(No Model.) 3 Sheets—Sheet 1.

C. SELDEN

RAILROAD SIGNAL.

No. 512,754. Patented Jan. 16, 1894.

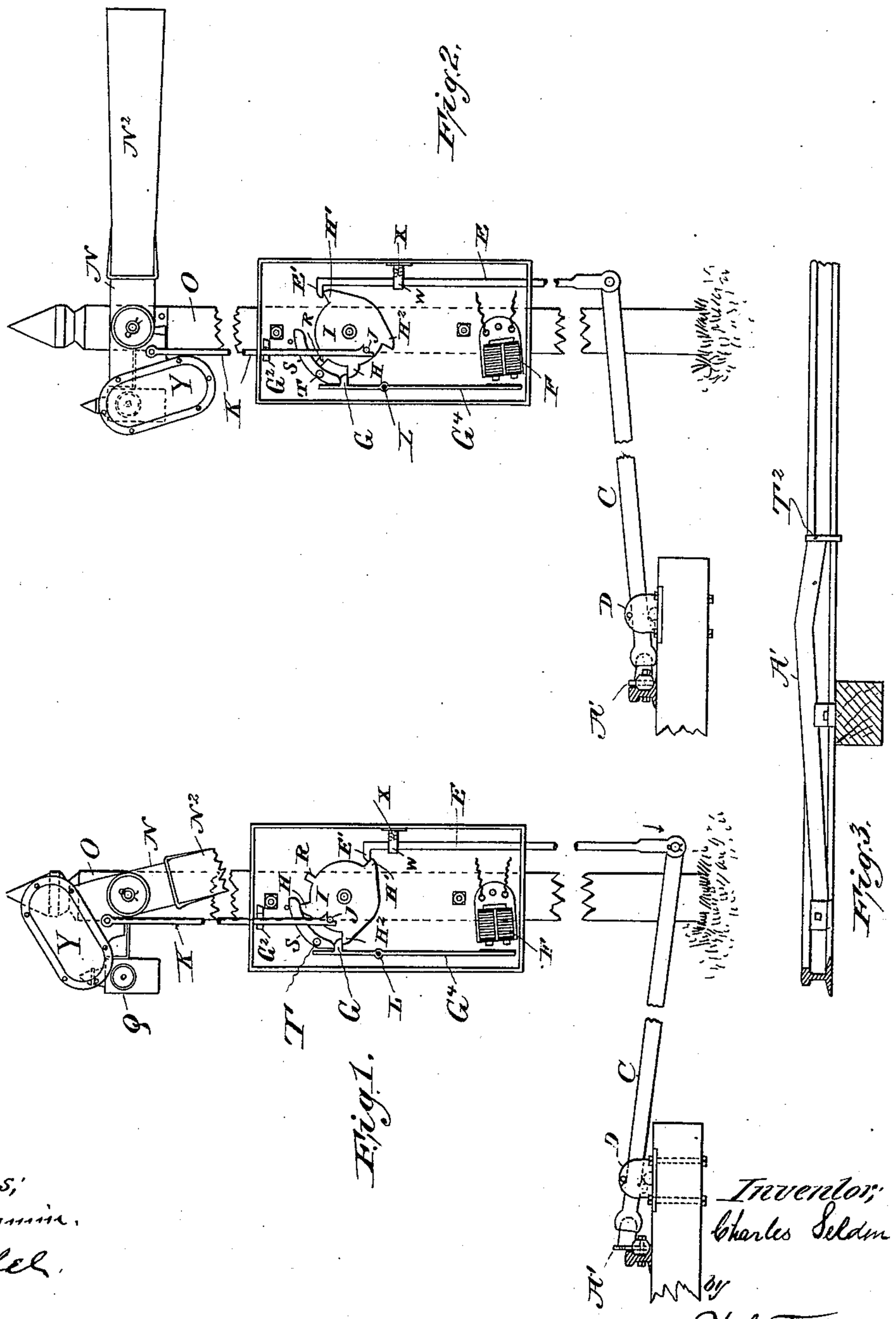

Fig. 1.

Fig. 2.

Fig. 3.

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(No Model.) 3 Sheets—Sheet 2

C. SELDEN.

RAILROAD SIGNAL.

No. 512,754 Patented Jan. 16, 1894.

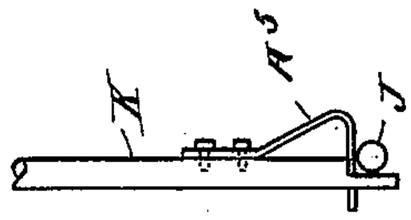

Fig. 6.

Fig. 7.

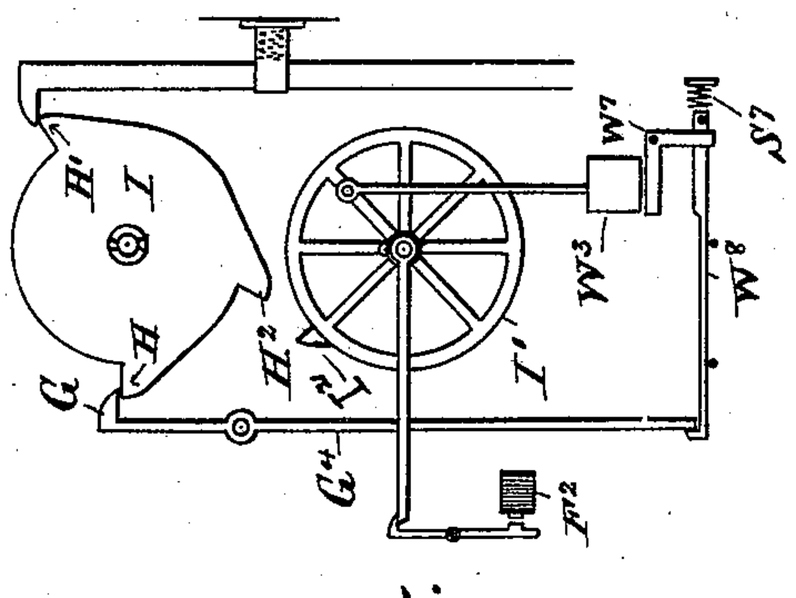

Fig. 5.

