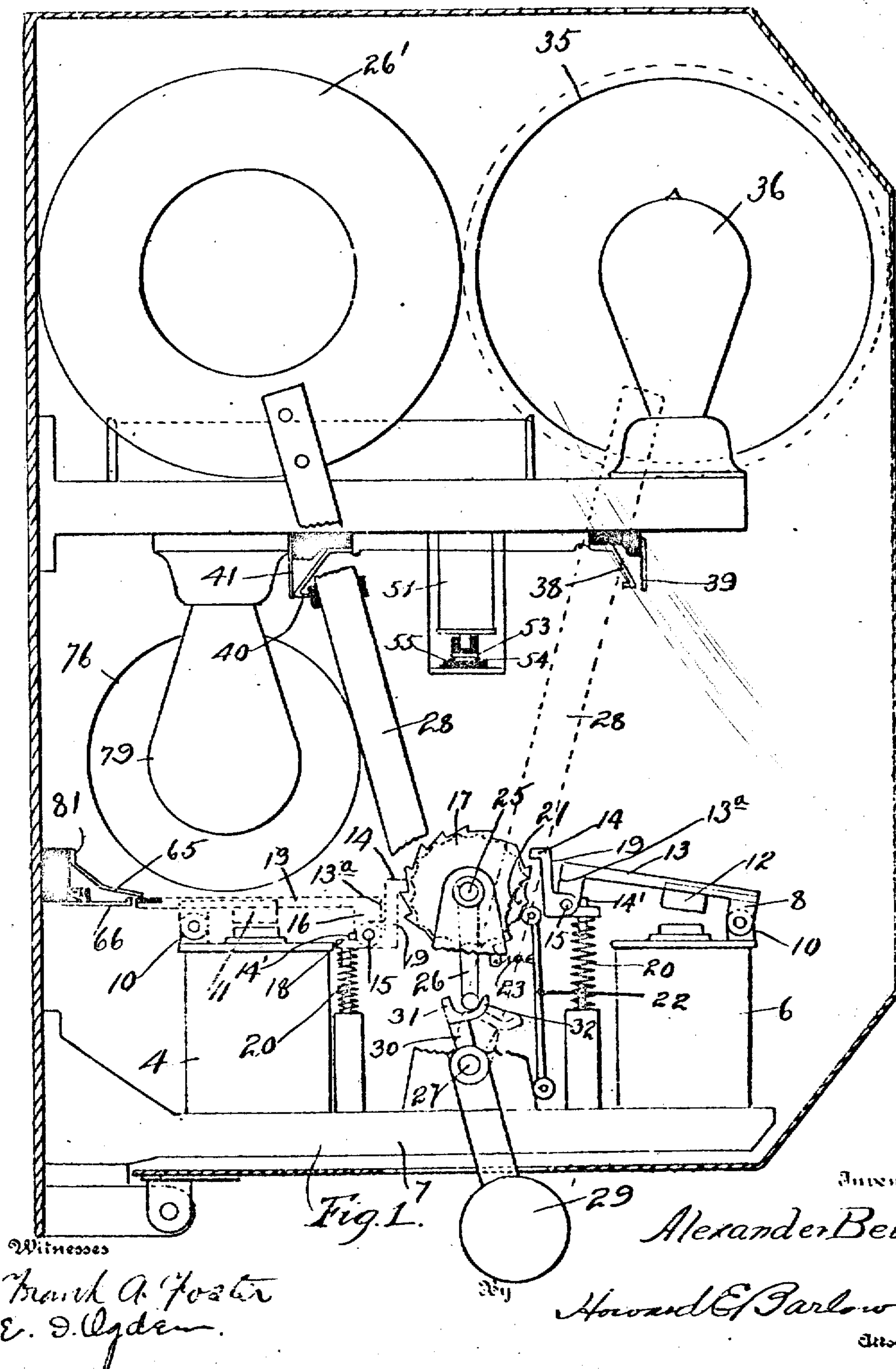


899,153.

A. BEVAN.
BLOCK SIGNAL APPARATUS.
APPLICATION FILED DEC. 3, 1906.

Patented Sept. 22, 1908.

