No. 873,720. PATENTED DEC. 17, 1907.

A. D. CLOUD.

SWITCH STAND.

APPLICATION FILED SEPT. 27, 1906.

7 SHEETS—SHEET 1.

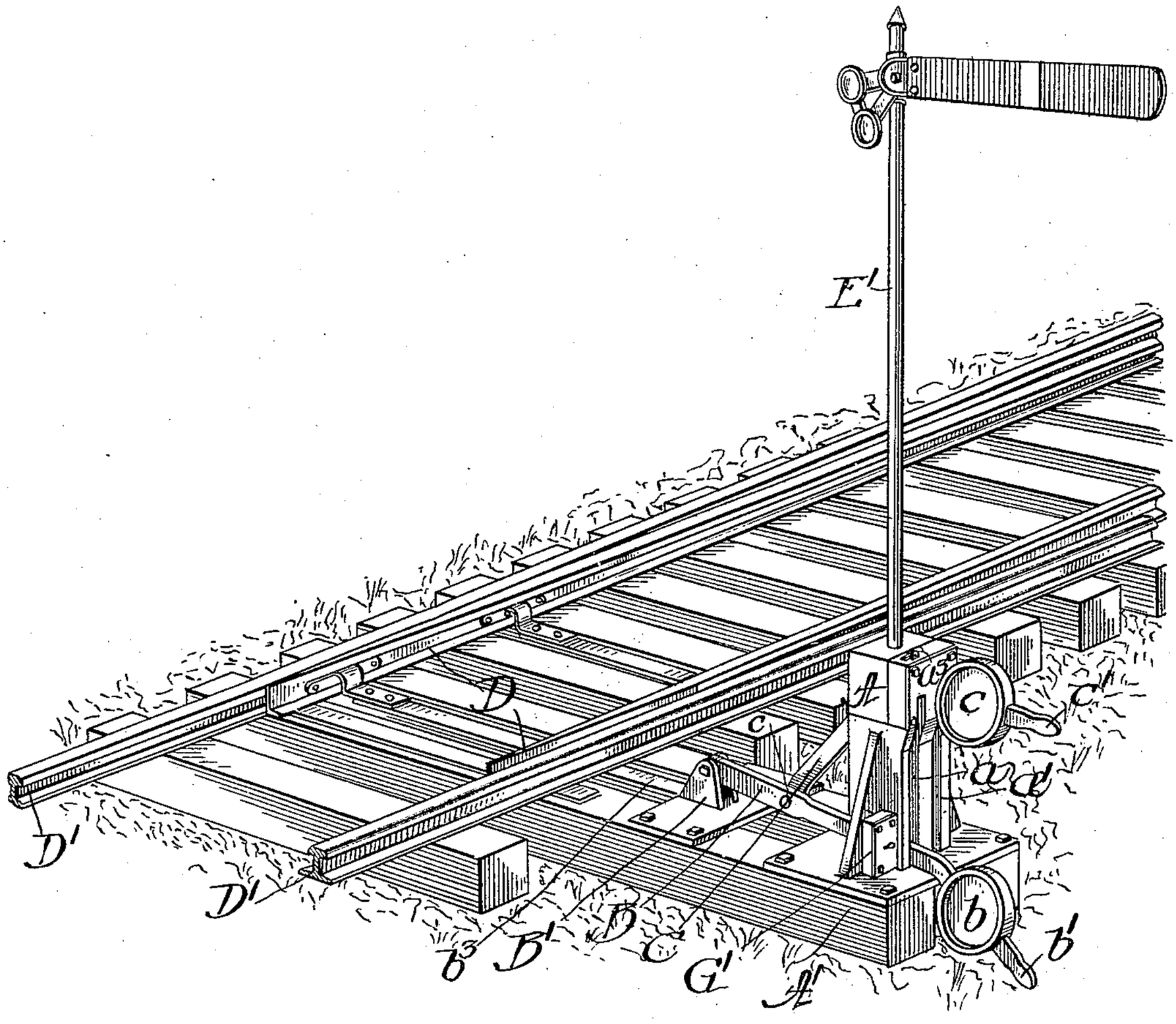

Fig. 1.

Witnesses:
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W. W. Hall.

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by Poole & Brown
his Attys

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7 SHEETS—SHEET 2.

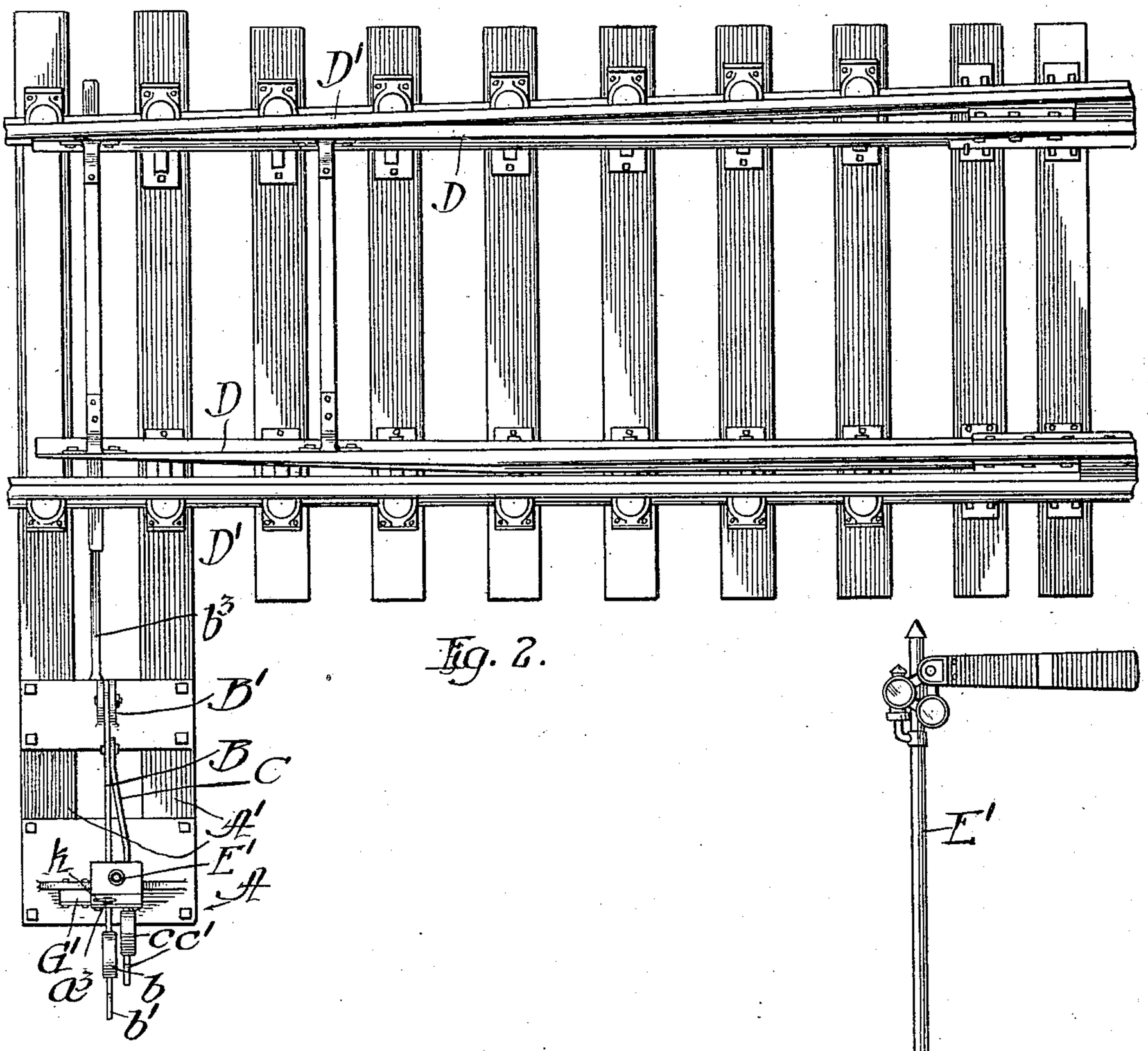

Fig. 2.

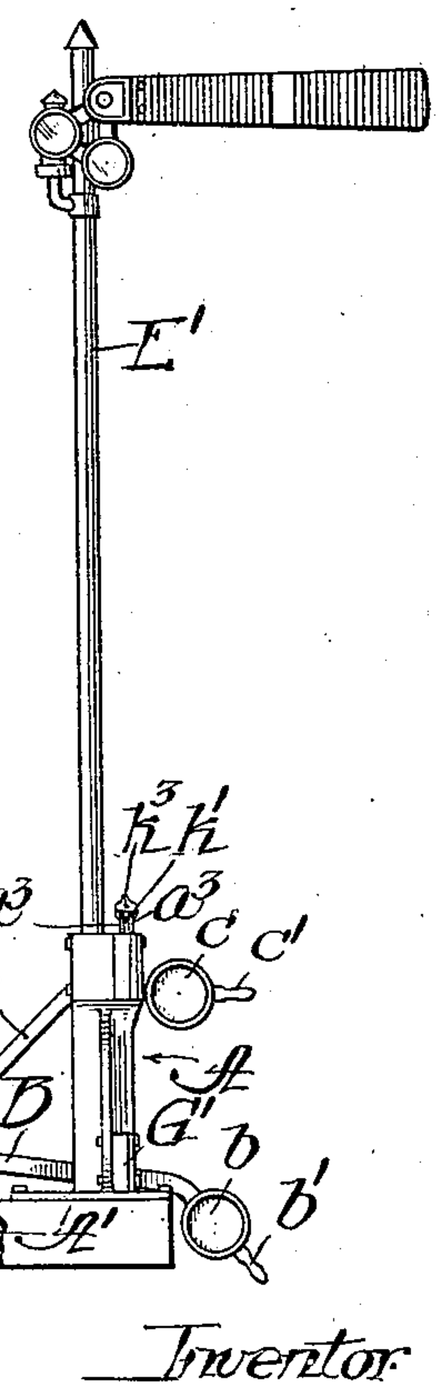

Fig. 3.

Witnesses:
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No. 873,720. PATENTED DEC. 17, 1907.

A. D. CLOUD.

SWITCH STAND.

APPLICATION FILED SEPT. 27, 1906.

7 SHEETS—SHEET 3.

Fig. 4.