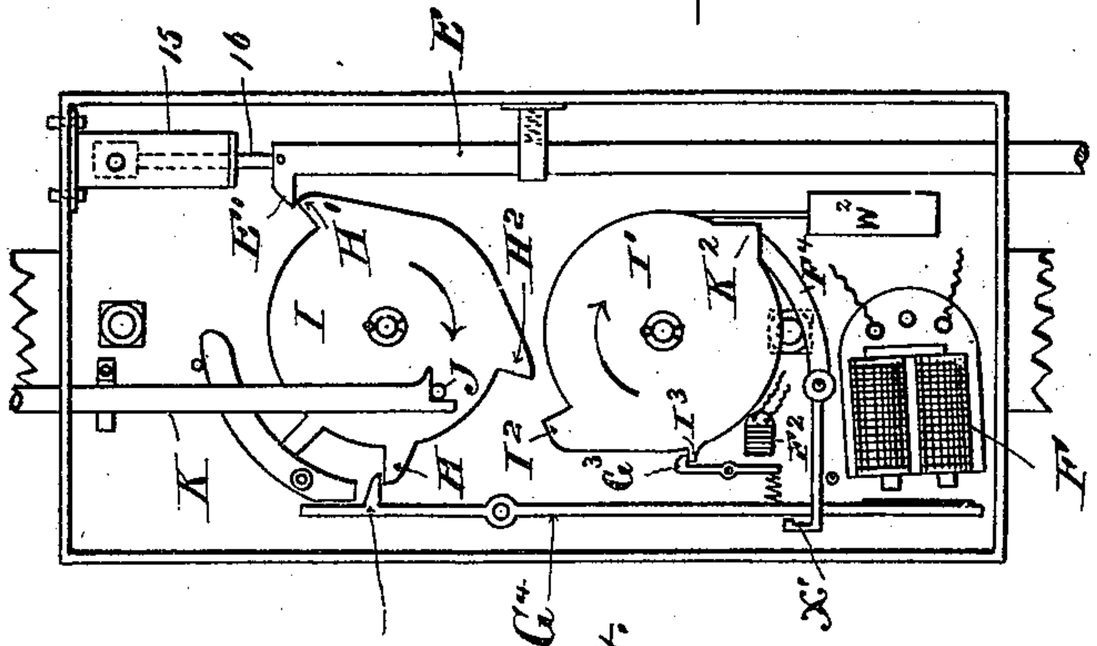

Fig. 4.

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(No Model.)

3 Sheets—Sheet 3.

C. SELDEN.

RAILROAD SIGNAL.

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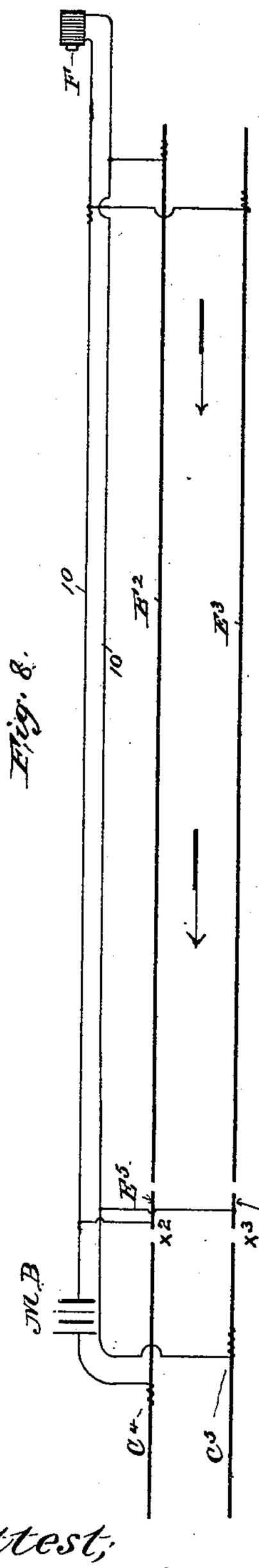

Fig. 8.

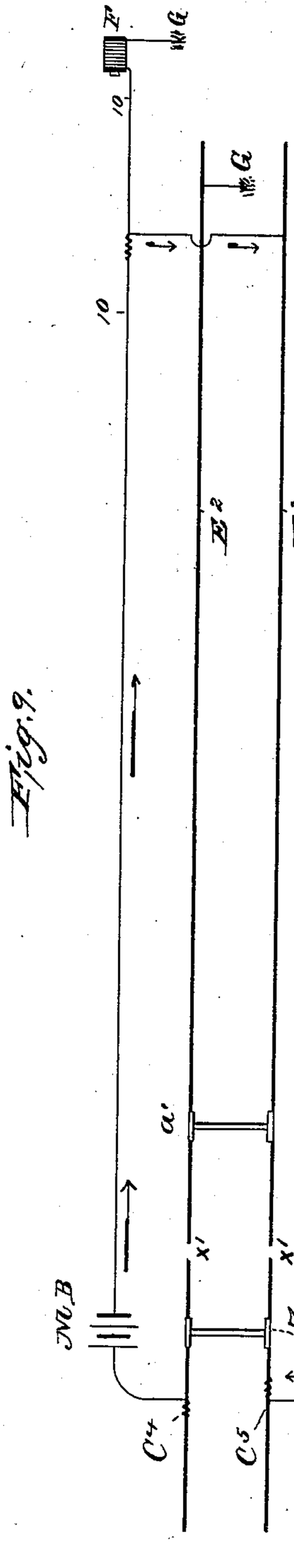

Fig. 9.

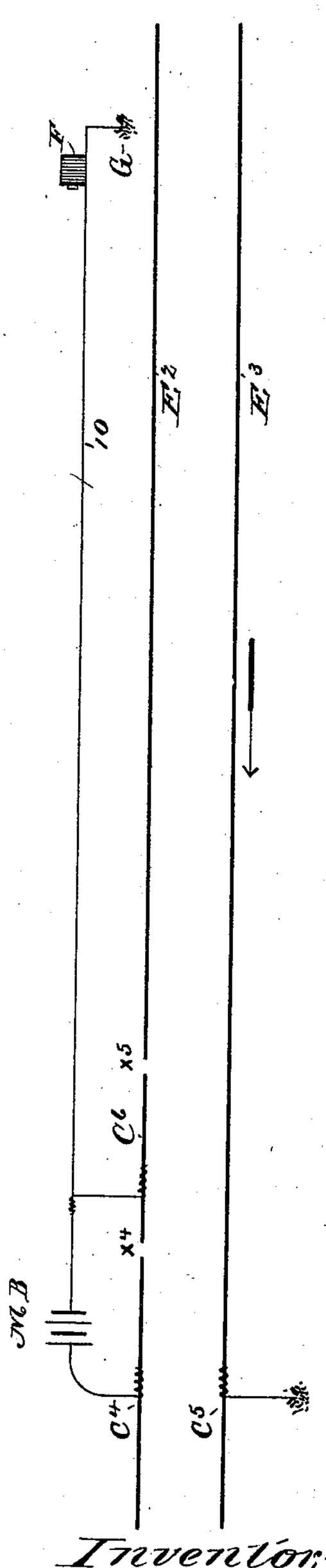

Fig. 10.

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UNITED STATES PATENT OFFICE.

CHARLES SELDEN, OF BALTIMORE, MARYLAND.

RAILROAD-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 512,754, dated January 16, 1894.

Application filed February 1, 1893. Serial No. 460,569. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SELDEN, a citizen of the United States, and a resident of Baltimore, in the State of Maryland, have invented a certain new and useful Improved Railroad-Signal, of which the following is a specification.

My invention relates to signal apparatus in which a swinging oscillatory or reciprocating arm, disk, blade or other signal device is employed, as in railroad signal apparatus, particularly automatic block signals where a blade, arm or disk indicates by its different positions "safety," "danger," "caution" or other signal.

The object of my invention is to produce a simple, effective and reliable semaphore or signal apparatus, and among other things to also so construct the signal that the blow or impact of the first wheels only of a moving car or train shall act mechanically upon the devices for setting the signal and the apparatus be thus relieved from the blows of succeeding wheels of the train.