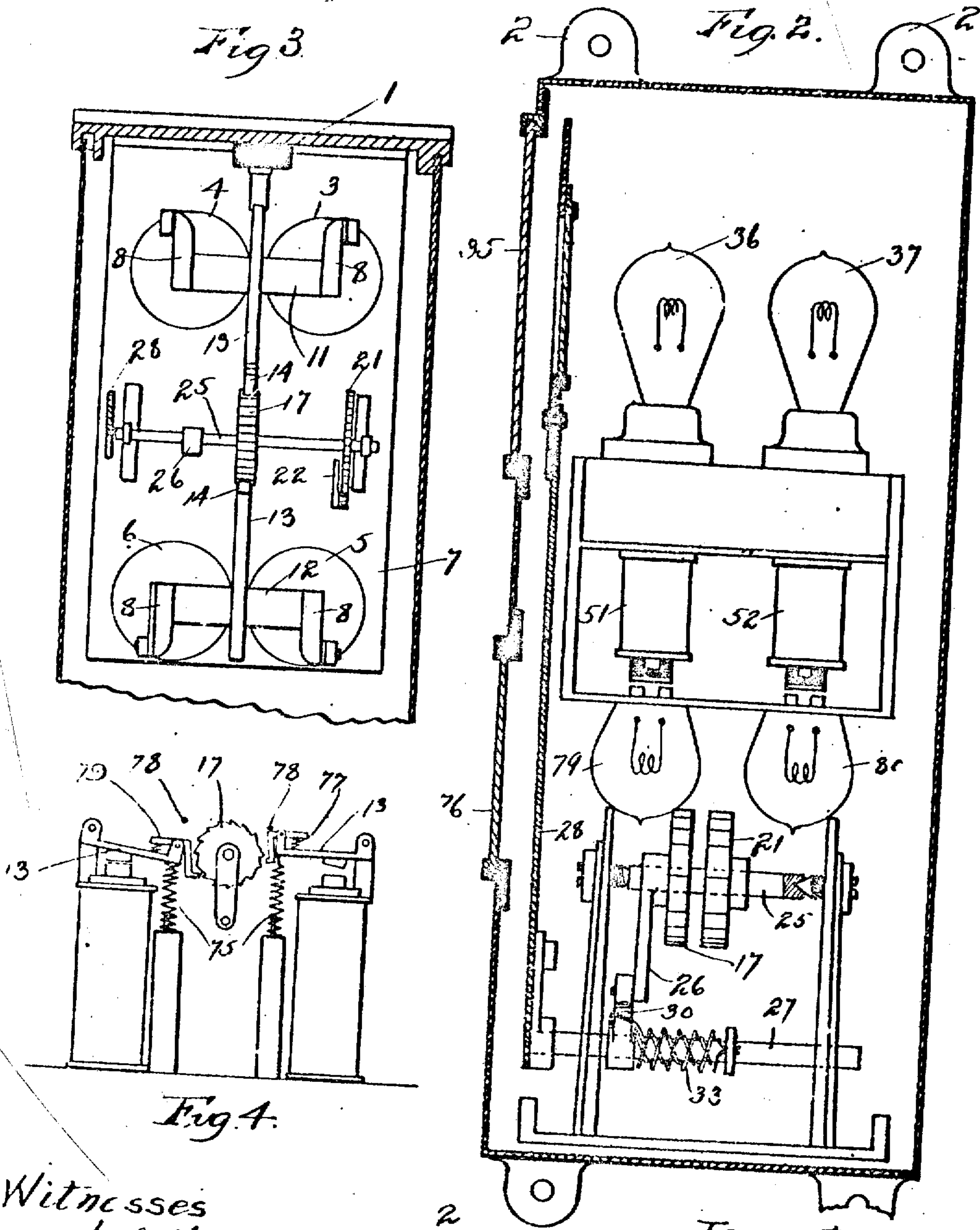
4 SHEETS-SHEET 1.



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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

