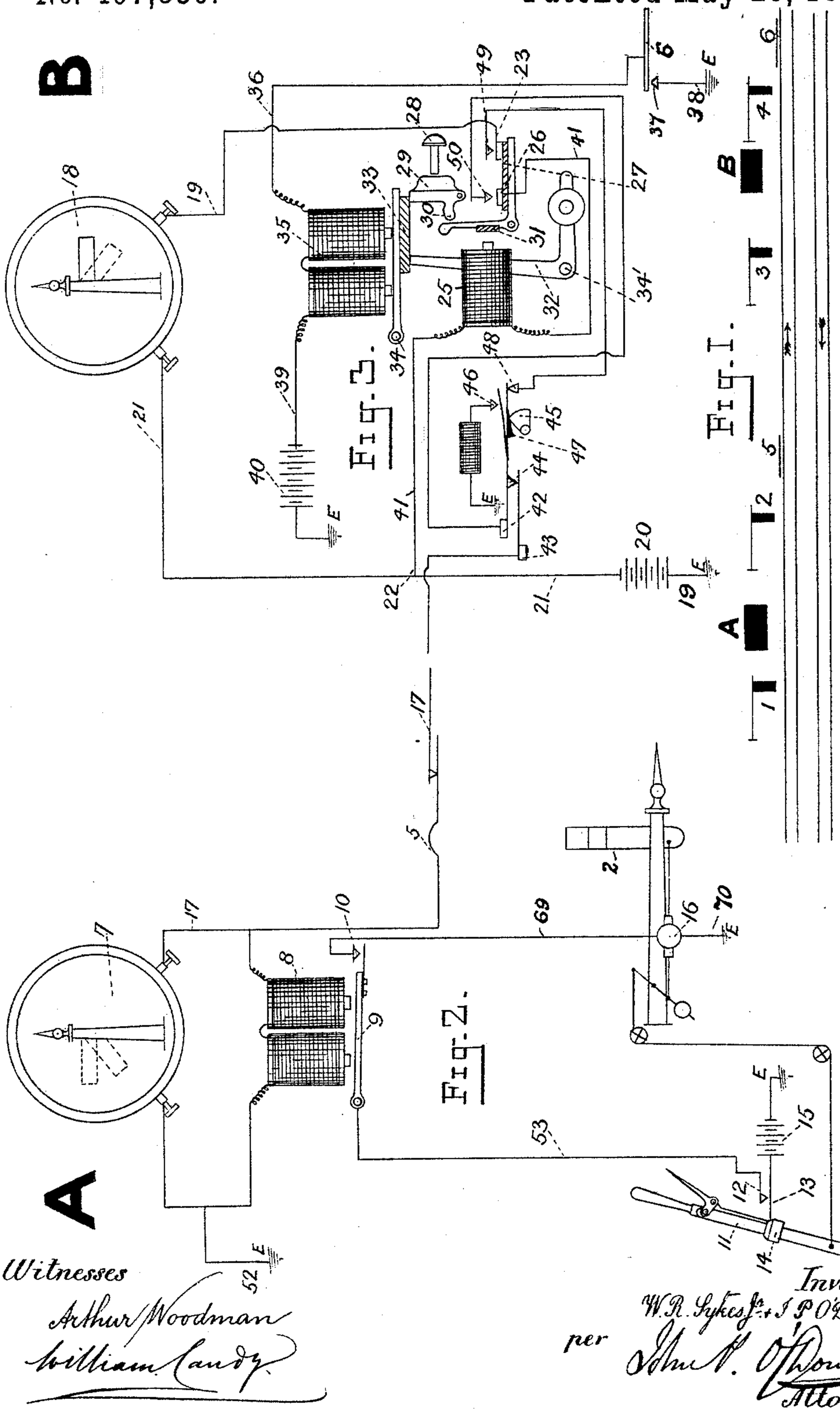
(No Model.) 2 Sheets—Sheet 1.