A further object of my invention relates to the means for controlling the circuit of the electro-magnet which is employed for governing the position of the signal, the object being to provide for closing the circuit of said controlling magnet momentarily through the action of the rear wheel or wheels of a train instead of keeping the circuit closed during the whole period that the wheels of the train are passing over the circuit closing point. The general aim of my invention so far as this feature thereof is concerned is also to give the protection that is afforded by other block systems in which the rails are divided into blocks and a controlling circuit is closed so long as a section or block is occupied by a train or a portion thereof, but with less expenditure of battery. As is well known, electric block signal systems have been heretofore provided, in which the battery or electric source is kept in action so long as a section of the track is occupied by the train, the signal being for such time kept in danger position; but for the purpose of giving thorough protection the practice has usually been to keep the circuit normally closed through the rails and the signal magnet and to allow the train to short circuit the signal magnet, the object being to provide for the case of failure of the electric source or of a section of the track. In this system the batteries or other electric source, which energize the magnet or control the action thereof, are in constant use whether the train be on the block or off it. In my invention the electrical source is in use for a brief interval only, but at the same time the system affords the same practical protection that is afforded by the normally closed circuit systems mentioned, wherein the organization is such that the signal cannot go to safety if a train should break and a car or cars be left on the section to be protected.

Another object of my invention, so far as the mechanical portion thereof is concerned, is to provide for the case of an accidental fracture or breakage of the mechanism.

My invention aims at causing the signal to automatically set itself to danger in case of fracture of the track lever employed for operating upon the same, or in case of fracture of any of the intermediate mechanism.

It also provides for the automatic setting of the signal to danger in the case of fracture of other parts, as will hereinafter be set forth. Hence by my invention should the mechanical parts fail, the signal will take the position indicating danger, or such position as will tend to avoid accident.

It has been heretofore proposed to give semaphore arms or disks in railway signals a bias or counterpoise which will cause them to automatically set themselves to danger in case of the failure of the connecting rod or cord, and it has also been proposed to set railway signals to the danger position by the operation of a track lever acting on the signal apparatus when the train enters the block and to allow it to go to safety by the releasing action of a magnet energized when the train leaves the block and I do not wish to be understood as claiming broadly any such organization.

My invention consists in the combination with a semaphore arm, disk or other signal normally biased to turn to danger, of an overbalancing weight that normally holds the signal in safety position, and a track lever for acting on such overbalancing weight, said track lever operating to lift the weight and thereby free the biased semaphore arm or

disk from the restraining action of said weight. The semaphore will be kept in safety position by the action of said weight and will be allowed to set itself by its own bias to danger position when the weight is lifted by the action of the track lever, while if it be held in such danger position by the operation of an automatic catch, the weight will serve to swing it back to safety position if the catch be released by the action of a magnet or other device operated when desired.

My invention further consists in the combination with the biased semaphore signal or arm normally tending to turn to danger, of a weight restraining or holding it in safety position and loosely engaged with the signal mechanism so as to be capable of being lifted freely off its bearing, and a track lever for lifting said weight to permit the signal to turn to danger, the object of so combining the weight with the semaphore and track lever being to relieve the semaphore signal proper of the shock of impact of a car wheel upon the track lever.

Another feature of my invention consists in sustaining the overbalancing weight by a yielding or separable bearing or connection adapted to disengage itself when the weight acts with greater than normal power, whereby I am enabled to provide for the accidental breakage of the track lever or intermediate connections between the same and the weight, as will hereinafter more fully appear, and to cause the signal to automatically set itself to danger in case of accidental breakage.

My invention consists also in the combination with a semaphore arm or disk normally biased to set itself to danger, of a weight overbalancing said semaphore arm or disk and adapted to be lifted by the track lever to allow the semaphore to set itself to danger, and an automatic catch for holding the semaphore in danger position and the weight in lifted position.

Another feature of my invention relates to the operation of the catch which frees the signal to allow it to go to safety when said catch is operated by an electro-magnet, this part of my invention consisting in the application of an auxiliary operating power which is permitted to act upon the catch when freed by the electro-magnet and which is reset or rewound by the operation of the signal when the latter resets itself to safety position under the action of the overbalancing weight.

Other features of my invention consisting in details of construction and combinations of parts, relating to the mechanical part of the signal, will be more particularly described hereinafter and then specially designated in the claims.

As to the circuit closing devices my invention consists in the combination with a circuit closer operated by the train at a predetermined point in the progress thereof, of a neutralizing circuit closed through the wheels and axles of a section of track or rail in advance of said circuit closer, whereby the said circuit closer may be prevented from producing the desired action upon the electro-magnet or circuits thereof until the last pair of wheels and axles, one or more, may reach the same, when, (said wheels and axles having left the neutralizing rail or rails,) the circuit closer may act in the desired manner. This part of my invention, it will be seen, provides for the case of breakage of the train because if a car be left on a section of a block signal system, the circuit closer at the end of a section may not be operated by the train passing out of the section. It also provides a substitute for a mechanical circuit closer or breaker operated by a special device carried by the last car of a train and permits of the use of a circuit closer consisting of a short pair of rails closed by the wheels and axles, in place of such mechanical circuit closer, since by providing a short length of rails in advance thereof over which a neutralizing circuit may be closed, the circuit closer proper may be held out of action until the whole train has progressed to a point where the last pair of wheels and axles shall have left the neutralizing rail or circuit. So far as this feature of the invention is concerned, it will be seen that the circuit closing devices are applicable for the production of a momentary closure of circuit no matter what the length of a train and in systems where the rails are not divided into blocks.

In the accompanying drawings:—Figure 1, is a side elevation of an apparatus embodying my invention and shows the same in the safety position. Fig. 2, shows the apparatus in danger position, which it takes under the action of the track lever. Fig. 3, is a side elevation of the track lever. Fig. 4, illustrates in side elevation, a construction of the mechanical parts of the signal wherein provision is made for operating the catch which releases the mechanism to allow it to pass to danger position, by means of an auxiliary power upon which latter the electro-magnet operates instead of operating directly upon the catch or detent. Fig. 5, shows the preferred construction of mechanism embodying the use of the auxiliary releasing power. Fig. 6, illustrates a preferred detail of construction designed to permit a controlling wheel or disk to pass to normal position under the action of its own counterbalancing weight. Fig. 7, shows a modification in the construction of a hook or lug upon the controlling wheel or disk. Figs. 8, 9 and 10, are diagrams illustrating the means employed for controlling the circuit of a magnet by the passage of a train or car.

For the purpose of explaining my invention, I shall describe it as carried out by the use of a semaphore or signal in which a pivoted arm or blade is employed, said arm or blade showing by its depressed position "safety," and by its horizontal position or position at right angles to its support, "danger."

N, is the semaphore arm pivoted on a suitable post O, as shown, and N^2, is the semaphore blade.

Y, is a spectacle set in a casting or arm of the semaphore lever, and Q, is a suitable lamp placed so as to throw rays of light through the spectacle Y, when the semaphore turns to danger position, the color thereby shown being such as the rules of the company using the signal may demand. It will be seen, however, that the spectacle is so set and of such dimensions that it will not only show when the blade takes the danger position, but will also show if the blade should only move partially up from the safety position, as would be the case should the parts become accidentally fixed or caught between the horizontal and nearly vertical positions. Hence, any action of the apparatus which moves the spectacle from safety position, even part way toward danger, will cause the indication of danger by means of the spectacle.

K, is a suitable connection rod attached to the semaphore as shown, and by means of which, as will be presently described, the semaphore may be locked in the safety position.

G^2, is a guide in which the rod moves and in which it has a slight lateral play.

As well understood in the art, the semaphore is by means of the superior weight of the spectacle Y, rod K, and any other connected parts on the same end of the lever with them, given such a bias that, when freed from restraint, the semaphore will automatically take the danger position. Hence, as will be obvious, should the rod K, break, or should the devices which engage with the same to hold the semaphore in safety position change their position either normally or by accident so as to free the connection rod K, the signal will go to danger.