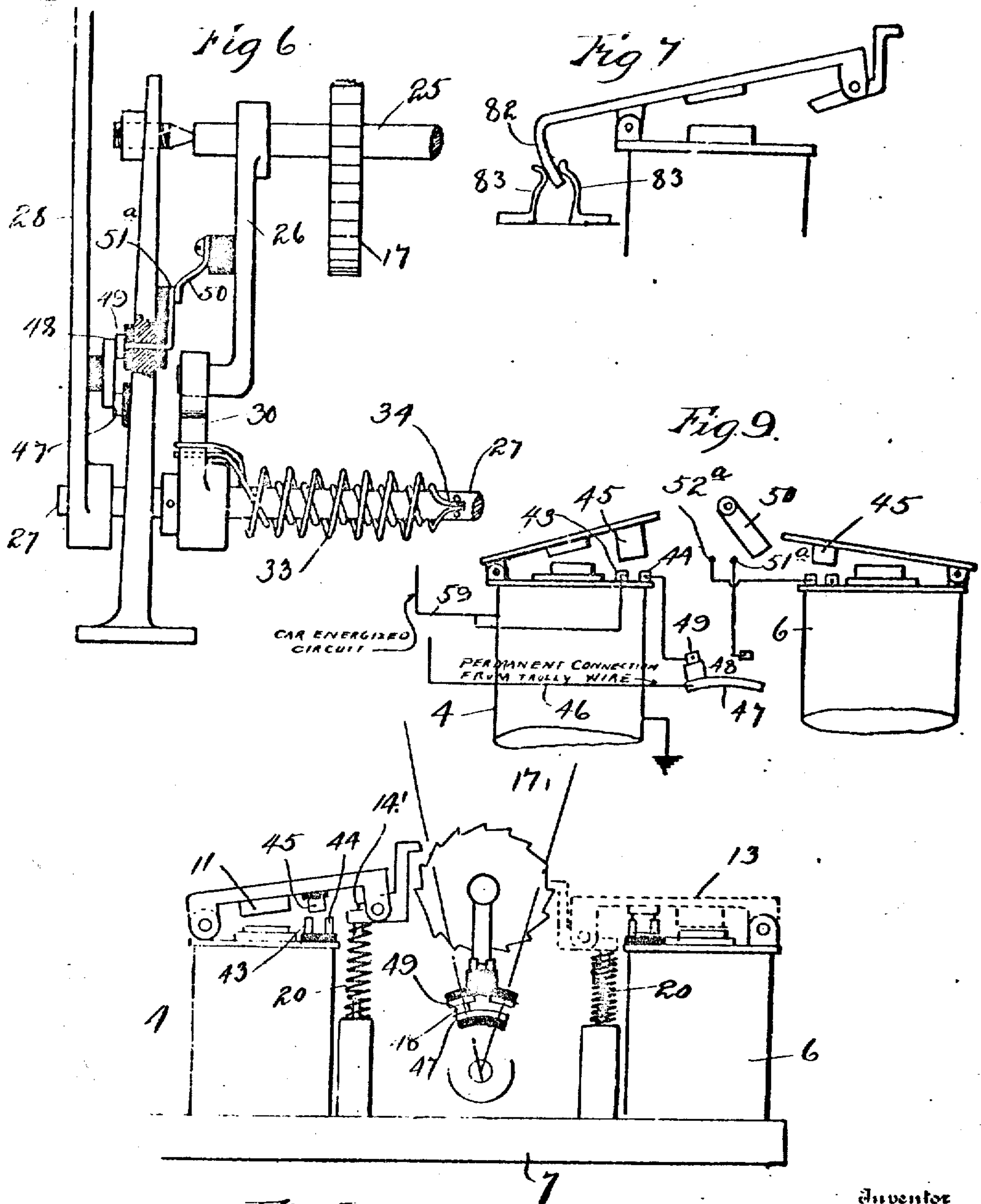


Fig. 5

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4 SHEETS--SHEET 4.