W. R. SYKES, Jr. & J. P. O'DONNELL.

SAFETY BLOCK SYSTEM FOR RAILWAY SIGNALING.

No. 497,836. Patented May 23, 1893.



(No Model.) 2 Sheets—Sheet 2.

W. R. SYKES, Jr. & J. P. O'DONNELL.

SAFETY BLOCK SYSTEM FOR RAILWAY SIGNALING.

No. 497,836. Patented May 23, 1893.

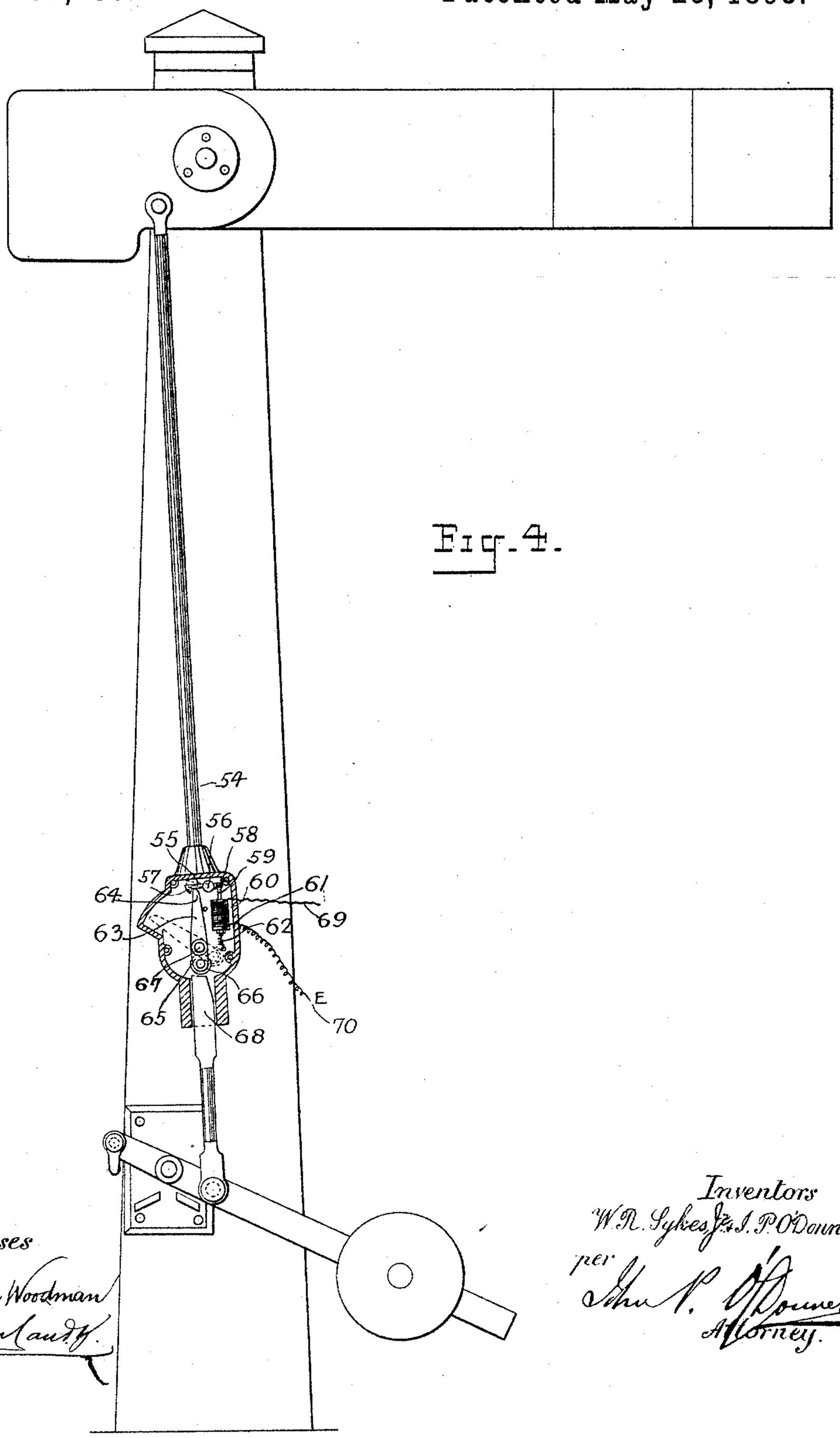


Fig. 4.