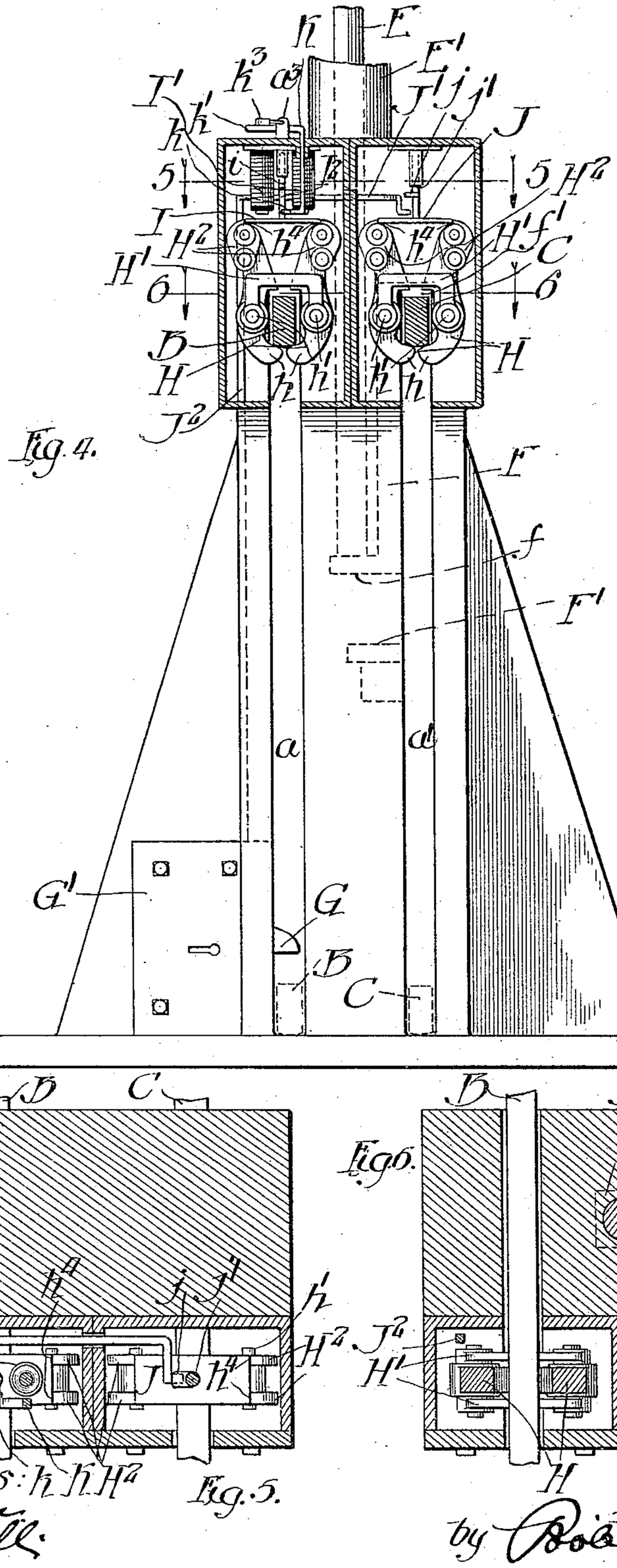
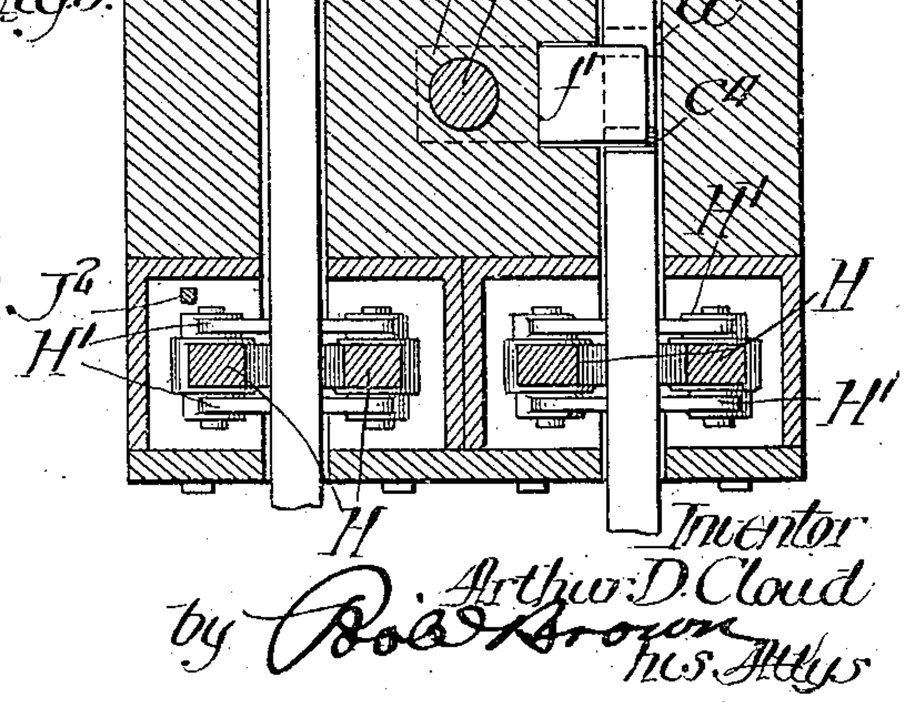


Fig. 5.

Fig. 6.



No. 873,720. PATENTED DEC. 17, 1907.

A. D. CLOUD.

SWITCH STAND.

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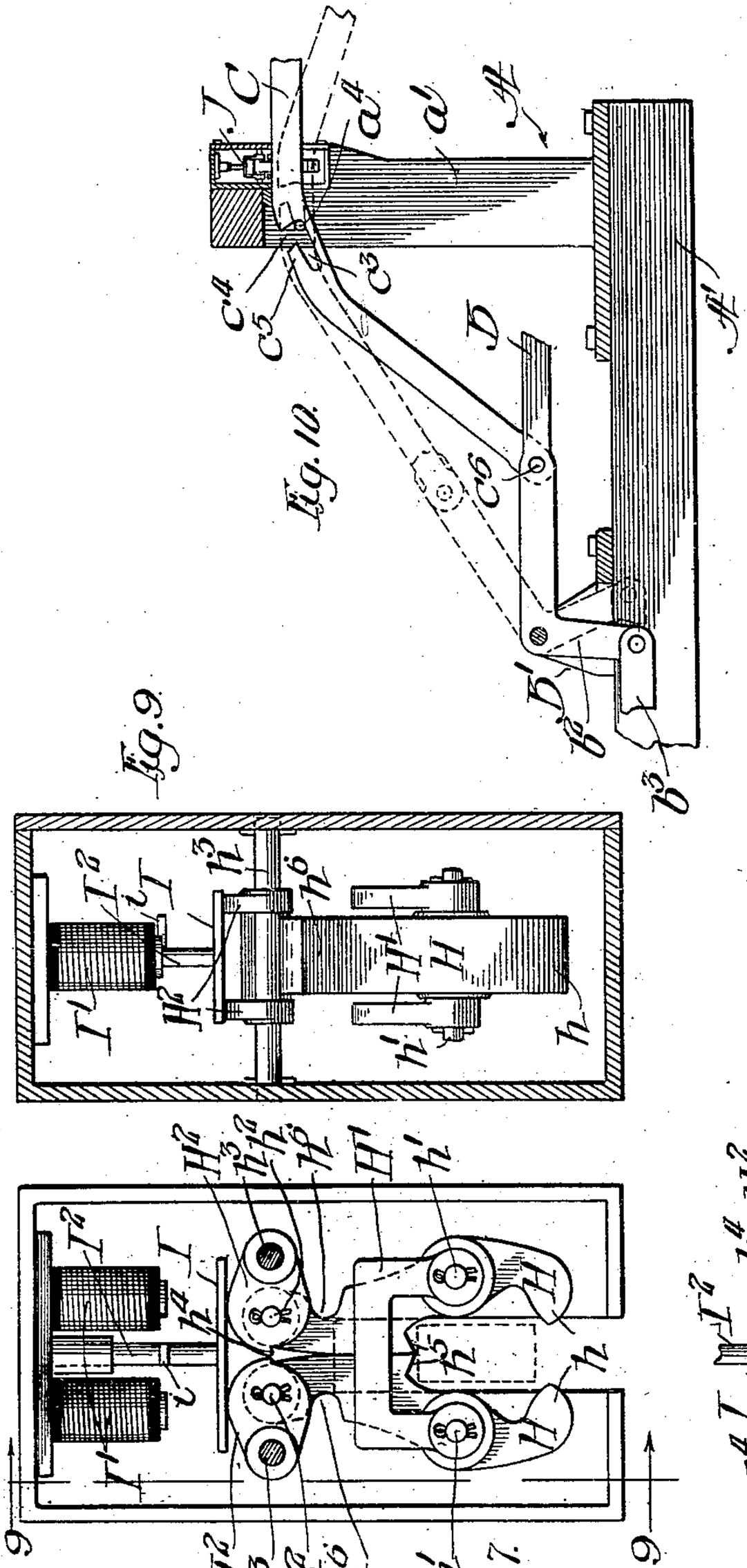

Fig. 10.

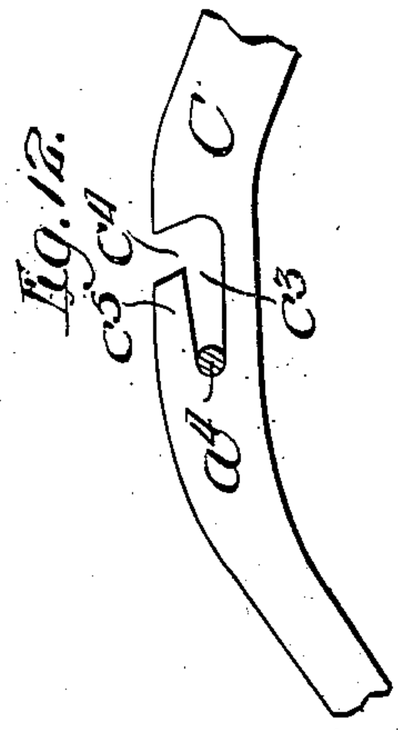

Fig. 12.