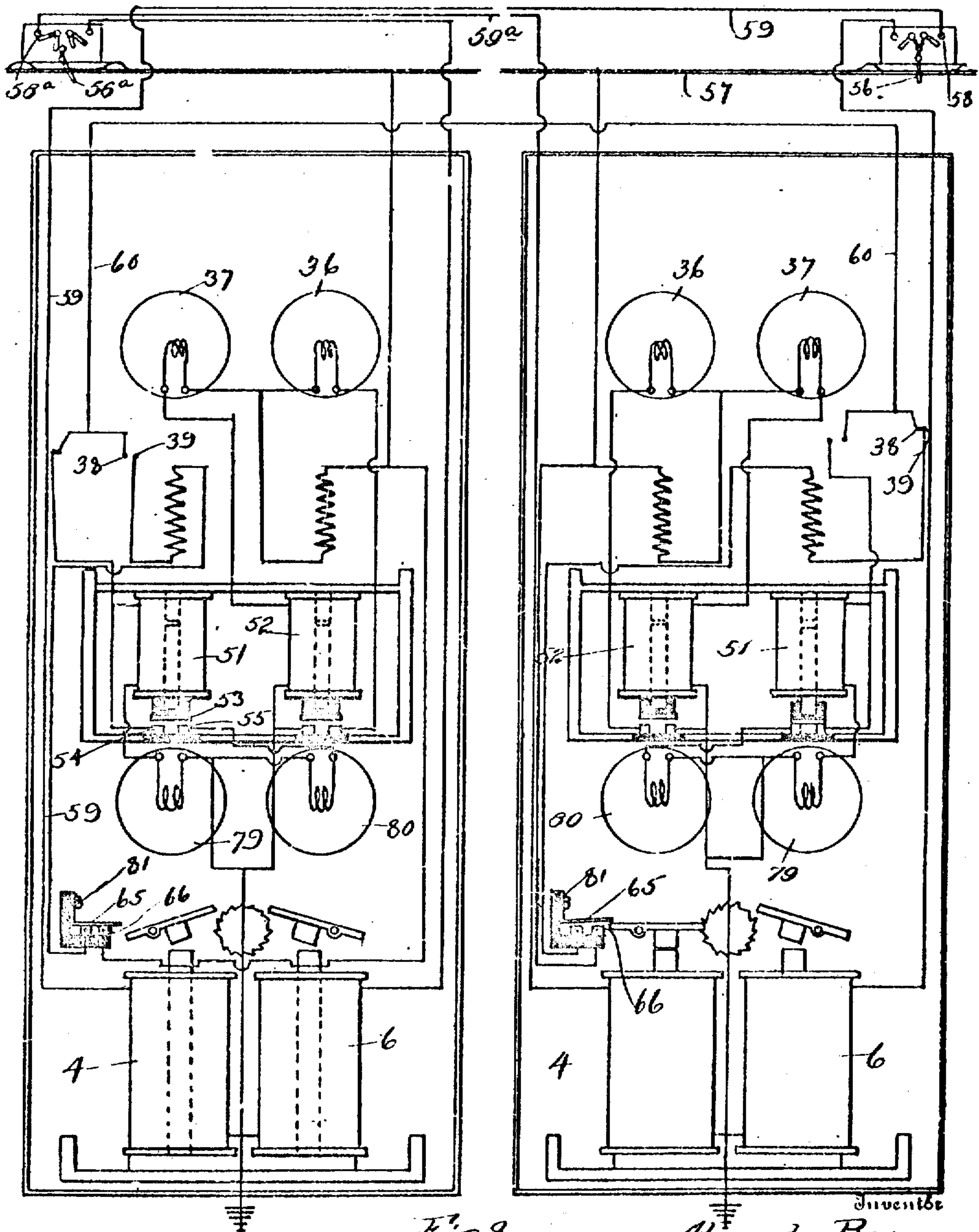


Fig. 8.

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BLOCK-SIGNAL APPARATUS.

No. 899,153.

Specification of Letters Patent.

Patented Sept. 22, 1908.

Application filed December 3, 1906. Serial No. 346,001.

To all whom it may concern:

Be it known that I, ALEXANDER BEVAN, citizen of the United States, residing at the city of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Block-Signal Apparatus, of which the following is a specification, reference being had therein to the accompanying drawing.

10 My invention relates to railway block signaling systems, and has for its object to provide an improved device of simple, durable and practical construction and one that will be most effective as an electrically operated railway block signaling system in which the signals will be actuated automatically by a passing car to indicate the presence or absence of other cars on the track sections or blocks, signals being so arranged that they will indicate to a car entering the block whether or not the track is clear ahead, and in which direction a car or cars may be moving in the block.

25 This signaling system is particularly adapted for use on a single track road with turnouts, each section of single track constituting what is known as a "block"; each end of each section being provided with a signaling apparatus both of which apparatus are actuated alternately to set the necessary signals when a car enters an empty block and to restore said signals to normal conditions when the last car leaves the block.

35 A feature of my improved device is the manner of supporting and operating the target, the same being fixed to the upper end of an oscillating arm, the center of gravity of said target passing over the pivotal point in moving from the clear to the danger position and vice versa. I do not confine myself however to this particular arrangement, as the target may be counterbalanced and suspended from above to swing like a pendulum from its point of support. In either one of the above arrangements the target is moved in either direction only by a passing car and not by gravity as is the case of most signals of this character.

50 When the gravity target is held by an electromagnet in its clear position it may be found in the danger position not only when a car is in the block but also if the wiring becomes defective, or if for any cause the current is shut off from its supporting magnet deenergizing the same. The above objection is obviated in the present construction as it is

impossible for the danger signal to move except that a car operates the same in entering the block; the last car on leaving the block carries the target back to the clear or normal position indicating that the track is unoccupied.

Another feature of the invention is that the mechanism controlling the flashing or momentary extinguishing of the lamp is so arranged that this flash can only occur when the actuating mechanism has fully completed its operating movement, and not at the beginning of the movement as in other constructions. The flash is thus positive evidence that the signal has properly operated.

In the ordinary construction of targets of this character one set of magnets is operated to control the counting mechanism and through it to operate a set of secondary magnets, which in turn control the movement of the target. By this improved construction I have eliminated the secondary magnets, causing the primary magnets to not only operate the counting mechanism but to also operate the target as well. These actuating magnets are energized by the current from the trolley wire and owing to the great but unavoidable variation in the intensity of the current the target when operated directly by the electro-magnets is sometimes thrown with great force while at other times it would be scarcely moved at all. Such lack of uniformity obviously would prove fatal to the successful working of a device operated in this manner. It is therefore found advisable to employ an auxiliary mechanism which is first operated by the said magnets and which in turn operates to move the target with the desired speed and certainty.

The invention consists of other novel features as will be fully described hereinafter and then pointed out in the appended claims.

100 A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

105 In the drawings: Figure 1—is a side elevation of my improved device one side of the casing being removed. Fig. 2—is an end view of the device in section. Fig. 3—is a plan view showing the counting mechanism and arrangement of magnets which operate the same. Fig. 4—illustrates a

form of target actuating mechanism whereby the quick movement of the magnets is caused to act on a spring or its equivalent to compress the same allowing the re-action of said spring through suitable mechanism to move the target with a comparatively slow and uniform motion. Fig. 5—is an electrically operated mechanism in side elevation, showing means whereby the period of action of the initial current on the magnets may be prolonged until the semaphore has been thrown to a predetermined point before said current is cut off. Fig. 6—is an end elevation showing the relative position of the electrically operated mechanism. Fig. 7—is a detail illustrating one form of mechanism by which the flashing of the lamps may be produced which is that of a prolonged wiping contact carried by the moving parts. Fig. 8—is a diagrammatic view of the general wiring of the system. Fig. 9—is a diagram of wiring of the mechanism shown in Fig. 5.