Witnesses
Arthur Woodman
William Cauffy.

Inventors
W. R. Sykes Jr. & J. P. O'Donnell
per John P. O'Donnell
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM R. SYKES, JR., AND JOHN P. O'DONNELL, OF LONDON, ENGLAND.

SAFETY BLOCK SYSTEM FOR RAILWAY SIGNALING.

SPECIFICATION forming part of Letters Patent No. 497,836, dated May 23, 1893.

Application filed October 1, 1892. Serial No. 447,484. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM ROBERT SYKES, Jr., telegraph-engineer, residing at 43 Kent House Road, Beckenham, London, in the county of Kent, and JOHN PATRICK O'DONNELL, civil engineer, residing at 2 Great George Street, Westminster, London, in the county of Middlesex, England, subjects of the Queen of Great Britain and Ireland, have invented a certain new and useful Improved Safety Block System for Railway Signaling; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to systems of railway signaling; and it consists in the novel combination of the parts hereinafter fully described and claimed.

In the drawings: Figure 1 is a diagram showing the two stations A and B, their signals, and a line of railway. Fig. 2 is a diagram showing the apparatus at station A. Fig. 3 is a diagram showing that part of the apparatus at station B which is connected to the apparatus at A. Fig. 4 is a front view of a signal post, partially in section.

Briefly, we arrange that, supposing two sections A and B, B is free to accept a train from A under the normal condition. B plunges through the special instrument, which we will hereinafter describe, and through the apparatus fixed upon the signal post he places certain apparatus so that the action of working the lever operating the starting signal at section A effects the lowering of the said signal. Assuming that B gives his permission A operates his starting signal lever, the said starting signal being deflected; a treadle or rail contact is arranged a suitable distance in advance of the starting signal and operates so that when a train has arrived and deflected the said treadle or rail contact, the starting signal in its rear is replaced to the "danger" attitude. It is immaterial whether the signalman replaces his starting signal lever or not, for he cannot lower the starting signal a second time until permission is given by B. The train having left A has approached B and drawn up under the protection of B's starting signal; even then B is not in a position to release the starting signal at A. It is only when the starting signal at B has been lowered by the operation of B's starting signal lever. The train can then proceed over the treadle in advance, operate the said treadle, and replace B's starting signal to "danger" and through it, B's starting signal being at "danger," a current is taken to the instrument at B, which, if he wishes, enables him to plunge and release A's starting signal, so that he can accept a second train from A. It is understood that in the event of B accepting a train from A and B wishing to cancel the signal previously given, provided the train has not started from A and depressed the treadle, B has power to reverse his operation and replace A's starting signal to "danger." It will be readily understood that if trains are required to be brought in closer connection, that is to say, one at the starting signal in the section and one at the stop signal in the same section, that to carry out our invention a second treadle is needed a suitable distance ahead of the stop signal and one of our apparatus fixed in the upright rod, intermediate between the balance lever and the arm of the stop signal in that section. Generally, trains can be drawn up at every signal, other than a distant signal, provided our apparatus is fixed in the upright rods of these signals and sufficient treadles are placed in advance of the said signals.

In order that our invention may be better understood and more readily carried into effect we will proceed to describe the drawings hereunto annexed.

Figure 1 illustrates two sections, A and B, on an ordinary line of railway. In this figure, 1 is the stop signal at A, 2 the starting signal at A, 3 the stop signal at B and 4 the starting signal at B. 5 is the treadle the required distance in advance of the starting signal at A, and 6 is the treadle in advance of the starting signal at B.