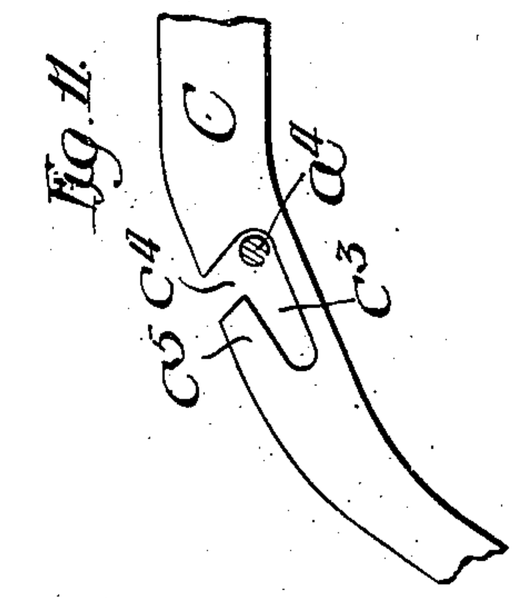

Fig. 11.

Fig. 9.

Fig. 7.

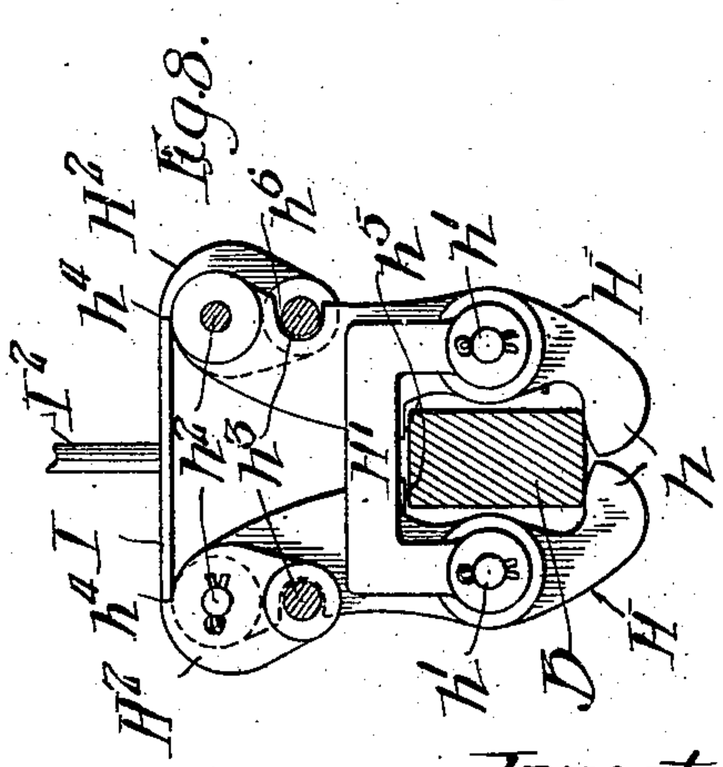

Fig. 8.

Witnesses:
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No. 873,720. PATENTED DEC. 17, 1907.

A. D. CLOUD.

SWITCH STAND.

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7 SHEETS—SHEET 5.

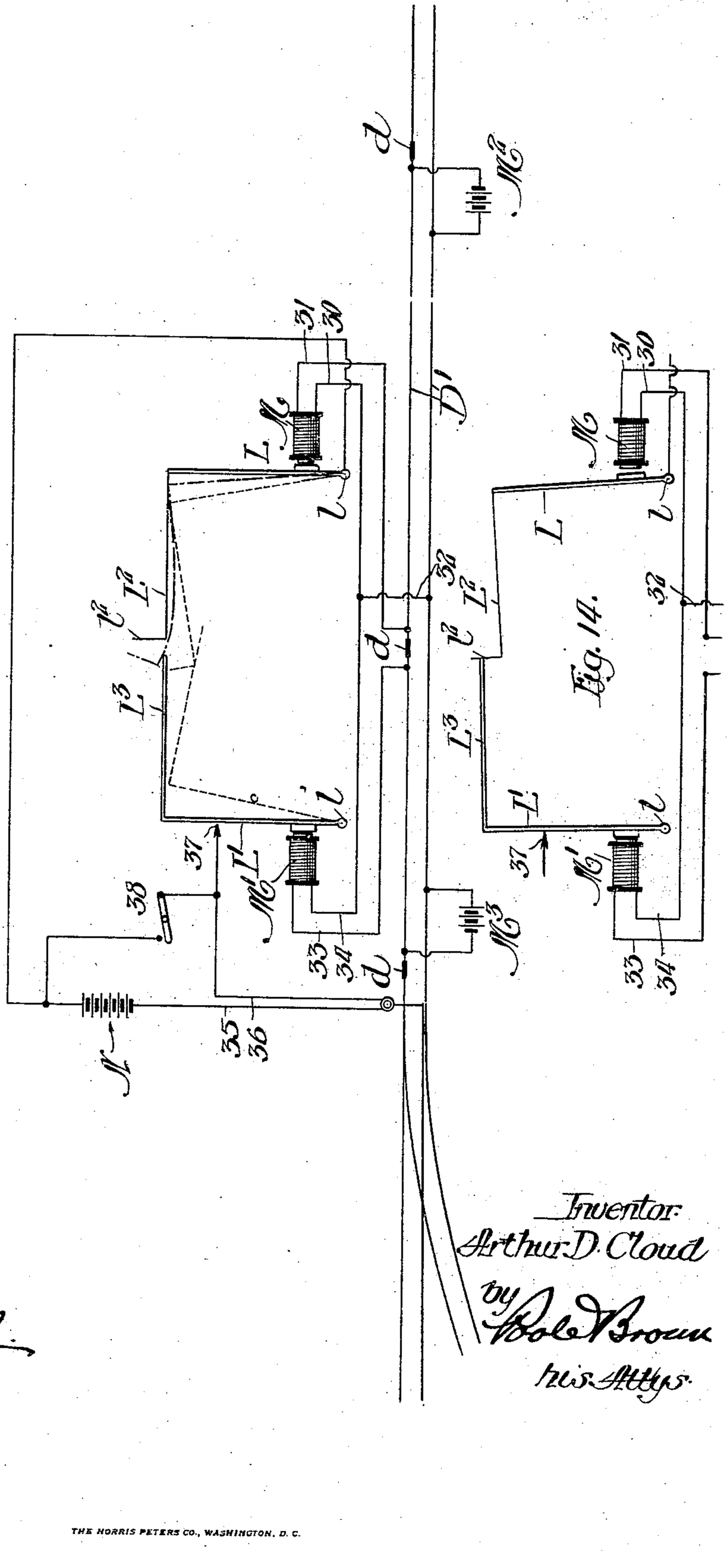

Fig. 13.

Fig. 14.

Witnesses:
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No. 873,720. PATENTED DEC. 17, 1907.

A. D. CLOUD.

SWITCH STAND.

APPLICATION FILED SEPT. 27, 1906.

7 SHEETS—SHEET 6.

Fig. 15.

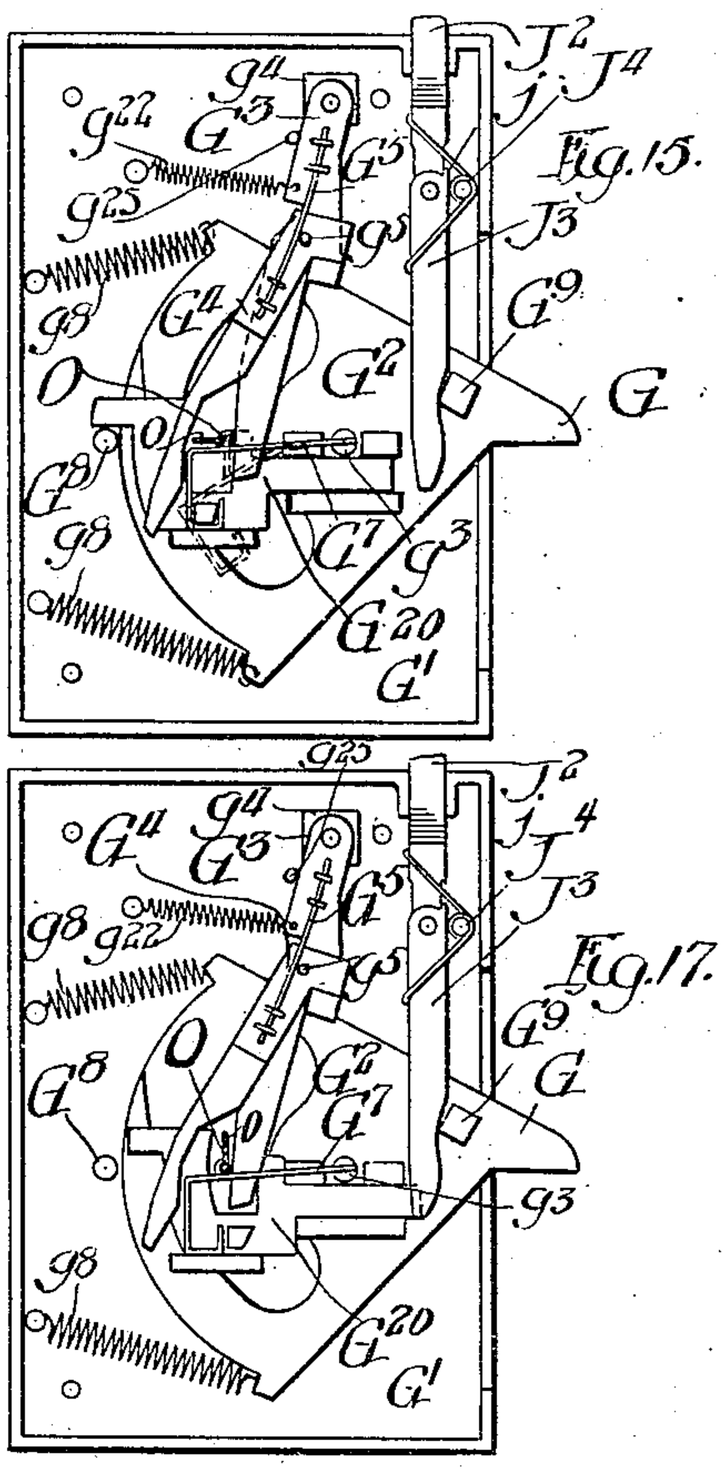


Fig. 16.