Referring to the drawings, at 1 is the base to which is secured the signal operating mechanism. Suitable fastening means, such as ears 2—2, are provided on either end of this base by which the same may be secured in position on a pole or other convenient place to display the signals. At 3 and 4 is represented a pair of electro-magnets which work together upon a single armature 11, and are energized by the incoming cars. At 5 and 6 is another similar pair of magnets which act upon another armature 12 and are operated by the outgoing cars. All four of these magnets are supported on the bracket 7, which bracket is bolted to the base to support this mechanism. These armatures are made in a bar form and are preferably mounted on rearwardly extending arms that are provided with ears 8—8 hinged to brackets 10—10 on the magnets that control the same.

Supporting the armature 11 (see Fig. 1) is the member 13 on the outer end of which is the knee lever shaped pawl 14 pivotally hung at 15 on the downwardly extending ear 16. The upper end of this pawl 14 is turned outward so as to engage the teeth of the ratchet 17. The lower end of this pawl is arranged to extend backward at 18 on the opposite side of the pivot point 15 from its engaging end, said rearwardly projecting portion being acted upon by a spring 20 that serves to press the end upward against the stop pin 14' and swing forward said engaging end 14 so as to catch the teeth of the ratchet and rotate the same when said pawl is drawn downward by the energizing of the magnets 3 and 4. Another feature in the construction of this pawl is that its upright portion 19 is backed up at 13* by the end of the member on which it is hung, thus preventing the pawl from swinging backward while engaging a portion

of the ratchet wheel, forming a positive stop and making it impossible for the ratchet wheel to turn more than one tooth at a time when drawn quickly down by the magnet. A duplicate set of mechanism supports the armature 12 and is operated by the other pair of magnets 5 and 6. The said ratchet wheel 17 is arranged so that the teeth on its opposite halves stand in opposite directions, the same being mounted on and fixed to an oscillating shaft 25 on which is also mounted and fixed the detent 21 and the target operating lever 26. The detent pawl 22 is held against the detent wheel 21 by the tension spring 23 preventing the wheel from turning in either direction when the ratchets are not engaged by either of the pawls.

In my present construction I have shown the target 26' as preferably made in the form to resemble a banjo, and as provided with a single disk in the center of which is a transparent red material with a broad outer rim or border also colored red, the center being to show the color by night and the rim or border to display the danger signal by day and is arranged to show to a car entering the block, through the aperture 35 in the casing. This target is pivoted on the oscillating shaft 27 near the lower end of its arm 28, said target being supported so that the center of gravity moves across the vertical line drawn through its point of support in moving from the danger to the safety position, and vice versa. The target may be partially counterbalanced as at 29 (see Fig. 1) if desired, so that it may be moved more easily from one position to the other, and a dash-pot or other cushioning device may be employed to stop the target gradually as it approaches the end of its stroke in either direction.

At 30 is an arm loosely mounted on the shaft 27. The upper end of this arm has upwardly extending projections 31 and 32 which projections are engaged by the target operating lever 26 to oscillate the shaft 27 and move the target in the manner hereinafter more fully described. At 33 is a double coil spring wound on the shaft 27 (see Fig. 6) one end of each of these springs being connected to the lever 30, the opposite ends being connected as at 34 to the shaft 27.

The purpose of these springs is to absorb the shock of the quick impulse of the operating magnet so that when the armature is drawn quickly downward by the magnet it acts on these coiled springs through the ratchet 17, lever 26 and arm 30 and exerts a flexible tension on the shaft 27 which in turn acts on the target through its arm 28 to throw it easily from one position to the other.

In addition to the mechanism illustrated in Fig. 1 I have arranged a device as illustrated in Figs. 5 and 9 for continuing the application of the current to the actuating

magnets until the target has reached a predetermined point in its movement from one position to the other, which is accomplished in the following manner:

5 A car entering the block from the right completes the circuit through wire 59 to energize magnets 3 and 4 drawing armature 11 downward causing blade 45 to bridge terminals 43 and 44. At 47 is a terminal permanently connected with the trolley wire
10 through wire 46, and at 48 is a spring finger attached to the target arm connecting terminals 47 and 49 (which latter terminal is connected to terminal 44), thus completing a
15 secondary circuit to magnets 3 and 4 that continues until the target has moved and carried finger 48 to the right to break this connection, which break however does not occur until the target has nearly completed
20 its stroke.

The cars in leaving the block operate magnets 5 and 6 which are also connected up with a double circuit corresponding to that operating magnets 3 and 4. In providing
25 for more than one car to enter the block an auxiliary pair of terminals 51 and 52 are introduced into the secondary circuit of magnets 5 and 6 which terminals are bridged by the positioning of the swinging spring finger
30 50 which is operated by the counting mechanism and is brought into contact with said terminals only when the last car leaves the block.