Fig. 2 illustrates the instrument at A for forwarding instructions for a train. The usual system for asking instructions for a train by means of a bell is used with our invention. The existing system of three wires we also employ, one for the bell and one each for up and down lines. Fig. 2 illustrates the instrument containing an electro-magnet, armature, and arm indicator. In this figure

also the lever in the locking frame operating the starting signal, is illustrated. The starting signal itself is also illustrated, showing the apparatus in the upright rod.

Fig. 3 illustrates the receiving instrument at B. 7 is the dial of the instrument indicating to the signalman at A whether in operating his lever the starting signal arm will be deflected or not. In the interior of 7 the electro-magnet 8 is fixed and the armature 9 and contact 10. 11 is the mechanical lever in the interlocking apparatus operating the starting signal 2 Fig. 1. Behind the starting signal lever is arranged what we call a contact maker, comprising two springs 12 and 13, joined together when the catch-handle is raised. When the drop box 14 of the catch-handle is raised it allows the two springs 12 and 13 to come together. 15 is the battery. At the right hand of the battery the wire goes to earth. The wire from the contact 10 leads to the apparatus fixed in the upright rod on the post of the starting signal 2. 16 illustrates the position in the upright rod, of our apparatus on the post. 17 is the line wire from the instrument at B, being intermediately intercepted by the treadle fixed in advance of the starting signal at A. 18 is the instrument at B, indicating whether the line is blocked or not. When the current arrives at 22 it has two paths, one only passing through the arm indicator to a spring 23 arranged on the armature; the other path passes through the electro-magnet 25 to another spring 26 arranged on the same armature 27. 28 is a plunger. 29 is a lever at the back of the plunger. The lever 30 operates the armature 31. 32 is a click held up normally by the armature 33. The armature 33 is centered at 34. 35 is the electro-magnet operated by the treadle. 36 is the wire from said magnet to the said treadle 6. The treadle 6 is a "making contact" treadle. The wire 38 goes to earth. 39 is the wire leading through battery 40 to earth. 41 is a wire running from the spring 26 of the armature 27. 42 is a spring. 43 is a spring. 44 is the contact connecting one spring with the other. 45 is the switch. 46 is the contact through the resistance to earth. 47 is an insulating piece on spring 42. 48 is the contact in the wire connecting with spring 23 in connection with contact 49.

The working of our invention is as follows:—Referring again to Fig. 1, A is ready to send a train to B, and for this purpose must get B's permission; B plunges, in Fig. 3, 28, 28 pushes forward lever 29, and 29 through its projection 30 pushes forward armature 31, making contact with the electro-magnet 25. This also displace click 32 and the armature 33 falls, the thickened portion falling in front of the click 32 and on top of the lever 29; by this action the click 32 cannot be moved forward and the lever 29 cannot be moved backward. The armature in connection with the electro-magnet 25 is in contact at its lower portion 27 with the contact pieces 49 and 50, with the result that the current of battery 20 travels to the indicator 18 and to the electro-magnet 25. This has resulted in the arm of the indicator instrument at B being lowered to the "safety" attitude, and the current passing from the magnet 25 along the line through the contact 48 to the lower spring 43 and along the line wire through the treadle 5 at A and into the instrument 7, deflecting the arm to the safety attitude. It also passes through the electro-magnet 8 to earth at 52. Upon the withdrawal of the hand from the plunger the lever 29 has a movement toward the plunger and the thickened portion of 33 falls between the lever 29 and the click 32 in its moved position. By this it will be observed that both the click and the lever and, indirectly, the plunger, are locked in their positions. B further in plunging has left a current on so that the armature 9 is moved up to the electro-magnet 8 in contact with the contact piece 10; by this the current is on at the contact piece 12, so that A in operating his starting signal lever, moving up the drop box allows springs 12 and 13 to come in contact. The signalman is now free to operate the lever and deflect the signal.