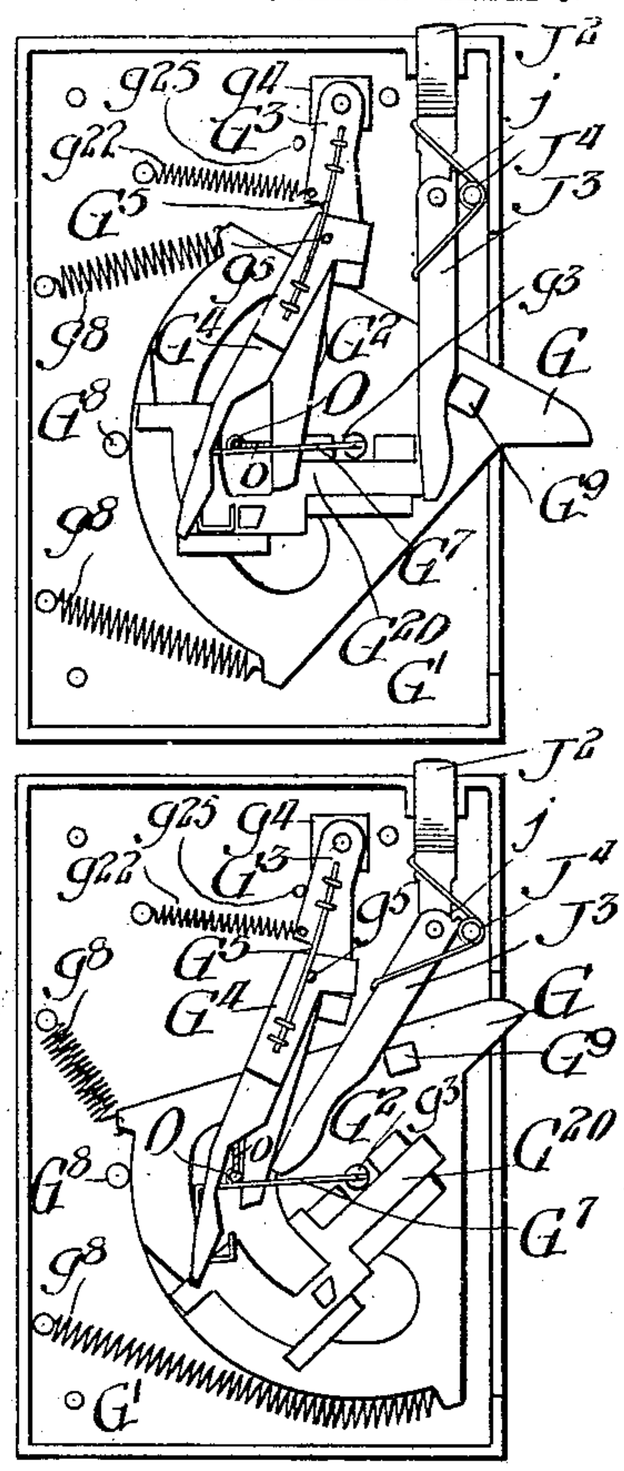


Fig. 17.

Fig. 18.

Fig. 19.

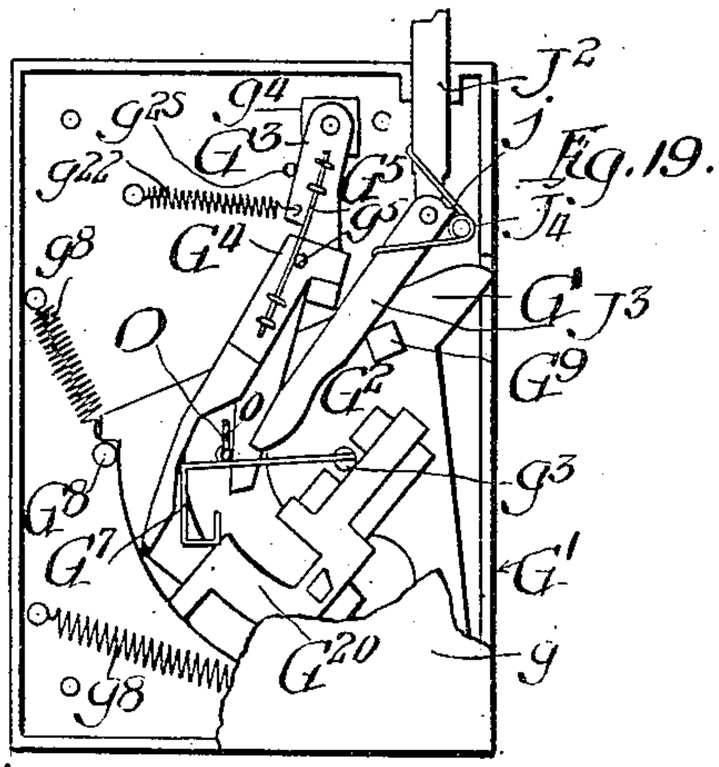
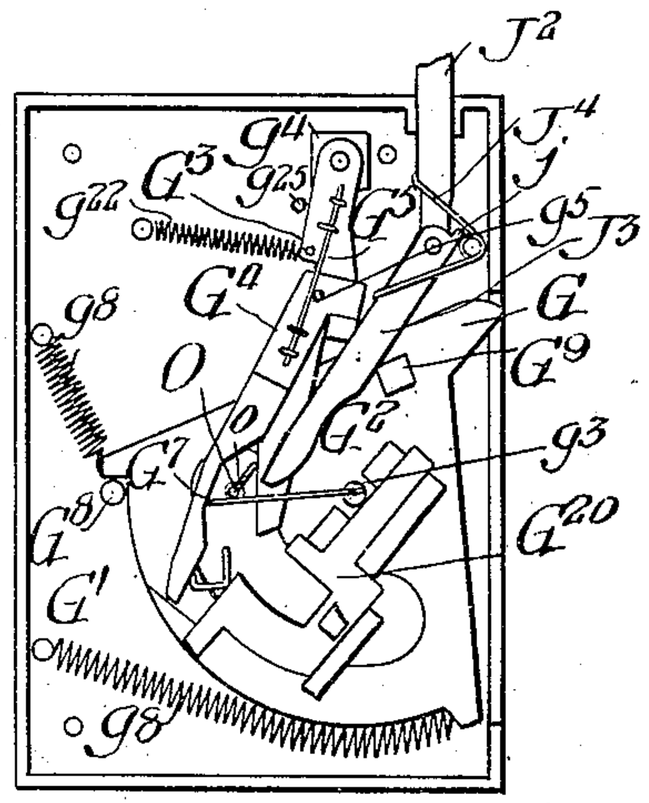


Fig. 20.



Witnesses:
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W. D. Hall.

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his Attys

No. 873,720. PATENTED DEC. 17, 1907.

A. D. CLOUD.

SWITCH STAND.

APPLICATION FILED SEPT. 27, 1906.

7 SHEETS—SHEET 7.

Fig. 21.

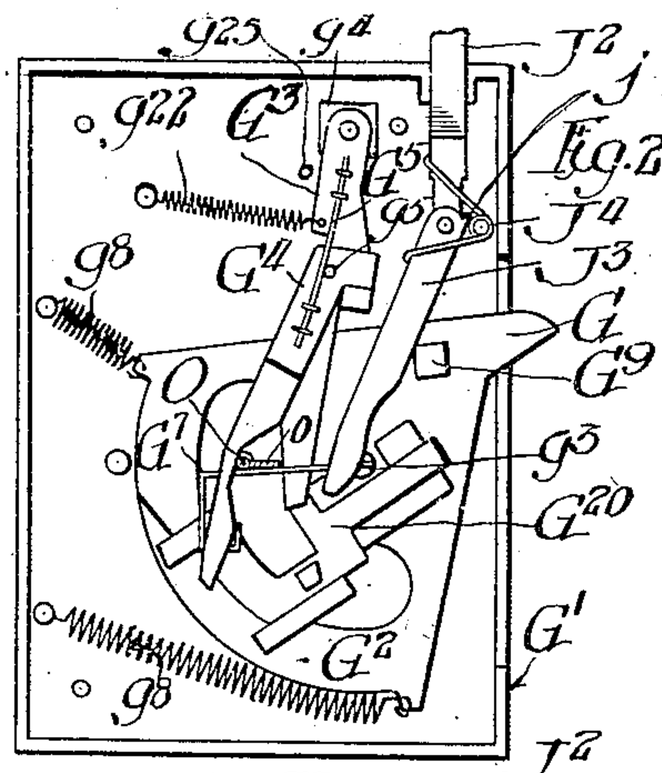


Fig. 22.

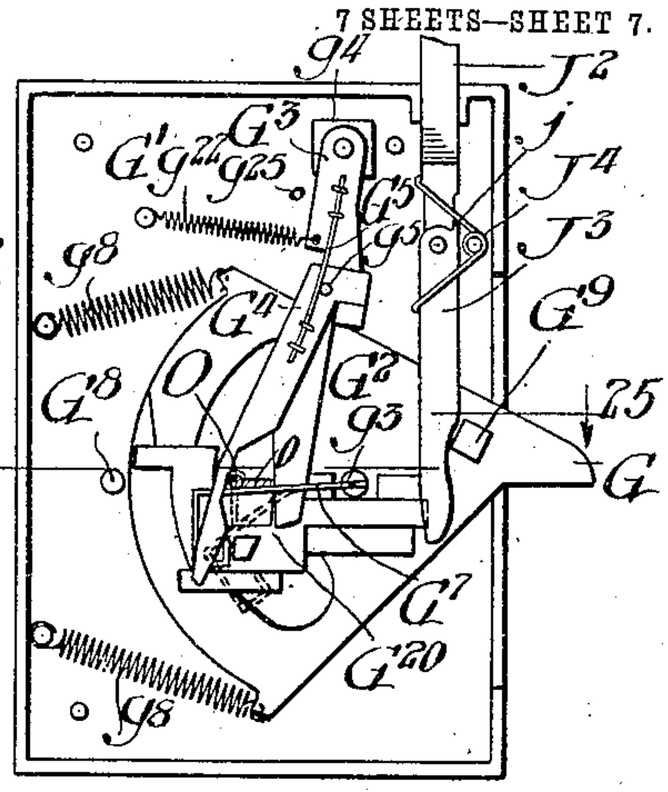


Fig. 23.