Fig. 4 illustrates a modification by which
35 the counting mechanism and the target are operated by purely mechanically actuated mechanism with a speed entirely independent of that of the magnets. In this construction the pivoted members 13, together
40 with the engaging pawls are inverted so that when one of said members is drawn downward by a sudden impulse of the energized magnet the spring 75 is compressed and as soon as the current is shut off from said mag-
45 net said spring carries the pawl upward to engage and rotate the ratchet wheel 17 and throw the target to the opposite end of its stroke with a speed entirely independent of that of the electro-magnet, which speed may
50 be controlled by adjustment of the spring tension or by any other suitable means.

The small spring 77 acts on the pawl to draw the end 79^a downward and throw its engaging end outward to catch on the teeth
55 of the ratchet as the member 13 is forced upward by the spring 75. As soon as the pawl nears the end of its upward stroke it encounters the stop pin 78 and is thus disengaged from the tooth of the ratchet leaving
60 the same free to be turned in the opposite direction by the action of the magnet in its turn on the opposite side.

36 and 37 represent a pair of incandescent lamps that shine through the colored trans-
65 parent center of the target. But one of

these lamps is lighted at a time, the other being a reserve lamp which is automatically lighted by mechanism hereinafter described when the first light burns out or for any reason fails to light. At 38 is a spring finger
70 serving as a terminal which when the target is thrown to the danger position is carried back against the second terminal 39 by the pressure of the target arm 28, to complete the circuit to the trolley wire to light one of
75 the green or indicator lamps 79 and 80 in the box at the opposite end of the block by a system of wiring hereinafter described.

At 51 and 52 are two solenoid magnets that control the lighting of these extra or reserve
80 lamps. Solenoid 51 is connected in series with one of its pair of green lamps so that as the circuit which is normally open is completed through the lamp 79 the solenoid is energized and the core is held in its up or open
85 position. The core of each magnet 51—52 is provided with a cross-piece or contact bar 53 insulated in any preferred manner from the core and from the circuits. This cross-
90 piece will bridge the contact posts 54 and 55, establishing electrical connection between them to complete the circuit to the reserve lamp when the solenoid is deenergized by reason of the current failing, for any cause,
95 to pass through the lamp which was originally lighted, thus any failure of the current to pass through lamp 79 allows the solenoid core 51 to drop and automatically close the circuit to lamp 80. A corresponding condition exists with reference to the solenoid 52, which
100 is connected in series with the red lamp 36, so that when said lamp is burned out, the lamp 37 is automatically lighted, the circuit of lamp 36 being normally closed.

The operation of the apparatus and circuit
105 wiring of the system, as illustrated in Fig. 8, may be more fully described as follows: This system of signaling is more particularly adapted to be located at the turnouts of a
110 single track road, each section of single track constituting a "block", and at each end of this single track section is located a signal apparatus. When a car enters the block from the left the trolley wheel (not shown) comes in contact with and operates a switch
115 lever 56^a. This switch lever may be constructed in any desired form and mounted on or near the trolley wire 57 and is arranged to complete the circuit in either direction
120 through one or the other of the operating magnets, being actuated by the passing car. As the lever is thrown to the contact 58^a it makes a connection through wire 59^a (see Fig. 8) to energize the pair of setting magnets
125 3 and 4 and causes the actuating lever 26 to throw the target to the danger position, where it may be seen through the aperture 35 in the casing. As this target has reached its danger position it closes terminals 38 and 39 completing the electrical circuit to the green
130

lamp 79 in the box at the entering end of the block. The flashing switch 81 is held normally closed as illustrated at the left in Fig. 8, and is only opened to flash the green lamp, in which position it is shown at the right in Fig. 8. This green lamp is a cautionary signal and shows through the aperture 76 in the casing either day or night at the entering end of the block, to notify the car that the danger signal at the opposite end of the block has been set. This green light, as can be seen from the construction of the apparatus, can only be lighted when the danger signal is set at the opposite end of the block.

When more than one car enters the block from the same direction the pair of magnets 3 and 4 are energized and through the mechanism described above, turns the lever 26 a step each time a car enters after the signals have been set, and this finger is returned again by the clearing magnets 5 and 6 a step towards its normal position each time a car leaves the block, until but a single car remains on the block. When the last car passes out the lever 26 engages and throws the target through its flexible mechanism, above described, to the clear position at the same time extinguishing the green light in the box at the opposite end of the block.

Another feature of my invention is the construction by which the green lamp may be flashed only when the operating mechanism has fully operated and the target at the opposite end of the block is set to the danger position. There are various constructions for accomplishing this purpose, one of which is that illustrated in Fig. 1 whereby the last portion of the stroke of the target actuating mechanism serves to separate the terminals 65 and 66 to flash the lamp. Another mechanism for accomplishing this object is that illustrated in Fig. 7 whereby a prolonged and sliding contact is broken when the segment 82 breaks the connection between the terminals 83 at the last end of the stroke of the target actuating mechanism.

