the passing of the train at a preceding point in the track, substantially as described.

11. In a block signal system, the combination for each block, of a semaphore actuated by a connecting rod constructed and adapted to move said semaphore from its position of danger to a position of safety by mechanical power received and stored from an impulse of the train in passing said semaphore, an electric lock controlling the release of such power, an electric generator at a point beyond the next succeeding semaphore and provided with means for operating the same by an impulse from the passing train, said means being provided with a delay, and an electric circuit for transmitting the current generated to operate the electric lock, said circuit being provided with a normally open break controlled by the passing of the train at a preceding point in the track, substantially as described.

12. In a block signal system, the combination of a semaphore, an actuating connecting rod composed of independently movable upper and lower sections provided with an automatic coupling device, a spring on the lower section adapted to move the semaphore into its other position when the sections are coupled, means to raise said lower section by an impulse from the passing train to compress its spring and couple it with the upper section, a stop adapted to automatically engage with and hold the upper section of the connecting rod in position and an automatic releasing device for such stop controlled by an electric lock operated by the passage of the train at a predetermined point, substantially as described.

13. In a block signal system, the combination of a semaphore, an actuating connecting rod composed of independently movable upper and lower sections provided with an automatic coupling device, a spring on the lower section adapted to move the semaphore into its other position when the sections are coupled, means on the track whereby an impulse from the passing train raises said lower section to compress its spring and couple it with the upper section, a stop adapted to automatically engage with and hold the upper section in position, an automatic tripping device for the stop controlled by an electric lock operated by the passage of the train at a predetermined point beyond the semaphore and an automatic releasing device for the coupling controlled by an electric lock operated by the passage of the train in advance of the semaphore, substantially as described.

14. In a block signal system, the combination of a semaphore an actuating connecting rod composed of independently movable upper and lower sections provided with an automatic coupling device, a spring on the lower section adapted to move the semaphore into its normal position of safety when the sections are coupled together, a spring or its equivalent on the upper section adapted to move the semaphore to danger when the sections are uncoupled, means to raise the lower section by an impulse from the passing train to compress its spring and couple it with the upper section, a stop adapted to automatically engage with and hold the upper section of the connecting rod in position, an automatic tripping device for the stop controlled by an electric lock, an electric generator at a point beyond the next succeeding semaphore for operating said lock by an impulse from the passage of the train, an automatic tripping device for the coupling controlled by an electric lock and an electric generator at a point in advance of the semaphore for operating said tripping device by the passage of the train, substantially as described.

15. The combination with the semaphore and its actuating connecting rod composed of an independently movable upper section adapted to move the signal into one position and of an independently movable lower section adapted to hold the semaphore in its other position when coupled therewith, of the hook 43 on the lower section, the roller wrist 41 on the upper section, with which said hook is adapted to couple, the spring arm 78 pivotally secured to the hook, and the latches 81, 84, adapted to engage with the spring arm 78 to trip the hook as a safety device, substantially as described.

16. The combination with the semaphore and its actuating connecting rod composed of the independently movable sections 30 and 12, of the spring 28 on the upper section adapted to move the signal into one position, the spring 16 on the lower section adapted to move the signal into its other position when the sections are coupled together, the automatic coupling device comprising the roller wrist 41 and coupling hook 43, the tripping arm 49 on the coupling hook, the electric lock for such tripping arm comprising the parts 54, 56, 61 63 and 65, the automatic stop 45 and the tripping device therefor comprising the parts 66, 67, 68 69, 70, 74 and 75, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EUGENE FONTAINE.

Witnesses:
M. B. O'DOGHERTY,
N. L. LINDOP.