The signal is normally restrained or held in safety position by a suitable weight acting against the end of the connecting rod K, or on any other part of the semaphore in any proper or desired manner. In the preferred form of my invention it is made to act through a disk or wheel I, carrying a stud J, upon which the rod K, rests normally and presses in a longitudinal direction. The weight is furnished by means of a vertical rod E, constituting alone, or in conjunction with other parts, a weight of sufficient power to overcome or overbalance the bias of the semaphore. This rod E, engages with the wheel I, by means of a lug or projection H′, on said wheel upon which a hook E′, on the end of the rod rests, as indicated.

It will be obvious that if the rod E, and attached parts constituting the overbalancing weight, be raised to the position indicated in Fig. 2, thereby freeing the signal from this overbalancing power, the normal bias of the signal will cause it to move to danger. It will also be obvious that the weight may be raised freely for this purpose without imparting any shock to the signal mechanism, and that the said weight will operate to restore this signal to danger position if the wheel I, or any other part, be freed from the action of the lug or catch to be presently referred to, which holds the parts in the position indicated in Fig. 2, into which they may have been set by the raising of the weight.

In the operation just described the lug J, will move vertically downward in the arc of a circle. It will be seen, however, that engaging with the end of the rod K, as it does, it would disengage itself from said rod if moved to the right by the turning of the wheel I, in the opposite direction through a slight arc of a circle, the connection rod K, moving at first with the stud as far as its play in its guide G^2, will permit after which the stud would become disengaged and the signal would automatically set itself to danger by its own bias. This movement of the stud J, in both directions, as described, to free itself or to settle under the bias of the semaphore, is obviously provided by mounting it upon the oscillatory or swinging support afforded by the wheel I.

The automatic setting of the signal to danger through the disengagement of the lug from the semaphore or its connected devices, as just described, will obviously take place if the wheel I, be allowed to rotate from the position shown in Fig. 1, under the action of the overbalancing weight. It is normally locked from so moving by the catch G, which engages with a lug, tooth, or similar projection H^2, on the wheel I. The catch G, is operated by means of an electro-magnet F, the armature lever G^4, of which is pivoted at L, and is given a bias by gravity or a spring such as to cause the catch G, to normally engage and lock the wheel I, in the position shown. Another lug or projection H, similar to H^2, is provided for engagement by catch G, when the signal has been set to the danger position through the raising of the weight as indicated in Fig. 2.

It will be obvious that if the catch G, or part supporting the same, should become accidentally fractured so as to free the wheel, the signal would automatically set itself to danger as just described, the weight afforded by the rod E, or connected parts to be presently described turning the wheel I, and the wheel I, being thus freed from the mechanism would be left to the action of its own counterbalance or bias. The wheel I, is counterbalanced within itself so that it will normally assume the position indicated in Fig. 2, which is a position where the lug J, will engage with the semaphore. Hence, after freeing the connection rod to allow it to settle freely and put the signal to danger, the wheel will reverse its motion, and, owing to the rod K, being pivoted to yield in the guide G^2, will pass the same while in depressed position Fig. 1, and settle in the position indicated leaving the signal at danger. The wheel

may thus reverse its motion unobstructed by the hook E′, because the rod E, when it settles to turn the wheel I, and disengage the lug J, from the connection rod K, will drop to a position where the hook E′, will be out of the path of the teeth of the wheel. The same operation will obviously take place in case the signal is freed by the action of the magnet F, withdrawing the catch G, and hence, as will be explained in connection with the diagram, the signal may be used on a single track road for trains passing in either direction, the magnet F, operating to set the signal to danger and the weight being raised by the track lever into position from which in falling it will restore it to safety.

In addition to the lug H^2, the wheel I, is provided with a lug or projection H, which is adapted for automatic engagement by the catch G, when the signal is moved to the danger position Fig. 2, through the raising of the weight E, and the settling of the connection bar K, through the bias of the signal. In this position the parts are retained until the magnet F, is energized, when the devices are released and the overbalancing weight is allowed to reassert its power and overcome the bias, thus resetting the signal to safety.

A′, is the track lever which is employed for lifting the overbalancing weight that normally engages with the signal mechanism and holds the same in safety position against the action of its own bias. The track lever A′, may be of any desired construction adapted to gradually receive the blow of a car wheel. It is connected with the overbalancing weight or rod E, through a lever C, fulcrumed in lever stand D. Connection of the lever and the rail A′, is through a knuckle or other connection, as indicated in the drawings. As will be seen the weight of the track lever A′, partly counterbalances that of the weight E, and connected parts. If the track lever were broken a greater weight would come upon the rod E, or if the lever C, should break between the track lever and the stand D, the weight of rod E, would pull down with greater force. Similarly, if the lever C, should break between its connection with the rod E, and its fulcrum, the weight would be freed from the counterbalancing effect of the track lever and connected parts. To cause the automatic setting of the signal to danger through any fracture of any of these intermediate parts or mechanisms, or other derangement which would bring greater weight to bear through the rod E, I connect the weight with the semaphore through a yielding or separable connection so adjusted as to disconnect the weight when the latter pulls down with the increased force or power which it would necessarily do in the case of fracture of any of the parts as just described. This yielding or separable connection is adjusted so as to maintain the connection during normal condition of the parts when the bias of the track lever A′, through a spring or gravity downward, assists in holding the weight of the bar E, and connected parts up. The yielding or separable connection is provided in the present instance by allowing the hook E′, on the end of the bar E, a lateral movement against the action of a spring X, applied in a guide W, and operating upon the bar E, to tend to hold the hook engaged with the lug H′. In other words the spring is so adjusted that if the whole weight of the rod E, and connected parts comes upon the hook or lug, the spring will give way before it and allow it to slide off the lug. In that event, as will be obvious, the semaphore is freed from the restraint of the overbalancing weight and the signal will set itself to danger, the connection rod K, settling into the position shown in Fig. 2, the rod E, however, remaining in depressed position. If the rail A′, be depressed, however, by the action of the car wheel, the weight will obviously be raised in the normal manner to position indicated in Fig. 2, or slightly higher, thus allowing the semaphore to take the danger position as indicated, in which position the parts will be locked by the action of the catch G. As the first depression of the rail A′, causes this action and locking of the parts, and as the rail A′, in this position is depressed to the level of the main rail A, it will be obvious that but one wheel of the train can act upon the same, to wit; that first engaging it, and succeeding wheels will pass over it without impact upon it or the connecting devices.

A keeper indicated at T^2, is applied by preference to the rail or track lever A′, to act as a stop to keep the track lever from flying clear above the rail A. This stop is so adjusted, however, as not to interfere with the free play of the track lever so that if it goes up above normal or adjusted position, the signal will go to danger as before described by the overbalancing weight automatically disconnecting itself from the signal mechanism.

It will be seen that the spring X, will permit the hook E′, to pass the lug H′, if the wheel I, be in position indicated in Fig. 2, and the bar E, be raised from depressed position or that which it assumes if allowed to drop below the position in Fig. 1, which under some circumstances may be the action required of the apparatus.