It is understood that the starting signal lever is normally free, but under the conditions named when B has plunged if the starting signal lever is operated the current passes through wire 53, through the armature 9, making contact with the contact piece 10, and so goes to the apparatus fixed upon the post, 16, and through this to earth. This action allows when the starting signal lever itself is operated that the arm be deflected. Upon the deflection of the starting signal and the train proceeding toward B, it operates the treadle 5, breaks the line current, and replaces the arm to "danger," allowing the armature 9 to drop from its contact with magnet 8, putting the arm to "danger" in the instrument at A and also in the instrument at B and drops the armature 31 at B. That action breaks the contacts 49 and 50, in fact, breaks all contacts previously made by the plunging at B.

In order to release B's plunger and enable him to take a second train from A, the train itself must have passed over the treadle 6 at B in advance of B's starting signal 4. The treadle 6 closes the contact 37 of wire 38, and thereby completes the circuit of battery 40 through wire 39 and electro-magnet 35. The electro-magnet 35 being excited raises the armature 33 and thus allows the click 32 to fall by gravitation to its normal position and also allows lever 29 to be plunged by B for a second operation. The electro-magnet 35 is de-energized by the treadle 6 as soon as the train has passed over it and has released it, thereby breaking the circuit of the battery 40. The click 32 then supports the armature 33 until the plunger 28 is pushed in to press forward the lever 29 as hereinbefore described.

Fig. 4 illustrates one among the various modifications that may be devised of our ap-

paratus fixed in the upright rod on the signal post between the balance lever and the arm. In this figure 54 is the upright rod from the top of our apparatus to the arm; 55 is a lever centered at 56, having its end formed as a tooth or catch 57 and its end 58 connected to a link 59. 60 is an electro-magnet through which the link 59 passes to its armature 61. The spring 62 is connected to a fixed spot on the plate and to the end of the said link 59. 63 is a lever its upper end 64 arranged for connection with the end 57 of the lever 55 and its lower end 65 carries a roller 66; the said lever is centered at 67. The lower portion of the upright rod 68 is from the balance lever normally to the under side of the roller 66. The upper part of the upright rod 68 is slightly beveled to insure the thrusting aside of the lever when the current is withdrawn. 69 is the wire passing from the magnet 60 to the contact 10 Fig. 2. 70 is the wire passing from the magnet to earth. The figure as shown illustrates our apparatus in the condition that the signalman at B has given permission for the deflection of the arm and the lever 63 is in gear with the click 55 at its end 57. In the normal condition of our apparatus such connection of 57 and 64 would not be made so that if the man at A were to operate his starting signal lever the upright rod 68 would thrust aside the roller 66 and although an upward movement of the lower portion of the upright rod 68 would take place the arm would not be deflected, but in the condition as illustrated when the current from B indicating permission has been sent the current goes through the contact to the back of the lever and from thence to the magnet 60 to earth; by this means the armature 61 is held up to the electro-magnet 60 and the lever 55 held down making connection with the lever 63, locking it in position. If the balance lever is now operated by the operating lever in the signal box the whole apparatus is moved upward and the arm deflected.

It is obvious that although we have hereinbefore described the action of B plunging through the treadle to the instrument, from the instrument to the lever, and from the lever to the apparatus on the signal post, yet if desirable B may plunge and go direct to the apparatus on the signal post without going to the instrument in the signal box, and if desirable indication may be given of the condition of the signal in signal box A. Although this latter is a simpler method yet we have described it in detail in the manner first described in consequence of its requiring less consumption of battery power.

It will be understood in our system that we have no need for canceling signals, as, assuming that B has plunged and given permission to A and then B wishes that A should not act on such permission, he could suspend the permission previously given by operating his switch, and when he wishes that A should act upon the instructions previously given he simply reverses the switch and the previous plunging is operative for A to act upon. When the operator at B suspends his permission to A by operating the switch 45, the contact 44 is moved and the connection between the springs 42 and 43 is broken. This prevents the current from passing down the wire 17 to the electro-magnet 8 at A, and the armature 9 falls by gravity.