In either one of the cases illustrated it will be noted that by the arrangement of the mechanism the target must of necessity be in its danger position before said mechanism will break the circuit and cause the green lamp to flash.

In the operation of the system it will be seen that the danger signal at the distant end of the block is set first and then the signal at the entering end is set only after the signal at the distant end is in position. The signal at the entering end thus affords a true indication that the system is in working order, and that the signal at the distant end has been set to prevent the entrance of the car into the block from the opposite direction.

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

1. In a block signaling apparatus, the combination of a swinging target mounted upon an oscillatory shaft and retained in either the danger or safety position by gravity, said target being adapted to be moved from one side to the other of a vertical line through the point of support in moving from the danger to the safety position and vice versa, the center of gravity of said target being above its point of support, and electro-magnetic means for actuating said target through said shaft.

2. In a block signaling apparatus, the combination of a swinging target adapted to pass from one side to the other of a vertical line through the point of support in moving to and from its danger position, magnetically actuated means operated by the cars entering and leaving the block, and means whereby said actuated means is caused to move the target to the danger position when the first car enters the block and return the same when the last car leaves the block.

3. In a block signaling apparatus, the combination of a swinging target adapted to be moved from one side to the other of a vertical line through the point of support in moving from the danger to the safety position and vice versa, electro-magnets, a counting mechanism actuated by said magnets as a car enters or leaves the block, and means actuated by said counting mechanism to move the target when the first car enters and the last car leaves the block.

4. In a block signaling apparatus, the combination of a swinging target adapted to be moved from one side to the other of a vertical line through the point of support in moving from the danger to the safety position and vice versa, a shaft, a ratchet wheel mounted on said shaft, magnetically actuated means for oscillating said shaft, and means also mounted on said shaft for moving the target when the first and last cars enter and leave the block.

5. In a signaling apparatus, the combination of a target supported on a pivoted arm, and adapted to move each side of a vertical line through the point of support in passing to and from the danger position, a shaft, a ratchet wheel mounted on said shaft and magnetically actuated means for operating the ratchet wheel and a lever mounted on said shaft and adapted to act through said arm to move the target.

6. In a signaling apparatus, the combination of a pivotally supported target adapted to swing each side of a vertical line through its point of support, a shaft, a ratchet wheel and target actuating lever mounted on said shaft, magnetically actuated means for operating said ratchet wheel in opposite directions whereby said lever will move said target to and form its danger position.

7. In a signaling apparatus the combination of a swinging target adapted to be

moved each side of a vertical line through its point of support, a shaft, a ratchet wheel and target actuating lever mounted on said shaft, electro-magnets arranged on either side of said shaft and pawls pivoted to be actuated by said armatures and adapted to engage and operate said ratchet wheel in opposite directions whereby said lever will move said target to and from its danger position.

8. In a signaling apparatus, the combination of a target, a shaft, magnetically actuated means for oscillating said shaft with a step by step motion and flexible means interposed between said shaft and said target to serve in moving the same to and from its danger position.

9. In a signaling apparatus, the combination of a swinging target adapted to be moved each side of a vertical line through its point of support, a shaft, magnetically actuated means for oscillating said shaft, and flexible means interposed between said shaft and said target to move the same to and from its danger position.

10. In a signaling apparatus, the combination of a swinging target adapted to be moved each side of a vertical line through its point of support, a shaft, a ratchet wheel and target actuating lever mounted on said shaft, magnetically operated means for operating said ratchet wheel in opposite directions, flexible means interposed between said lever and said target through which the latter is moved to and from its danger position.

11. In a signaling apparatus the combination of a target, a shaft, a ratchet wheel and target actuating lever mounted on said shaft, an electro-magnet, a pivoted member, an armature supported thereon, a pawl pivoted on said member, a spring for carrying the end of the pawl into the engaging position, said pawl being arranged to engage the end of said member to prevent an excessive backward motion and form a stop for the ratchet preventing the same from rotating but one tooth at a time.

12. In a signaling apparatus the combination of a target, a shaft, a ratchet wheel and target actuating lever mounted on said shaft, an electro-magnet, a pivoted member, an armature supported thereon, a pawl pivoted on said member, a spring arranged to raise the armature and also to carry the end of the pawl into its engaging position, and means whereby said pawl forms a stop for the ratchet preventing the same from rotating but one tooth at a time.

13. In a signaling apparatus the combination of a target, a shaft, a ratchet wheel and target actuating lever mounted on said shaft, an electro-magnet, a pivoted member, an armature supported thereon, a pawl pivoted on said member, a spring arranged to act on said pawl to raise the armature and also to carry the end of the pawl into its engaging

position, and a stop engaged by said pawl to limit the same in its backward motion, thereby preventing the ratchet from rotating but one tooth at a time.