I do not limit myself to the form of construction of the weight which overbalances the bias of the semaphore nor to any particular way of imparting movement thereto by means of a car wheel so as to raise the weight free from the signal mechanism and allow the latter to move to danger, nor do I limit myself to any particular form of separable connection of the weight and the semaphore, the gist of the invention consisting in connecting said weight and semaphore by a separable connection adjusted as described to allow the weight to free itself when it is not sustained to the normal extent by the track lever or other devices and connecting mechanisms through which it is lifted by the

passage of the train. Any other form of separable connection might be used.

The essence of the invention consists in adjusting the separable connection device so that if the action of the overbalancing weight be made greater than its normal amount through breakage of the parts as described, the connection will be severed and the signal freed from such overbalance.

S, indicates an automatic trip device pivoted at T, and engaged with a catch G, and with the wheel I, in such manner that while the lugs H, H^2, with which the catch is designed to operate remain intact, the trip will not act upon such catch. The end of the trip lever which bears upon the wheel gives to the trip a leverage such that if it be freed at such end, it would disengage the catch from the lever. This it would do if the lug H, were broken. The signal would thereby be freed and go to danger through the action of the overbalancing weight of E, which would pull the wheel I, around and disengage the stop from the connection rod K. When the lug H, is in position to be engaged by the catch the trip is held lifted by a trip guide R.

The action just described would obviously take place, the parts being in the position indicated in Fig. 1. If they be in the position indicated in Fig. 2, and the lug H, be broken, then when the wheel I, swings around to bring the signal to safety, the lug H^2, would pass the catch G, because the trip would hold the catch away, and the wheel would swing under the influence of the bar E, around still further so as to disengage the stud J, and allow the signal to go back to danger position as already described.

In Fig. 6, A^5, indicates a spring that may be applied at the end of the rod K, for engagement by the stud J, in the manner indicated. This device may be used for permitting the stud J, to pass the end of the rod K, when the wheel I, revolves by reason of its own counterweight and non-engagement by other parts back to position for engagement with the end of the rod which it should do as already explained after being disengaged from said rod through a swinging movement to the right from position Fig. 1.

Fig. 7, shows a construction of spring lug that may be substituted for a solid lug on the wheel I. The design is to allow a part to pass the lug freely which will yield for that purpose when engaged in one direction. As seen in this figure in place of the solid lug, a spring or skeleton lug of the proper form is employed, the spring being fastened upon a solid projection, as shown, at its curved side, and at its flat side being engaged by a tongue entering a notch in the solid lug. It is obvious that on engagement of a hook with the bevel side of the spring lug, the spring would give way as it would naturally have to do in the reverse movement of the bar E, upward when the latter passed the lug to reach the position shown in Fig. 2. When the parts are engaged in the position shown in Fig. 1, it will be seen that the lug would be carried in the opposite direction and will simply seat itself against the flat face of the solid lug.

In connection with the devices already described a suitable retarding device in the nature of a dash pot or air cushion device may be employed for slowing the movement of the devices under the downward movement of the weight E, or to lessen the force of the blow from bar E, upon the lugs of the wheel I, when the said bar settles back. Such a device I have indicated in Fig. 4, where 15, indicates a suitable air or liquid cylinder having a piston connected at 16, with the rod. It will be readily understood that this dash-pot or cylinder arrangement might be suitably constructed to allow the bar to rise rather freely but to descend with a retarded movement. The time of descent and attendant movement of the wheel I, to position Fig. 1, where the lug H^2, should meet the catch G, may be thereby so regulated that even if the magnet F, should be excited for a considerable time through the action of a circuit closer operated by the train, nevertheless the mechanism will not pass around so far that lug H^2, will have passed the catch before the magnet F, has lost its power and will not have thereby passed around to danger position again. The momentary closure of circuit of the magnet F, without this dash-pot device is, it will be apparent, necessary in order that the proper resetting of the signal to safety may be secured when a train passes out of the section, but this momentary action may be provided for by the novel circuit closing arrangement to be presently described.

In Fig. 4, I have shown a construction of apparatus designed to relieve the magnet as far as possible of the work of disengaging the catch G, which, in an apparatus of sufficient size and certainty of action is subject to considerable strain by the lug H. The organization is such that the work of the magnet is confined to releasing a supplemental power that acts on the catch and the supplemental power is wound up for the next action by the operation of the overbalancing weight E, that restores the signal to the safety position. Hence, by this construction a less powerful magnet or source of energy may be employed for releasing the apparatus. This supplemental power may operate upon the catch alone or in conjunction with the magnet F. In Fig. 4, it is supposed to operate in conjunction with the magnet F, the magnet of weak power, which is the only one necessary for the operation being indicated at F^2. If both the magnets be used they may be placed in the same circuit. The supplemental force which operates on the catch is here shown as that of the weight W^2, applied through a wheel I', which is provided with a lug K^2, adapted to act on a lever F^4, a hook or arm of which latter X', may engage the armature lever carrying catch G, and throw it in a direction to free

the wheel I. The magnet F^2, operates upon a hook G^3, which frees the wheel I', by releasing the hook from a lug I^3, of said wheel. The wheel may then turn under the influence of the weight W^2, and the lug K^2, will act upon the lever carrying arm X', which in turn will act on lever G, the power of the weight W^2, being thus applied to release the catch G. In practice magnet F, might be omitted or its position changed so as to permit of its acting mechanically on both hooks or catches simultaneously. The magnets may be either neutral or polarized, and wound as may be desired. Where but one magnet is used it should be placed so as to give it the benefit of leverage in the control of the wheel I', whether it control the wheel through engagement with the periphery of the wheel I', or act upon any other device connected with it in such manner that the release of the wheel and of the power is effected by the action of the magnet. The power is rewound or restored through engagement of some of the parts which move with the weight E, in restoring the signal to safety. For instance, a lug I^2, may be provided on the wheel I', and on such portion of its periphery as to be brought by the action of the device in the manner just described into position to be engaged by the lug H^2, or other portion of wheel I.

The operation would be as follows:—When the weight is released by the action of the magnet F^2, the wheel I', will be revolved in the direction shown by the arrow so as to disengage the hook G, and free the wheel I, so as to admit of the revolution of the same and the setting of the signal to safety position under the influence of the weight E. By movement of the wheel I', the lug I^2 thereon will have been brought into position to be engaged by the lug H^2, as the latter moves with the wheel I, under the influence of the weight, and thereupon the wheel I', will be turned in the opposite direction so as to wind up the weight W^2. It will be obvious that in this operation the lug H^2, will turn the wheel I', until lug H^2, slips by lug I^2. To allow of the free movement of the lug H^2, in the opposite direction in the operation of the setting of the signal to danger position, a device such as shown in Fig. 7, may be employed. The revolution of the wheel I', in either direction may be stopped by the weight W, touching the bottom of the box, or by taking off the tension of a spring, if one be employed, or any proper stop device may be used.

Fig. 5, shows the preferred construction of the electro-mechanical devices. Here the releasing magnet F^2, is given the benefit of leverage in its control of the wheel I', which latter is here shown as a spoked wheel. It is obvious that this permits of a very delicate action of the magnet in releasing the wheel. The weight w^3, is suspended by a rod from the wheel I', and the weight in falling strikes upon mechanism which communicates a movement to the lever of the detent or catch G. In this construction the benefit of the acquired velocity of the weight in falling is secured and the operation will be much more certain. The weight falls upon a crank lever W^7, and the latter in turn by its crank arm, engages with a pin on a slide W^8, which in turn engages by a hook with the lever of catch G. The crank and the slide are returned to and held in normal position by the action of a spring indicated at S^7.