We have not considered it necessary or desirable to bind ourselves to any particular form of treadle as it must be understood that our invention is applicable with any form.

Having fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The combination, with the upper part 54 of the signal operating-rod having a plate at its lower end, and the lever 63 pivoted to the said plate and normally retained in a vertical position by gravity, of the lower part 68 of the said rod provided with a beveled end adapted to turn the lever 63 on its pivot when raised, and the electrically-controlled pivoted lever 55 provided with a hooked end adapted to be moved into engagement with the upper end of the lever 63 when the signal is to be lowered thereby locking the said lever in its vertical position, substantially as and for the purpose set forth.

2. The combination, with the upper part 54 of the signal operating-rod having a plate at its lower end, and the lever 63 pivoted to the said plate and normally retained in a vertical position by gravity, of the lower part 68 of the said rod provided with a beveled end adapted to turn the lever 63 on its pivot when raised, the lever 55 pivoted to the said plate and provided with a hooked end adapted to engage with the upper end of the lever 63, the electro-magnet secured to the said plate, the spring-actuated armature normally held out of contact with the said electro-magnet, and the link 59 connecting the lever 55 with the said armature, whereby the lever 63 is locked in its vertical position when the electro-magnet is excited, substantially as set forth.

3. In a block signaling system, the combination, with a starting signal 2 at one station A, and a starting signal 4 at another station B, of electro-magnetic devices at A and at B, the latter devices provided with a plunger adapted to be operated by hand to permit the signal 2 at A to be lowered, a locking device at B for locking the said plunger automatically when the plunger is operated, a treadle 5 in advance of station A operated by the train and adapted to break the electric contacts previously made by the said plunger and cause the signal 2 to be raised, and a second treadle 6 in advance of station B also operated by the train and adapted to restore the electric connection between A and B and to release the said plunger from the said lock-

ing device, subsequent to the lowering of the signal 4 which permits the train to pass over the said treadle 6, substantially as set forth.

4. The combination, with the signal lever 11, the signal 2, an electro-magnet 60, and intermediate signal-operating mechanism operatively connecting the lever 11 with the signal 2 when the said electro-magnet is excited, of the battery 15 for exciting the electro-magnet 60, the springs 12 and 13 adapted to be connected by raising the catch of the lever 11, the electro-magnet 8, the armature 9, the wire 53 connecting the said armature with the spring 12, a battery for exciting the electro-magnet 8, the contact 10 and the wire 69 connecting the electro-magnet 60 with the wire 53 when the electro-magnet 8 is excited, and a treadle 5 interposed between the electro-magnet 8 and its battery and adapted to be operated by the train after passing the signal 2 whereby the said signal is automatically released from its operating lever, substantially as set forth.

5. The combination, with the battery 40, the electro-magnet 35, the connections 39, 36, 38, and a treadle 6 adapted to be operated by a passing train to close the circuit through the said parts; of the pivoted armature 33, the click 32 for supporting the said armature, the pivoted lever 29 having a projection 30, the plunger 28 for operating the said lever, the pivoted armature 31 and the springs 23 and 26 carried by it, the electro-magnet 25 opposite said armature 31, the battery 20, wires 21 and 19 connecting the battery 20 with the spring 23, the wire 41 connecting the spring 26 with the wire 21 and including the electro-magnet 25 in its course, the spring 43 connected to the line wire 17, the spring 42, the contact 44 connecting the springs 42 and 43, the switch 45 for operating the contact 44, the contacts 49 and 48 and an intermediate wire connecting them, the contact 50 and a wire connecting it to spring 42, and the contact 46 and its resistance and earth connection, substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in the presence of two witnesses.

W. R. SYKES, JUNR.
JOHN P. O'DONNELL.

Witnesses to the signature of William Robert Sykes, Jr.:

F. VALERN,
F. COLE.

Witnesses to the signature of John Patrick O'Donnell:

KUND SANDS,
J. E. KENNEDY.