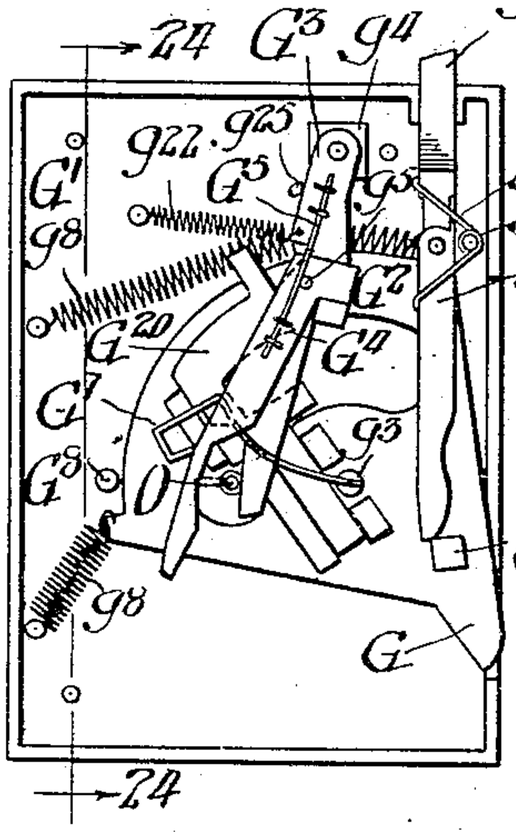


Fig. 24.

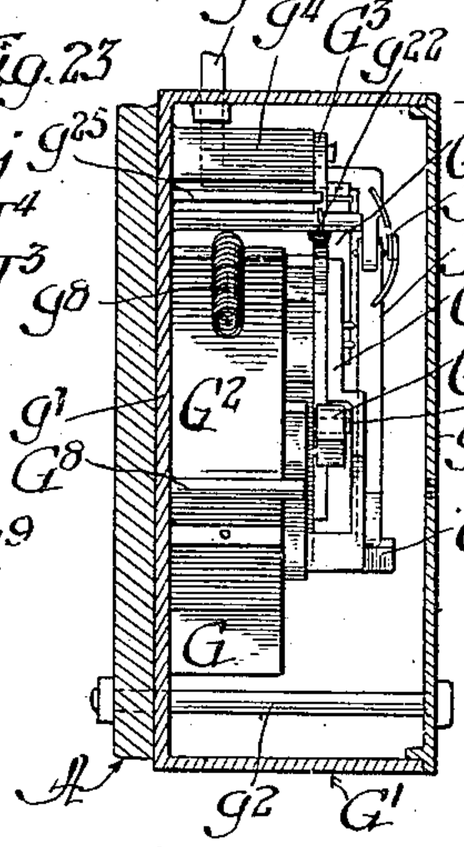


Fig. 25.

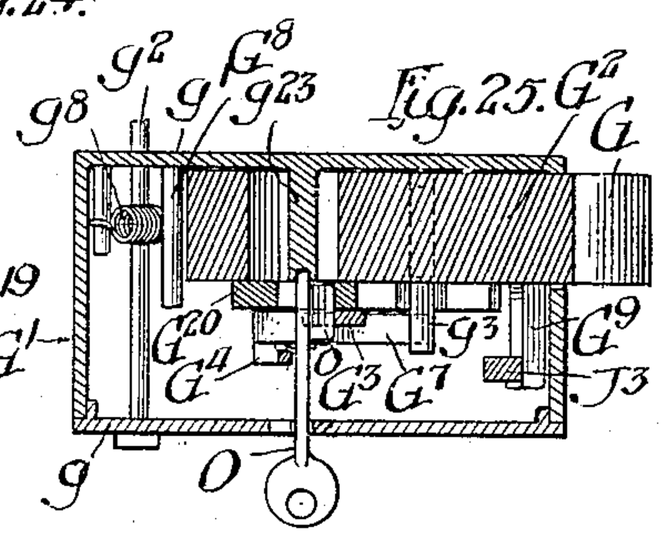


Fig. 26.

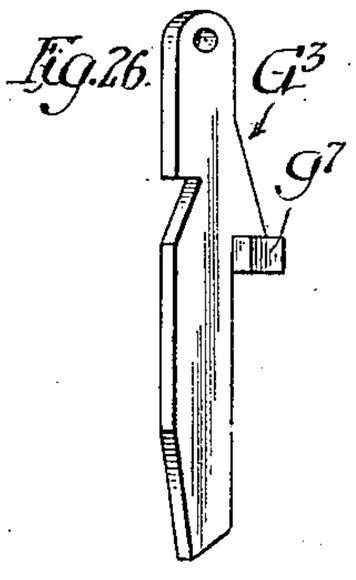


Fig. 27.

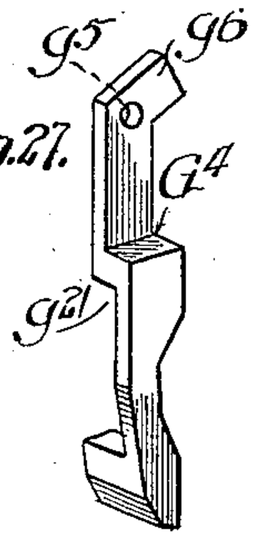


Fig. 28.

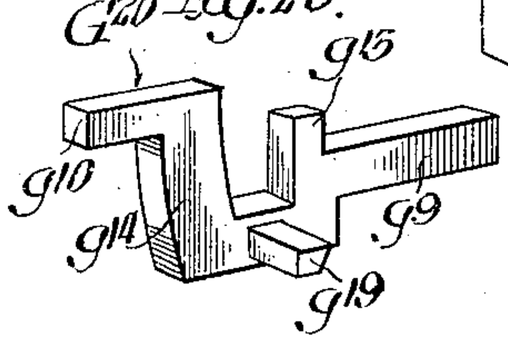


Fig. 29.

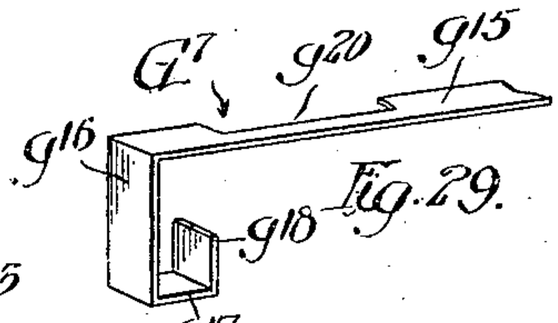
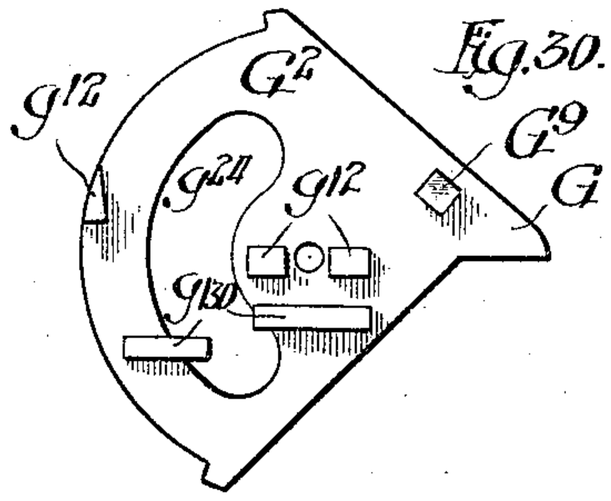


Fig. 30.



Witnesses:

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W. L. Hall

Inventor:

Arthur D. Cloud

by Poole & Brown

his Attys

UNITED STATES PATENT OFFICE.

ARTHUR D. CLOUD, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-THIRD TO FRANK M. PATTERSON AND ONE-THIRD TO FRED W. RIZER, OF CHICAGO, ILLINOIS.

SWITCH-STAND.

No. 873,720. Specification of Letters Patent. Patented Dec. 17, 1907.

Application filed September 27, 1906. Serial No. 336,387.

To all whom it may concern:

Be it known that I, ARTHUR D. CLOUD, a citizen of the United States, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Switch-Stands and Equipment for Railways; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawingss and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in switch stands and equipment therefor designed for railway uses, and more particularly adapted for use at the outlying ends of passing tracks, and the invention consists in the matters hereinafter set forth and more particularly pointed out in the appended claims.

Among the principal objects of the invention is to provide an improved stand and equipment thereof, the parts of which are so constructed and arranged that the switch will be automatically closed by a train after it has passed from the side track to the main track, thereby, not only saving the time required of a trainman to lock the switch closed after the train has passed, but also avoiding the waste of time and the expense incurred in stopping the train in order to permit the trainman to board the train after he has locked the switch closed, as is now common in good railroad practice. In addition to this feature of the invention, the said switch stand is designed for practicable use at grade points of a railway track where it would be economically impracticable to use a stand that must be manually closed after the train has passed upon the main track. This arises from the fact that, with my improved stand and equipment, a train may pass rapidly from the side or passing track to the main track and maintain a speed that will carry it over a grade on the main track located a distance from the switch over which it would not be economically or practically possible to move a train if the conditions made it necessary to start from a standstill at such grade.

A further object of the invention is to provide, in a switch stand of the general character herein described, a signaling device so connected and operating with the mechanism for opening and closing the switch as to avoid all possibility of the signaling device showing a clear track before the switch has been properly locked in place.

A further object of the invention is to provide a switch stand wherein the gravity returned switch lever is positively locked in its open position, combined with means for releasing the locking means to permit the lever to return by gravity. The said upper lock may be automatically operated to engage the lever, and its release may be automatically or manually effected.

A further object of the invention is to provide a self-closing switch mechanism of the character referred to which is capable of being closed by the last car of an outgoing train, whereby the controlling mechanism for said closing device may be placed closely adjacent to the switch stand.

A still further object of the invention is to provide a special form of lock designed to lock the switch lever in its closed position while permitting the switch lever to return or swing down to normal and automatically locking said lever in such position.

Another object of the invention is to provide improved devices in the nature of a latch for holding the switch lever, as also the signal lever, in its upper position, combined with means for releasing said latch.

Further objects of the invention will be disclosed by the following description of one approved embodiment of the invention.

In the drawings:—Figure 1 is a perspective view of a switch stand embodying my improvements, showing its relation to the switch and main track. Fig. 2 is a plan view of parts shown in Fig. 1. Fig. 3 is a transverse section of the tracks showing the stand and signal device in elevation. Fig. 4 is a view, partially in elevation and partially in section of the switch stand itself looking towards the track. Figs. 5 and 6 are horizontal sections, looking downwardly, taken on the lines 5—5 and 6—6 of Fig. 4. Fig. 7 is a view of the upper end of the hollow switch stand, constituting the casing for inclosing the locking mechanism for holding the switch lever in its elevated position, and showing such locking or latch mechanism in elevation. Fig. 8 is a side elevation of said latch mechanism in a changed position, removed from its inclosing casing. Fig. 9 is a section taken on line 9—9 of Fig. 7. Fig. 10 is a fragmentary view illustrating the switch

throwing lever in two positions, by full and dotted lines, and also the manner of mounting the signal lever thereon. Figs. 11 and 12 are details illustrating two positions of the signal lever relatively to a locking device therefor, as will hereinafter be described. Fig. 13 is a diagram illustrating one approved form of magnetically controlled appliance for automatically releasing the gravity switch throw lever to permit the switch to close. Fig. 14 illustrates parts of said controlling device, in a changed position, removed from the associated electrical devices. Fig. 15 is an elevation of the locking mechanism for locking the switch lever in its closed position. Figs. 16 to 23 illustrate said locking mechanism showing the parts thereof in changed positions in the order which they assume in the operation thereof. Fig. 24 is a section taken on line 24—24 of Fig. 23. Fig. 25 is a section taken on line 25—25 of Fig. 22. Figs. 26 to 30, inclusive, are perspective views of the principal elements of the switch lever locking mechanism hereinafter to be described.