In the diagram Fig. 8, the relative positions of the signal and the circuit closing device therefor in a block system are indicated. E^2, E^3, are the rails of a block and C^4, C^5, are rails which operate as a circuit closer in connection with the car wheels and axles to energize the magnet F. In the normal operation of the apparatus the trains are supposed to proceed in the direction of the arrow and the magnet F, with its connected semaphore devices are placed sufficiently far in advance of the section E^2, E^3, to give warning to an engineer so that he may bring his train to rest before entering section E^2, E^3, in case he finds the semaphore set against him. The point at which the train acts upon the track lever may be any position, such as circumstances may require. Before entering or at the time of entering the section the train throws the signal to danger. When it leaves the section and passes the circuit closer C^4, C^5, it is supposed to energize the magnet and reset the signal to safety. For ordinary working, or for double track working, therefore, a train in entering the section E^2, E^3, would find the signal in the position indicated in Fig. 1; its first pair of wheels would strike the track lever, would throw up the weight and the semaphore would set itself to danger, the weight settling back into the position shown in Fig. 2, and being locked in that position with the other parts through the automatic catch G. In this operation it will be observed that none of the wheels or other mechanism than the rod E, and its bar connections receive the blow or impact from the wheels as they engage the track lever A', and that the latter only receives one impact by reason of the fact that the rod E, when it strives to return so as to throw the track lever A', up again, will find the lug H', opposed to it and the lug H', is locked in position as already explained. When the train passes out of the section the magnet F, is energized, the catch G, is freed by the action of the magnet, and the overbalancing weight E, is allowed to act, thus turning the wheel I, back to the position shown in Fig. 1, and setting the signal to safety. Assuming now that the train has passed out of the section and set the parts to safety or position shown in Fig. 1, as just described, and that, the devices being on a single track road, a train is about to enter the section from the opposite direction. It would be desirable to have the signal set so that no train could proceed against it onto the section E^2, E^3, and the signal would be set to danger under this con-

dition through the action of the magnet F, since the moment the train reached the circuit closer, the magnet would be energized, the hook G, would be released, the lug H^2, and the counterbalancing weight would settle still further so as to carry the wheel I, around and disengage the stud J, from the connection rod, whereupon the connection rod would settle and the semaphore by its own bias would take the danger position. Under this condition it is obvious that the rod E, would not be in connection with the devices as shown in Fig. 2, but on the other hand would be in depressed position, its downward motion being, however, stopped by the stop or keeper of the track lever. When the same train reaches the point A', it is obvious that the wheels striking the track lever would lift the bar E, as before described, and the clutch or hook E', would rise and pass the lug H', and engage therewith in the position shown in diagram 2. In this operation it is obvious that the spring afforded by X, avoids the blow which would otherwise come upon the lug and permits the bar to slide past into position ready to set the signal back to safety when the magnet F, may be again energized by the train at some succeeding point of its travel.

Referring now to the diagram Fig. 8, the sections of track rail C^4, C^5, operate for closure of the circuit of magnet F, and battery M, B, by being bridged by a car wheel and axle passing from section E^2, E^3, onto the rails C^4, C^5, the main or supply wires 10, 10, connecting the battery M, B, and rails C^4, C^5, extending back from the end of section E^2, E^3, where the train leaves the section, back to the entering end of the section where the magnet F, is located. The rails of the sections E^2, E^3, are connected to these main or supply wires, at any desired point, so that while any pair of wheels and connected axles are on the section E^2, E^3, any current on the main wires would be shunted from the magnet F, but if no car or pair of wheels be on the section E^2, E^3, then the closure of circuit between the rails C^4, C^5, will energize the magnet. The length of the rail circuit closer C^4, C^5, would vary with circumstances. If a momentary energization of the magnet F, be desired, the length of a rail C^4, C^5, would be determined by the maximum time required for a single pair of wheels to pass over said rails C^4, C^5. They may be greater or less than a rail length, obviously, under such conditions. When a train enters the section E^2, E^3, the wires 10, 10, are bridged independently of the rails C^4, C^5, and will remain so bridged so long as any car or pair of wheels is on the section E^2, E^3. When the train reaches the point X^2, X^3, and the first pair of wheels passes onto rails C^4, C^5, no effect will be produced on magnet F, because the current will be shunted from the magnet by the following wheel or wheels of the train, and the closure of the circuit at C^4, C^5, will be ineffective to energize the magnet until the last pair of wheels of the train shall have passed off the end of the section E^2, E^3, at points X^2, X^3, and onto the rails C^4, C^5. The preliminary or antecedent diversion of current having thus ceased, the magnet will be immediately energized and will remain energized for the time that the last pair of wheels shall be passing over the rails C^4, C^5. It will be observed that in this system, the battery M, B, can be in action only while the rails C^4, C^5, are bridged, but yet that the signal cannot be set to safety if the train which leaves the section E^2, E^3, shall have left one or more cars upon that section at any point by breakage of the train connection. Hence, in this particular, my system furnishes the protection that is provided by other systems where the battery is always in action and a train on entering a section operates to short circuit a battery from a semaphore magnet and to hold a semaphore at danger. The system also presents the advantage over that other plan in which the presence of the train on the section operates to energize the semaphore magnet, since in that plan the battery must be in action so long as a train is on the section, while in my system it need only be in action for the time required for the passage of the train over the short circuit rails C^4, C^5. Nevertheless my system provides the same extent of protection that is provided by the old system just referred to.

If it is not desired to provide for the accidental detachment of a car or cars of the train and the leaving of them on the section E^2, E^3, at any point, the same momentary excitation of the magnet F, may be provided for by making connection of the line wires 10, 10, to a short section of rails E^5, E^6, which need be no longer than an ordinary rail length, but which are located in advance of the rails C^4, C^5, so as to provide the preliminary neutralizing or diverting circuit which, as already explained, would keep the magnet F, out of action until the last pair of car wheels passes onto the rails C^4, C^5. The operation in this instance would be obviously the same as already explained, the only difference being that protection is not provided for the accidental breakage of the train and the leaving of one or more cars on the block. It is quite obvious that this plan of producing a momentary action of magnet F, through the operation of a train operated circuit closer could be employed whether the closure of the magnet's circuit were produced by rails C^4, C^5, or by any other devices so constructed as to be operated by every car on a train.

In other systems it is necessary to either put some sort of apparatus on the rear car of the train that will trip or produce connection as the rear car passes out, unless of course a track circuit be used, in which case as long

as anything remains within the block the signal remains at danger and the battery is for such time in connection.

The arrangement shown in Fig. 9, requires but a single line wire. In this arrangement the section E^2, E^3, to be protected has one rail as, for instance, E^2, grounded and the line wire connected to the other rail. The magnet F, is grounded at one terminal and at its other terminal connected to the line wire, while battery M, B, is connected to a circuit closing rail C^4, and the opposite rail C^5, is connected to the ground. It will be apparent that in this arrangement a short circuit of the battery from magnet F, is provided before the train passes onto the rails C^4, C^5, which are insulated at X', from the rails E^2, E^3. When the first pair of wheels Z reaches C^4, C^5, the following pairs of wheels a' will bridge rails E^2, E^3, and though the connection of battery M, B, with the ground be formed by the first pair of wheels, its opposite pole will be directly grounded by rail E^3 and to rail E^2, through any pair of wheels approaching them. Hence, current may be diverted from the magnet F, through the connection of the line wire to the rail E^3, in such amount that the magnet will not be energized sufficiently to operate the signal. This condition will be maintained until the last pair of wheels leaves the section E^2, E^3, when the battery may flow without diversion through magnet F, and thereby energize it, but its period of flow will obviously depend upon the time taken by the last pair of wheels in passing the rails C^4, C^5.