14. In a signaling apparatus, the combination of a target, an electro-magnet, means for closing a circuit through the coil of said magnet, means for automatically closing a second independent circuit through the same magnet coil whereby the full energy of said magnet may be prolonged.

15. In a signaling apparatus, the combination of a target, an electro-magnet, means including said magnet for operating said target, and means including a secondary circuit for prolonging the energy of said magnet until the target has reached a predetermined point in its travel.

16. In a signaling apparatus, the combination of a target, a magnet, an armature on said magnet, means including said magnet for operating said target, and means actuated by said armature for closing a second circuit through the coil of said magnet to prolong the energy of the same until said second circuit is broken by the movement of the target.

17. In a signaling apparatus, the combination of a target, a magnet, an armature on said magnet, means including said magnet for operating said target, means including a secondary circuit closed by said armature for prolonging the energy of said magnet, and means for deenergizing the magnet when the target has reached a predetermined point in its travel.

18. In a block signaling apparatus, the combination of a swinging target adapted to be moved from one side to the other of a vertical line from the center of support in moving from the danger to the safety position and vice versa, an electro-magnet, means including said magnet for operating said target, and means for prolonging the energy of said magnet until the target has reached a predetermined point in its travel.

19. In a signaling apparatus, the combination of a target, a magnet, an armature on said magnet, means including said magnet for operating said target, means operated by said armature for prolonging the energy of said magnet, means for deenergizing said magnet when the target has reached a predetermined point in its travel, and flexible means interposed between said actuating means and said target to absorb the initial shock.

20. In a signaling apparatus the combination of a target, a shaft, a ratchet wheel and means for operating said target mounted on said shaft, an electro-magnet arranged to operate on either side of said ratchet, means for operating one of said magnets each time a car enters the block and means for operating the other of said magnets each time a

car leaves the block, and means for prolonging the energy of one of said magnets only when the first car enters and the other of said magnets when the last car leaves the block.

5 21. In a signaling apparatus the combination of a target, a shaft, a ratchet wheel and means for operating said target mounted on said shaft, an electro-magnet arranged to operate on either side of said ratchet, means
10 for operating one of said magnets each time a car enters the block, means for operating the other magnet each time a car leaves the block, means for prolonging the energy of one of said magnets only when the first car
15 enters and the other of said magnets when the last car leaves the block, and means for deenergizing the magnets when the target has reached a predetermined point in its travel.

20 22. In a signaling apparatus, the combination of a target, a pair of magnets, an armature for each pair of magnets, and means actuated by the alternate movements of said armatures for moving said target to and
25 from its danger position at a speed independent of that of the armatures.

23. In a signaling apparatus the combination of a swinging target adapted to be moved each side of a vertical line through its
30 point of support, a magnet, an armature, and means actuated by the movement of said armature to throw said target to and from its danger position at a speed independent of that of the armature.

35 24. In a signaling apparatus the combination of a target, a magnet, an armature and spring actuated means operated by the armature to move the target to and from its danger position at a speed independent of
40 that of the armature.

25. In a block signaling system the combination of a swinging target adapted to be moved each side of a vertical line through its point of support, electro-magnetic means for
45 moving the target to and from its danger position, a lamp circuit normally open, and means whereby the movement of the target to its danger position closes said lamp circuit.

26. In a block signaling apparatus the

combination of a target, a magnet, an armature, a lamp circuit normally open, means
50 for closing said lamp circuit, and means for breaking said circuit at the end of the stroke of said armature as each car enters the block.

27. In a block signaling system the combination of a target, a magnet and armature
55 adapted to move said target to and from its danger position, a lamp circuit normally open, means whereby the movement of the target to the danger position closes said circuit and
60 means for breaking said circuit at the end of the stroke of said armature as each car enters the block.

28. In a block signaling system, a target, electro-magnetic means for throwing the target
65 to and from its danger position, a lamp circuit normally open, means for closing the lamp circuit when the target is moved to the danger position, and means for opening and closing the lamp circuit when a subsequent
70 car enters the block.

29. In a block signaling system, the combination of a target, a shaft, a ratchet wheel mounted on said shaft, electro-magnetic
75 means for rotating said ratchet, a lamp circuit normally open, means whereby said circuit is closed when said target is in its danger position, and means for breaking said circuit only when said magnetic means has completed an effective stroke on said ratchet
80 wheel as each car enters the block.

30. In a block signaling system, the combination of a target, a shaft, a ratchet wheel mounted on said shaft, electro-magnetic
85 means for rotating said ratchet, means including said ratchet for moving said target to and from its danger position, a lamp circuit normally open, means for closing the lamp circuit and means for breaking said circuit only when said magnetic means has completed an effective stroke on said ratchet
90 wheel as each car enters the block.

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

ALEXANDER BEVAN.

Witnesses:

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E. I. OGDEN.