Preliminary to describing the specific embodiments of the invention illustrated in the accompanying drawings, a brief statement of the principal features of the invention, together with their general manner of operation, will be useful to a more clear understanding of the details thereof. The location of the switch stand relatively to the switch points follows common practice, and the signal device herein shown as embodied in the complete apparatus, may be any of the well known types, *per se*.

The switch stand is provided with a gravity returned switch lever which is held in its lowermost position to close the switch by its weight, and is locked in its uppermost position by a device in the nature of a latch which automatically engages the lever, and, after once engaging the lever, holds it in its uppermost position and the switch open until released by the mechanism provided therefor. The said latch may be locked to hold the switch lever in its upper position by means of a device having the form of an armature, which is associated with an electromagnet, the circuit of which is designed to be closed by a train after it has passed out of the switch onto the main track, whereby the lever falls to its lowermost position and acts by its gravity to close the switch. Provisions are also made for releasing the switch holding latch by a manual operation for a purpose hereinafter to be described. The lock for locking the switch in its closed position is of such construction that the catch or detent thereof is normally locked in the path of the lever, but is free to swing out of said path by the manipulation of a suitable key, and the holding latch of the lever is located in such a position that the switch lever, after passing the lock, is raised into engagement with the holding latch and is automatically locked thereby and released in the manner stated. In the lower lock for the switch lever to lock the same closed, its catch or detent is yieldingly depressed out of the path of the falling switch lever but automatically returns to its locking position. The signaling lever comprises also a gravity lever that is locked in its uppermost position, as herein shown, by means of a latch mechanism similar to that which coöperates with the switch lever. The said signaling lever latch, however, is released under the control of the switch lever, when the latter is restored to its normal or lowermost position, and the intercontrolling devices are so arranged that the said signal lever cannot be returned until after the locking lever has been fully returned; thus avoiding the liability of the signal showing a clear track at a time when the switch is not closed.

In the following description of my invention I will, for convenience, refer in detail to the construction herein specifically illustrated, but it will be understood that that description is not to be regarded as limiting the invention, as such details are capable of wide variation, within the invention, as pointed out in the claims. It will be furthermore understood that the operation of each and all the special and novel appliances herein described look towards the decrease in operating expense and safety of the operation of trains, and that in the apparatus herein shown, such ports operate in unison to such end. However, the features of construction constituting the apparatus are capable of modified uses with each other and also without necessarily employing all the several features of the complete apparatus or equipment herein shown.

As shown in said drawings (Figs. 1, 2, 3, 4 and 10), A designates, as a whole, the switch stand proper comprising a hollow cast metal standard which is flanged at its lower end and is supported on and fixed to a base A^1 consisting of extensions of two of the adjacent ties, in the usual manner. Said standard is provided with two parallel, vertical slots a a^1 through which extends and swings the switch and signal levers B and C, respectively. Said levers drop to their lowermost positions by gravity, being herein shown as provided with weights b c and equipped with handles b^1 c^1 by which they are grasped to raise the levers. The switch lever B is pivoted to a stud or bracket B^1 rising from the base A^1 between the stand and the track and is provided with a downwardly turned rigid arm b^2, Fig. 3, that is connected by a link b^3 with the switch points D in a well known or familiar manner. The signal lever, by preference, in accordance with one feature of my invention, is pivoted to the switch lever at c^6

(Figs. 1 and 2). The signaling device or semaphore which rises from and is supported on the stand may, so far as my invention is concerned, be of any well known type. As herein shown, the operating rod E for said signaling device, which extends upwardly through a supporting tube E^1 of the signaling device, and which has guiding engagement in the upper end of the stand, is raised through the medium of a Z-bar F (shown in dotted lines in Fig. 4) that is provided with a laterally turned part or lug *f* at its lower end for engagement with the lower end of said rod, and with an oppositely turned lug f^1 at its upper end adapted to be engaged by the signal lever when the latter is raised. Such rod drops by gravity when the signal lever is lowered and is arrested and supported on a lug F^1, shown in dotted lines in Fig. 4.

In Figs. 1 and 3 the switch lever is shown in its lowermost position, or the position it occupies when the switch is closed, while the signaling lever is shown in its uppermost position. In Fig. 4 the two levers are shown in dotted lines as occupying their lowermost positions and in full lines as occupying their uppermost positions.

The switch lever B is normally held from rising, when in its lowermost position, by means of the catch or detent G of a special form of lock, designated as a whole by G^1, and hereinafter to be described. The said lock is fixed to a flange one side of the stand and its detent extends horizontally into the vertical slot into the path of said switch lever. Said catch is normally locked in this position to lock the lever but is adapted to be released, as by a suitable key, so as to be swung upwardly out of the path of the switch lever by engagement thereof with the switch lever when the latter is swung upwardly; and the parts of said lock are so constructed that the said catch or detent G swings freely out of the path of the switch lever when the latter drops to its lowermost position, and then to normal position to automatically lock the returned lever.

Referring now to the devices for holding the switch lever in its uppermost position, as shown in full lines in Fig. 4, and thereby locking the switch open, said parts are made as follows: The said switch lever holding device embraces, what may be termed, a locking latch comprising two generally hook-shaped levers which swing towards and from each other and are normally separated by a space in line with the path of movement of the switch lever, the operative parts being so constructed and arranged that when said switch lever moves into the space between said levers, it operates thereon to swing the lower ends of the levers inwardly to hold the lever in its elevated position. The said hooked latch levers are combined with mechanism for locking the same upon the switch lever until released by mechanism provided therefor. In the present instance, the means for thus locking the latch lever closed upon the switch lever comprises the armature of a suitable electro-magnet and the releasing of the mechanism is effected by the energization of the magnet which withdraws the armature from its locking position. The mechanism having the general characteristics above set forth and operating in the manner generally described is herein shown as made as follows: The said latch levers H are pivotally mounted between their ends upon two floating links H^1 of general inverted U-form, the connections of said levers with the links embracing pivot pins h^1 h^1 extending through the ends of said inverted U-shape yoke or link and the intermediate parts of said latch levers. The lower ends of said levers are provided with hooks *h* to engage the switch lever. The upper ends of said levers are connected by pivot pins h^2 h^2 with locking cams H^2 H^2, which latter are rotatively mounted on pins or studs h^3 h^3 fixed in the opposite walls of the casing which incloses said latch. The latch levers H, therefore, rise and fall in their movement to engage and release the switch lever, the upper ends thereof swinging outwardly and the lower ends inwardly when rising; the reverse movements occurring when dropping downwardly. The cam locking members swing towards and from each other on their axes, swinging away from each other when the parts rise and towards each other when the parts fall. The said locking members are provided with peripheral notches h^4 which, when swung away from each other (Figs. 4, 7 and 8) are adapted for engagement by a locking plate which, in this instance, constitutes the armature of an electro-magnet I^1 that is included in a magnetic circuit that is adapted to be closed when the train is passing from the side to the main track. Said armature is provided with a guide stem I^2 that has suitable guiding engagement with the upper wall of the inclosing casing of the stand. When the latch levers are in their unlocked positions the cam members H^2 occupy horizontal positions, with the locking plate or armature I lying on the peripheries thereof (Fig. 7). When said parts are raised, however, by the switch lever, the cams rotate outwardly until the edges of the plate I fall into engagement with the notches h^4 of the cam members, whereupon the latch locks the switch lever in its uppermost position.

It will be noted that the floating links or yokes H^1 maintain the axes of oscillation of the latch levers at a constant distance apart, while permitting the same to rise and fall in the manner stated. It will be furthermore observed that the pivots h^1 h^2 and h^3 of said parts when in their locking positions, are

located so nearly in line with each other that the weight of the switch lever has little tendency to swing the lower ends of the levers H outwardly and therefore exerts a minimum pressure to effect friction between the plate I and the notches of the cams H^2. The plate is lifted from engagement with the cams by exertion of little power, as compared to the weight of the lever B. The said latch levers H are provided, in line with the space dividing the lower ends thereof, with oppositely located lugs h^5 h^5 which are adapted to be engaged by the switch lever as it is swung upwardly, and the engagement with said switch lever of said projections or lugs has the effect of raising said latch levers and closing the same on the switch lever, in the manner described. The said latch levers are provided on their outer, lateral edges with notches h^6 h^6 (Fig. 8) which receive the pivots h^3 of said cam members as the latch levers rise and the upper ends thereof spread apart. The raising of the locking plate I or armature out of contact with the notches h^4 of said cam members releases said parts and permits the switch lever to drop to its lowermost position. Such release may be effected either electrically or mechanically, both means being herein shown.

The signal lever C is locked in its upper position by a latch mechanism identical, as herein shown, with the construction just described in connection with the switch lever and like parts of said signal lever holding device are designated by like reference letters. The releasing plate J associated with the signal lever may or may not be magnetically controlled, and is herein shown as mechanically controlled. The essential feature of the releasing function of the plate J of the signal lever is, however, for the same purpose as described in connection with the like device for the switch lever. The locking plate J of the signal lever holding latch, corresponding in function to the locking plate or armature I of the switch lever holding latch, is raised out of its locking position from engagement with the shoulders h^4 on the cam members H^2 by means of a horizontal arm J^1 rigid with a rod J^2 (Figs. 4 and 5) to which latter is imparted a vertical or rising movement through suitable coöperative connections with parts in the lock G^1, hereinafter to be described; said parts operating after the lever B has passed the detent or catch G of the lock G^1. The said arm J^1, for this purpose, is constructed to engage a lug j on the guide stem j^1 of said locking plate J. This construction and operation will be more clearly understood after the construction of the locking mechanism has been explained.