Fig. 10, shows the extension of my invention to a case where it is not desired to provide protection for a train accidentally breaking in two on a section. The magnet F, is directly grounded and the battery M B, connected thereto over a line wire from the end of a section where the train leaves such section. The circuit of the battery M B, when the magnet is energized is by way of the rails C^4, and a pair of wheels connecting C^4 and C^5, and from latter rail to earth. The preliminary diverting or neutralizing circuit which is formed before or at or about the time that the first pair of wheels reaches the circuit closer proper is formed by means of insulated section C^6, of rail of any desired length connected to the line wire as shown, and adapted when engaged by a wheel of the train to divert the battery from the line wire and magnet. For this purpose the said section may be formed on the same side of the line of track with C^4, and beside a line of rails which is connected with C^5, so that a pair of wheels one of which engages C^6, will complete a connection to earth and any pair of wheels on C^4 and C^5, will merely complete the local circuit of the battery.

It will be obvious as before explained that magnet F, will be energized when the last pair of wheels leaves the section C^6.

I do not limit myself to any particular way of forming the preliminary neutralizing or diverting circuit which prevents the energization of the magnet when the forward part of the train reaches the circuit closer position proper, the gist of my invention consisting in allowing the following part of the train to produce in any desired way, the diverting or neutralizing circuit which renders the forward part inefficient so that the action of the magnet will be a momentary action following only upon the passage of the rear of the train, and which may, therefore, be a momentary action independent entirely of the length of the train. I prefer, however, to produce these actions through the operation of the car wheels and axles bridging opposite rails.

It is obvious that where it is not desired to protect as against breaking of trains in two, and where it is desired to make very short blocks, mechanical means may be employed to release catch G from wheel I instead of electric as shown.

What I claim as my invention is—

1. The combination with a semaphore signal arm or disk biased or counterbalanced to turn to danger when unrestrained, of a weight normally overbalancing or overcoming the bias of said arm and normally engaged and sustained by some portion of the signal mechanism in a manner to permit it to be lifted freely without carrying the engaged part with it, and actuating devices for lifting said weight away from the engaged part so that the signal may set itself to danger.

2. A semaphore signal arm or disk biased or counterbalanced to turn to danger when unrestrained, in combination with a restraining weight engaged with the signal mechanism by a yielding hook or catch and itself normally sustained by the setting lever, as and for the purpose described.

3. A mechanical railroad signal normally biased to set itself to danger and having an operating track lever connected to the signal through a separable hook or bearing holding the signal at safety and adapted to free itself automatically on breakage of the track lever or portions of the intermediate actuating mechanism.

4. The combination with the signal mechanism, of an actuating bar and a sustaining hook therefor hooking upon the signal mechanism but free to move in a direction to tend to disengage the hook when the bar is actuated in a direction opposite to that in which it normally exerts a strain upon the engaged part through the hook, said hook being also adapted to yield laterally to disengage the bar and permit it to move in the direction of the strain.

5. The combination with a semaphore signal arm or disk normally biased or counterbalanced to turn to danger when unrestrained, of a weighted bar adapted to overbalance the counterbalancing force so as to turn the signal back to safety and loosely engaged with

said mechanism so as to be capable of being lifted off its bearing, and a track lever for lifting said bar to permit the signal to turn to danger.

6. The combination with the semaphore arm or signal having a counterpoise normally tending to turn it to danger, of a track lever and intermediate actuating mechanism having a normal bias sufficient to overbalance said counterpoise and loosely engaged with the signal mechanism as described, so as to permit the track lever to move independently of the signal when relieving the signal of said overbalancing weight for the purpose of setting the signal to danger, as and for the purpose described.

7. The combination of the semaphore biased to turn to danger when freed of an overbalancing weight, a track lever, a horizontal lever C, connected at one end with the track lever and overbalanced at its opposite end so as to tend to raise the track lever, and a hook connecting the overbalanced end of the lever C, with the signal mechanism and serving to normally sustain said overbalanced end, as and for the purpose described.

8. The combination, substantially as described, of the biased semaphore arm or disk normally tending to set itself to danger, and a track lever connected with the same through mechanism having a weight or bias, as described, sufficient to hold the signal at safety but engaged with the semaphore mechanism in the manner described so as to be lifted freely away therefrom when the track lever is depressed and to thereby leave the semaphore free to move to danger.

9. The combination with the semaphore arm or disk normally biased to turn to danger when unrestrained, of a restraining weight normally tending to hold it at safety, and a connected track lever for lifting the weight, said track lever operating by its weight to partially lift said restraining weight.

10. The combination, substantially as described, of a biased semaphore, an overbalancing weight acting on the signal mechanism, a track lever for lifting said weight by the action of a car wheel, said track lever being provided with a limiting stop which limits its upward movement, and a yielding or separable connection adjusted as described to disconnect the weight when the latter acts without its normal restraint by the track lever.

11. The combination with the semaphore biased to turn to danger, of a track lever and intermediate lever biased, as described, to operate as a normal overbalancing weight holding the signal at safety, and a yielding or separable sustaining connection adjusted, as described, to free the overbalancing weight when the latter increases through a breakage of the track lever or intermediate connections.

12. The combination with the biased semaphore, biased to turn to danger, of a stop normally holding the same at safety and mounted on an oscillating arm or support whereby it may move in one direction under the bias of the semaphore to allow it to turn to danger or by moving in the opposite direction may disengage itself from the semaphore so that the latter may turn to danger unrestrained by the stop and a weight tending to move the stop in a direction to cause it to disengage.

13. The combination with the biased semaphore, of a laterally yielding connection rod K, an oscillating supporting stop or pin for said rod, an overbalancing weight acting on the pin to normally overcome the bias of the semaphore, and a catch for normally holding the stop against movement by said weight.

14. The combination with the semaphore biased to turn to danger, of the connection rod K, and wheel I, having stop J, with which said rod engages longitudinally by the semaphore bias.

15. The combination of the stop wheel, the semaphore and its connecting rod, the stop J, for said connecting rod, and a catch G, holding said wheel against rotation in a direction to free the pin from the rod.

16. The combination with the biased semaphore, of the stop wheel carrying a stud or stop normally holding said semaphore from turning to danger, a catch holding the stop wheel against rotation by a weight in a direction to disengage the stop, an electro-magnet for operating said catch, and means for freeing the wheel from the weight whereby it may be allowed to rotate in the opposite direction under the bias of the semaphore.

17. The combination with a stop wheel I, controlling the semaphore's position, of a catch, and an automatic trip engaging a tooth or lug of said wheel and normally held thereby from operating upon said catch, as and for the purpose described.

18. The combination with wheel I, having a stud J, controlling the position of the semaphore, a catch G, an automatic trip, a tooth or lug H, governing the position of said trip, and a trip guide R, for holding the trip lifted when the tooth or lug H, is in position to be engaged by the catch.

19. The combination of the biased semaphore arm, connection rod K, adapted to move laterally as well as longitudinally, a stop wheel carrying the stop pin J, adapted to disengage from connection rod when moved in one direction and to recede under engagement with said rod when moved in the other direction, an electrically controlled catch G, engaging with said wheel, a weight also engaged with said wheel and tending to rotate it against the catch, and a track lever for lifting the said weight away from engagement with the wheel, as and for the purpose described.