It may sometimes occur that after the switch lever has been raised to its uppermost position to throw the switch to divert a train from the side track to the main track, circumstances will arise to make it necessary to close the switch, as, for instance, to permit a train to pass on the main line, before the train of the side track passes onto the main line. This may be accomplished either mechanically or electrically, and I have herein shown both methods of producing this result. The mechanical means for effecting this result is made as follows: K, (Fig. 4) designates a vertically movable rod which extends downwardly through the top wall of the casing which receives the holding latch of the switch lever. Said rod is provided at its lower end with a laterally directed rigid arm k that is adapted for engagement with a lug i of the guide stem or shaft of the locking plate or armature I, said arm and lug being normally separated so that the releasing rod is raised a distance before the arm thereof engages the lug. Said rod is adapted to be lifted by a handle or arm k^1 extending laterally therefrom above the wall of the inclosing casing and which, in its normal or lowermost position, is located between two parallel lugs a^3 a^3 rising from the top wall of the stand, as more clearly shown in Figs. 2, 3 and 4. The said rod K is held normally from rising by means of a padlock k^3, the loop of which extends through apertures in said lugs a^3 above the arm or handle k^1 thereof. When, therefore, the switch lever has been raised to open the switch and it is desired to close the same at a time before the train standing on the side track passes onto the main track, the lock k^3 is removed, thereby permitting the rod K to be raised to release the latch from said switch lever to permit the lever to drop to its lowermost position.

In order to provide against the signal lever being dropped io its lowermost position while the switch lever is in its uppermost position, whereby the signal would show a clear track with an open switch, I have provided a safety mechanism which operates to hold the signal lever in its upper position at all times when the switch lever is locked up and the switch open, regardless of whether or not the holding latch for the signal lever is performing its proper function. The features of construction of the mechanism for producing this result are as follows: As before stated, the signal lever is pivoted to the switch lever, so that in raising the switch lever after the signal lever has been raised and locked in its uppermost position, said switch lever is shifted endwise outwardly, as indicated in dotted lines in Fig. 10, said lever being curved and moving outwardly in a curved path. The lever is provided between its holding latch and the track with a notch or recess c^3, as indicated in Figs. 10, 11 and 12, which is closed at its end nearest the track but is provided at its other end with an entrance opening c^4 that is disposed obliquely upwardly and inwardly

towards the track. Extending transversely across the groove a^1 of the stand at the upper end thereof, and located between the holding latch for the switch lever and the track, is a pin a^4 which is so disposed, relatively to the entrance c^4 of the recess or notch c^3 of the signal lever, that when said lever is swung and locked upwardly the pin occupies the open end of said recess c^3, (Fig. 11). Thereafter, when the switch lever is raised it effects an endwise shifting of the signal lever in the manner before described, thus moving the notch outwardly over the stationary pin to bring the pin under the tooth or lug c^5 above the closed part of said notch. When the parts are in this position, therefore, it will be observed that the signal lever cannot drop so long as it is engaged with said pin a^4, and it will be further observed that disengagement of said parts cannot occur so long as the switch lever is in its uppermost position. Therefore, the signal device must always show danger while the switch is locked open.

The releasing magnets I^1 I^1 for releasing the locking latch of the switch lever may be included in a simple, normally open magnetic circuit having closing devices on the main track located at a distance from the switch stand equal to the maximum length of a train that may pass from the side to the main track, and adapted to be controlled to close said circuit by the wheels of the engine of the train, if the train be going ahead or the wheels of the last car of a train backing out of the switch. I prefer, however, to locate the controlling devices for the releasing magnet circuit closely adjacent to the switch stand for the purpose of economizing the construction, and also for the purpose of having the controlling devices so closely at hand that the switch lever latch may be released through such connection if desired. The said controlling devices will be ordinarily contained in a suitable box located adjacent to the stand on a suitable support not herein shown. Referring now to this feature of the invention, which is shown in Figs. 13 and 14, the same is made as follows: The track rails D^1 D^1 constitute portions of magnet circuits which operate the controlling devices. As herein shown, the rails at one side of the track are insulated from each other, as indicated at *d*, thus dividing the two circuits, which are herein employed. Such insulation divides the main track adjacent to the switch or side track into two sections. The first insulated section of the main track will hereinafter be termed, for convenience of description, the near section, and the farther section, the far section. Said controlling device is made as follows: L L^1 designate two swinging armatures which are pivoted at *l* and are so mounted as to swing towards each other when free. The said armatures L L^1 are provided with arms L^2 L^3 which extend toward each other, but are separated at their adjacent ends in the normal position of the parts. Said members are held in their normally separated positions by means of electro-magnets M M^1, and each of said magnets M M^1 is included in a normally closed circuit whereby said magnets are normally energized to hold the armatures upwardly away from each other. The circuit of the magnet M includes a battery M^2 which is bridged across the track rails D^1 D^1 of the far section, and said rails are connected by wires 30 and 31 with the magnet M, the wire 31 being connected directly with one section of the track rails D, and the other wire 30 being connected with the opposite track rail by a branch wire 32. The circuit of the magnet M^1 likewise includes a battery M^3 bridged across the track rails D^1 of the near section, the latter circuit being completed by wires 33 and 34 connected with the track rails of the near section in the same manner as are the wires 30 and 31 connected with the rails of the far section. The magnet circuits will hereinafter be referred to by the letters which designate their respective magnets. Said magnet circuits are normally closed so as to hold the armatures and their inwardly directed arms in a position to normally separate the latter. The magnet circuit for releasing the locking latch of the switch lever includes a battery N and comprises wires 35 and 36, one of which is connected with the armature L at its pivot, and the other of which is adapted for electrical contact with the other armature through the medium of a contact piece 37 when the said armature L^1 is in its normal or retracted position. The latter circuit will hereinafter be referred to as the magnet circuit I^1. By reason of the fact that the arms L^2 L^3 of the armature are normally separated, it will be observed that the magnet circuit I^1 is normally open.

The operation of the parts described is as follows: As soon as the engine or the car of a train passes from the side track upon the near section of the main track, the magnet circuit M^1 is short circuited around the magnet thus permitting the armature L^1 to drop to the position indicated in the lower dotted lines of Fig. 13. When the train passes onto the far section of the main track, the magnet circuit M is short circuited around the magnet M, thereby permitting the armature L to swing by its own tendency towards the other armature L^1 with the horizontal arm L^2 thereof resting on the horizontal arm L^3 of said other armature L^1. The inner terminal of the arm L^2 is made of thin spring metal so that it may readily yield, for a purpose hereinafter described. The parts will remain in the positions described so long as the train is on both the far and near sections of the main track. As soon, however, as the last car of the train passes off the near section of the

main track, the magnet circuit M^1 is closed, thereby energizing its magnet M^1 to raise or close the armature to its normal position. When this occurs the spring end of the arm L^2 of the armature L is sprung up into the upper dotted line position shown in Fig. 13; but the weight of the armature L is such that the force exerted on the outer end of the spring does not throw the latter armature into its retracted or closed position. The retraction of said armature L^1 in this manner closes the magnet circuit I^1 at the contact piece 37 and at the meeting ends of the arms L^2 L^3 and thereby releases the locking latch of the switch lever in the manner hereinbefore described, thereby closing the switch and shifting the signaling device to show a clear track. After the last car of the train passes off the far section of the main track, the magnet circuit M is closed, thereby retracting its armature L and withdrawing the end of the resilient arm L^2 away from the arm L^3 to open the magnet circuit I^1.

In addition to the magnetically operated controlling devices referred to, I may provide, as a precautionary measure, means which operate in connection therewith in such manner that a train passing along the main track headed towards an open switch may operate to automatically close the switch and thus avoid danger of a main track train passing unintentionally onto the side track. Such unusual opening of the switch, at a time when a train is scheduled to pass on the main track, may occur by reason of the fact that the switch has been opened for the purpose of cleaning the same or for other purpose, by a person not acquainted with the schedule of the trains on the main track. The closing of the switch under such contingency may be simply and economically effected by providing the resilient end of the arm L^2 of the armature L with an upturned portion l^2 that is adapted, when the magnet circuit M is short circuited by the entering of a train on the far section of the main track, and the armature L is therefore released and swings inwardly, to engage the end of the arm L^3, as shown in Fig. 14, to release the locking latch of the switch lever. The far section of the main track will be made of greater length than the near section thereof so as to give ample time for the switch to close after the train has entered upon the far section. Moreover, the length of the far section is such that the engineer of the main track train can stop his train if, after entering said far section, he finds that the signal is not shifted to show clear track. It will thus be observed that the engineer of the train on the main track headed towards the open switch, when it is open at a time when the orders are to proceed ahead, knowing the length of the far section may safely proceed continuously into said far section against the danger signal, knowing that if the signaling device is not shiftedto safety promptly upon the entrance of his train onto the far section he will have ample time to stop the train before reaching the switch.

Reference has been made hereinbefore to the means for releasing the switch lever and signal lever in the event that the switch be opened, and, for some reason it is desired to close the same before a train passes from the side to the main track, the releasing means so mentioned embracing the manually operable releasing rod K. Such release of the switch lever holding latch may also be effected electrically. In the diagram of Fig. 13 is shown one means for producing this result, consisting of a switch 38 connected at one end with the wire 36 and at its other end with the wire 35 on the side of the battery remote from the magnet I^1. This switch is normally open and is closed only when the switch and signal levers are to be manually released. The magnetic controlled mechanism described will be located closely adjacent to the switch stand so that this manner of releasing the switch lever may be readily accomplished by a person who has opened the switch and desires to close the same.