20. The combination, substantially as described, of the biased semaphore, and a stop wheel having two teeth or lugs as described, one adapted for engagement by an electrically controlled catch and the other engaged by a weighted bar or rod combined with a track

lever for lifting said rod away from engagement to permit the wheel to rotate under the influence of the biased semaphore.

21. The combination, substantially as described, of a biased semaphore having a connecting rod K, a stop wheel I, normally holding the biased semaphore in safety position, an electro-magnetically controlled catch G, normally engaged with a tooth or projection of said wheel, and a weighted rod E, also normally engaged with said wheel and sustained by a horizontal lever C, connected with the track lever, as and for the purpose described.

22. The combination, substantially as described, of a biased semaphore, a connection rod K, a wheel I, having a stud or projection J, with stop teeth or lugs H, H^2, H', a magnetically controlled catch G, adapted to engage with either tooth H or H^2, and a vertically movable rod E, normally sustained in part by the tooth H', and in part by a lever C, connecting it with the track lever, said bar E, being adapted to move laterally so that it may free itself from the wheel, as and for the purpose described.

23. In a railroad signal, the combination, substantially as described, of the counterbalanced wheel I, a semaphore having a bias normally tending to turn it to danger and held in safety position by said wheel, teeth or lugs H', H^2, on said wheel, a catch G, a vertical rod E, having hook E', horizontal lever C, and track lever A', all combined and operating as and for the purpose described.

24. The combination, substantially as described, of the semaphore arm or signal having a bias toward danger, a connection K, a wheel I, provided with a stud J, engaged by said connection, a weight tending to turn said wheel in a direction to free the stud from the connection rod and sustained in part by the wheel and by the track lever and connecting devices, and a separable connection of said weight with the wheel adjusted as described to permit it to free itself from the wheel on breakage of the parts and thereby to permit the wheel to rotate under the influence of the biased semaphore.

25. The combination of a semaphore arm or disk, a laterally yielding connection rod K, attached at one end to said disk, a wheel I, and a stop pin *j*, carried by said wheel and detachably engaged by said connection rod, as and for the purpose described.

26. A semaphore signal apparatus having a stop wheel, and a catch provided with an automatic trip engaging with the catch and with a tooth of said wheel with which the catch is designed to engage, as and for the purpose described.

27. The combination with wheel I, normally holding the biased semaphore in danger position, of a weighted bar E, adapted to move laterally, and normally engaged with a tooth of said wheel, as and for the purpose described.

28. The combination, substantially as described, of a semaphore, a stop wheel I, therefor, adapted to turn independently of the semaphore, said wheel being counterbalanced within itself as described, so that when freed from the semaphore mechanism and operating devices, it will set itself into normal position for engagement by the semaphore.

29. The combination with the semaphore position controlling wheel I, of an auxiliary wheel I', actuated by a weight or spring and provided with teeth or projections, as described, for operating upon the catch which controls the position of wheel I, and with a tooth or projection adapted to be engaged by wheel I, when the latter is rotated to return the signal to safety, whereby the actuating spring or weight of wheel I', may be wound up.

30. The combination with the stop wheel and the connection rod of the semaphore, of the yielding tooth for permitting the stop to pass the connection rod freely in one direction.

31. The combination, substantially as described, with a stop wheel I, of the biased semaphore, a catch engaging with a lug of said wheel and tending to hold the semaphore in danger position, an auxiliary actuating mechanism for operating on said catch to release the wheel, a weight or spring operating said auxiliary mechanism, a magnet controlling the same, and a tooth or projection therefrom adapted to be engaged by the stop wheel I, so as to rewind the spring or weight of said auxiliary mechanism when the wheel I returns the signal to safety position.

32. The combination with a semaphore, of an electro-magnetically controlled catch holding the same in one position, an auxiliary power device for operating on said catch to release it, and mechanism actuated by the power which sets the semaphore to opposite position for rewinding or resetting said auxiliary power.

33. In a semaphore, the combination, substantially as described, of a catch for holding the semaphore in one position, mechanism for releasing the catch to allow the semaphore to take the opposite position, a weight adapted in falling to strike said mechanism, means for releasing the weight, and means for restoring or lifting the weight by the power which moves the semaphore to said opposite position.

34. The combination with a semaphore arm or disk biased so as to tend to set itself to danger, of an opposing weight for returning the signal to safety, a track lever for lifting said weight to allow the semaphore to set itself to danger, and an automatic catch for holding the semaphore in danger position with the said weight lifted and the track lever depressed.

35. The combination, substantially as described, with a semaphore biased to tend to set itself into danger position, of an opposing weight which normally overbalances the opposing force, a track lever connected with

said weight for lifting it away from engagement with the semaphore mechanism so that the latter may move unrestrained into danger position, and an automatic catch for holding the weight lifted and the track lever depressed after the first impact.

36. The combination, substantially as described, with a semaphore signal having a bias to return it to danger when unrestrained, of a weight engaged with the signal mechanism and normally overbalancing the semaphore but engaged with the mechanism in such manner that it may be lifted freely without carrying said mechanism with it, a track lever connected with the weight and adapted to raise it, a catch for holding the said weight lifted and track lever depressed after the first impact, and in condition to keep the semaphore in position, and an electro-magnet controlling said catch.

37. The combination, substantially as described, with the semaphore arm N, normally biased to take the danger position, of a connection rod K, a weighted bar E, and an intermediate wheel I, the weight of said bar and connected parts being so adjusted with relation to the bias of the semaphore that on fracture of the bar E, or connected parts, the semaphore will automatically take the danger position.

38. The combination, substantially as described, with a railway block signal, of a rail circuit closer and a neutralizing circuit closed through the wheels and axles and section of track or a rail in advance of said rail circuit closer, whereby the magnet may he held out of operation until the last pair of wheels leaves the section.

39. The combination, of a magnet F, a circuit closer controlled by a train for actuating said magnet, and a circuit closing section of track in advance of said circuit closer adapted to be bridged by the wheels and axles of a train and thereby close a shunt or branch circuit of said magnet and keep it closed until the last car of the train reaches the circuit closer, whereby a momentary operation of the magnet may be produced with any length of train.

40. The combination, of a controller magnet F, an energizing circuit therefor completed from one rail to another through the car wheels and axles, and a section of rails in advance of said energizing section adapted to complete a neutralizing circuit of the said magnet so long as there is any pair of wheels and axles on said section but to permit the magnet to be energized so soon as the last pair of wheels leaves the section.

41. The combination with means for closing or establishing an electric circuit by the passage of a train of cars at any desired point on a line of track, of means for establishing and maintaining a neutralizing or diverting circuit for said circuit closing devices through the action of the rear portion of the train or part following that which first operates on the circuit closer and keeping said neutralizing circuit closed until the rear of the train reaches the circuit closing position proper.

42. In a railway signal apparatus, the combination with a train operated circuit closer, of means controlled by the train for establishing a diverting or neutralizing circuit until the last car of the train reaches said circuit closer, whereby momentary action of the circuit closer may be obtained independently of the length or speed of the train.

Signed at Baltimore city, in the State of Maryland, this 31st day of January, A. D. 1893.

CHARLES SELDEN.

Witnesses:
GEO. W. HAULENBEEK,
E. J. SILMAN.