Referring now to the construction of the lock G^1 by which the switch lever is normally locked in its lowermost position, it is made as follows: Said lock is inclosed in a case comprising front and rear walls g g^1, respectively, connected by top and side walls, one of which side walls is slotted for the passage therethrough of the latch or detent G. Said case is bolted to a flange of the stand by means of bolts g^2, which also hold the front wall of the lock case in place. The lock comprises as its main or essential element a rock plate G^2 which carries the catch or detent G, and rocks on a stud g^3 extending outwardly from the back wall of the case, a sliding bolt G^{20} carried on the front face of said plate, and a two-part or jointed locking lever coöperating with a lug or stop, hereinafter to be described, to temporarily lock the plate G^2 in its unlocking position. Said jointed locking lever comprises members G^3 G^4. Said member G^3 is hinged at its top to a lug g^4 extending forwardly from the back wall of the case and extends diagonally downwardly across the face of said rock plate G^2. The second member G^4 of said jointed locking lever is pivoted at its upper end to the member G^3 by means of a stud or pin g^5 and extends downwardly at an angle to and somewhat below that of the member G^3. The said lower member G^4 is provided at its upper end, above its pivot connection with the other member, with a short rigid arm g^6 that is adapted to engage a laterally extending lug g^7 on the upper member G^3, and a spring G^5, attached to said members across the pivotal connection thereof, operates to hold said arm

against said lug in a manner to prevent flexure of the two members of the jointed locking lever in one direction, while permitting it to slightly flex in the other direction during the operation of the lock, as shown in Fig. 18. The said rock plate is placed under the influence of two spiral contractile springs g^8 g^8 attached at their outer ends to studs extending inwardly from the back plate of the lock frame or casing and attached at their other ends to the rock plate in a manner to hold the same in its normal or central position with the detent or catch G projecting from the casing as more clearly shown in Figs. 15, 16 and 17; one of said springs yielding to permit the rock plate to rock on its axis in the one direction, and vice versa. The said sliding locking bolt is provided at one end with a shank g^9 and at its other end with a locking detent g^{10}, which latter coöperates with a stud G^8 on the back wall of the case to hold the rock plate from swinging upwardly when the bolt is in its normal position, with the detent extending beyond the periphery of the rock plate, as shown in Fig. 15. The bolt has guiding engagement with the upper and lower guide lugs g^{12} g^{130}, respectively, extending forwardly from the rock plate, whereby the bolt is guided in its endwise movement on the rock plate. When said detent g^{10} of the locking bolt engages said stud G^8, the rock plate and its detent G are held from rising. Said locking bolt is formed between its ends with upwardly rising arms or lugs g^{13} g^{14} on the upper end of which latter is formed a catch or detent of the bolt. Between said arms is formed a space to receive the key O, the bit *o* of which acts against the inner face of the arm g^{13} of the bolt at the proper time to withdraw the bolt, and acts at another time in the operation of the lock against the inner face of the arm g^{14} to return the bolt to its locking position. Said bolt is normally held in its forward or locking position, as indicated in Fig. 15, by means of a spring G^7, shown in detail in Fig. 29, which comprises a shank g^{15} and a hook at one end thereof embracing the angularly related parts g^{16}, g^{17} and g^{18}, the terminal member g^{18} of which is directed towards but is located at such distance from the shank as to provide space between the same. The shank of the hook, in the present instance, is fastened to the forward end of the pivot stud g^3 of the rock plate. The hooked terminal of said spring G^7 extends rearwardly past and in front of the lower end of the member G^3 of the jointed locking lever and is adapted for engagement with a lug g^{19} directed forwardly from the locking bolt. The spring occupies a position between the members G^3 G^4 of the jointed locking lever at certain times in the operation of the lock, and in order to make the parts fit compactly together, the spring is herein shown as notched at g^{20} to receive the lower end of the member G^3 of the lever, and is made of a length to permit the required relative movements of said parts. Likewise, the lower member G^4 of said jointed locking lever is offset between its ends to provide on its inner face a recess g^{21}, which permits the said member to pass in front of the spring. The arrangement shown conduces to compactness, but may be varied when the lock is otherwise modified. The said spring coöperates, in its normal position, with the stud g^{19} to hold the locking bolt in its locking position, as shown in Fig. 15, but is shifted out of this position by the key preparatory to sliding the bolt into its unlocking position.

In the operation of the lock described, the function of the key O is to release the spring G^7 from the locking bolt and to retract and return said bolt. When released the rock plate of the lock, together with the parts carried thereby, are swung upwardly by engagement thereof with the rising switch lever. The jointed locking lever functions at this time to temporarily hold the mechanism in this position until intentionally restored by the reversal or returning rotation of the key O. Such reversing rotation of the key to remove the same releases the jointed locking lever to permit the rock plate, and the part carried thereby, to be returned to normal. The locking key O extends through openings in the front wall *g* of the lock G^1 and is adapted to engage at the rear end of its shank a lug g^{23} extending forwardly from the wall g^1, as more clearly shown in Fig. 25. The rock plate G^2 is provided with a curved slot g^{24} concentric with the rocking axis of the plate G^2 and through which slot said lug passes as the plate is rocked on its axis.

The full operation of the lock to effect the result set forth may be observed by reference to Figs. 15 to 23, inclusive, taken in connection with the following: The normal position of the several members of the lock is shown in Fig. 15, and in that figure is shown the position of the key O when first inserted into the lock, the bit of the key lying horizontally over the hooked terminal of the spring G^7. The key is rotated to the left to unlock the locking mechanism. The first quarter rotation of the key, which is indicated by dotted lines in Fig. 15, operates to depress the hooked end of the spring G^7 to throw the hook below the plane of the lug g^{19} of the locking bolt. During the second quarter of the rotation of the key the key acts against the arm g^{13} of the locking bolt to retract the bolt away from the stud G^8. During this movement of the key the spring is held down by the bit of the key in a position required for the lug g^{19} of the sliding block to pass the hook of the spring. The completed half rotation of the key and consequent position of the parts are shown in Fig. 16. In this posi-

tion the bolt G^{20} is held retracted by the hooked terminal of the spring. It will be observed by reference to Fig. 25 that the face of the arm g^{13} of the sliding lock bolt is in the same plane or flush with the adjacent edge face of the upper members G^3 of the jointed locking lever referred to, so that during the movement of the key from its one-quarter to its one-half position, the said jointed bar is moved forwardly against the action of its spring g^{22}. This spring normally holds the jointed lever against a stop consisting of a stud g^{25}, extending forwardly from the rear wall of the lock case, as shown in Fig. 15. Fig. 17 shows the position of the parts when the key has rotated three quarters of its turn, or its full range of rotative movement. Fig. 17 also shows the position the parts assume when the key is brought to rest at its three quarter position. The rock plate is held centrally by the springs g^8, but is free to be swung upwardly as the switch lever is swung to its upper position. In Fig. 18 is shown the position of the parts when the rock plate and its detent is partially lifted by the upwardly swinging switch lever. In Fig. 19 is shown the position of the parts when the rock plate has been swung to clear the detent G from the slot *a* of the stand to permit the swinging switch lever to pass the same. At this time that the rock plate and the mechanism of the lock is held temporarily in the position shown in Fig. 19 by engagement of the lower member G^4 of the jointed locking lever with a lug on the rock plate, which is conveniently one of the upper guide lugs g^{12} of the sliding locking bolt, which lug, by reason of the rotative movement of the plate, has swung downwardly in position for such contact. For this purpose, said guide lug is beveled on its inner surface to engage the lower end of the member G^4 of said jointed locking lever. The joint of said locking latch admits sufficient flexure of said jointed lever to permit said lower end of the member G^4 to pass over the point of said lug to lockingly engage the same. The parts remain in this position until the rotation of the key is reversed to remove the same from the lock and the positions which the parts assume during the reversing movement of the key are shown in Figs. 20 to 22, inclusive.

The parts as illustrated in Fig. 20 shows that the key on its return movement from three quarter position toward half position first engages the lower end of the member G^3 of the jointed locking lever and, by reason of such engagement, and the construction of said lever, swings the lower ends of both members of said bar inwardly with the result of shifting the lower end of the member G^4 out of engagement with the locking stud or guide g^{12}. At the completion of the one half movement of the key, shown in Fig. 22, the parts have assumed practically the same position as shown in Fig. 16. In this figure, the full line position of the key indicates its return to one half position, while the dotted lines indicate the return to one quarter position. In the latter or dotted line position, the bit of the key engages the hooked terminal of the spring G^7 so as to lower the hook of said spring below the lug g^{19} of the sliding lock. During the return rotation of the key from one quarter position to normal, the bit of said key engages the inner face of the arm g^{14} of the locking bolt and forces the same outwardly over the lug G^8 and thereby locks the mechanism in its normal position. During the upward retraction of the lock mechanism, after the switch lever has dropped to place, there is effected the lifting of the rod J^2, hereinbefore mentioned which acts to release the lock plate J associated with the signal lever latch. The parts of this interlocking mechanism between the levers, functioning for the purpose set forth, contained in and coöperating with the lock mechanism, are made as follows: In Fig. 23 is shown the position which the parts assume when the switch lever is automatically released and drops by gravity to its lower position, the lock in this position offering no resistance to the lowering of the lever, excepting that afforded by the springs g^8.

The rod J^2 extends downwardly into the lock case and it is provided at its lower end with a bar J^3 hinged or jointed thereto in such manner as to normally maintain the bar in alinement with the vertically movable rod J^2 while permitting it to yield in one direction, to wit, away from the locking detent or latch of the rock plate, but prevents it from yielding in the opposite direction away from an axial position with the rod J^2. For the purpose of effecting this result, the pivoted parts are provided on one side thereof with suitable stops *j* and a spring J^4 connected above and below the pivot serves to normally hold the stops of the joints together and the parts in alinement while permitting the lower part to yield as stated. The said lower lever J^3 coöperates with a stud G^9 on the rock plate to effect the releasing of the signal lever locking latch in the following manner. During the normal position of the lock and which it assumes when being unlocked to permit the raising of the switch lever, the said lever J^3 is held by the spring J^4 against the said stud G^9 and at all times the stud is located slightly above the lower end of the lever. At the time, however, when the rock plate assumes its lowermost position, when the switch lever is being returned, the said rock plate is swung so as to bring the lug g^9 beneath the end of the jointed lever J^3, as shown in Fig. 23. The spring J^4 throws the end of said lever against the lug in such manner as to engage it with sufficient reliability and firmness that in the first part of

the raising of the rock plate to normal, under the action of the spring g^8, to shift the lever J^3 and rod J^2 upwardly and thereby effect the release of the locking latch of the signal lever. The lower end of said jointed lever J^3 is, however, rounded so that after the parts have performed their functions, and also by reason of the path of movement of the stud during the return of the plate to normal, the said lever slips off the stud and returns to its lowermost position as shown in Fig. 15.

It will be observed that the switch lever cannot be raised to unlock the switch without the proper key, and also that the order of manual operations that must take place to unlock and raise the switch lever to its upper locked position to open and lock open the switch cannot be departed from. Thus the person cannot unlock the stand and release his key without leaving the lock in position to automatically lock the switch lever when the lever is returned. Similarly the signal lever, when raised with the switch lever, cannot be lowered to show a clear track until the switch lever is fully returned. The person operating the switch stand is, therefore, left to no discretion on his part, but must follow the orders given him, and no more, to effect what is required of him to do.

Instead of effecting the release of the signal lever locking latch mechanically through the control of the return movement of the switch lever, such release may be effected electrically by employing lifting magnets, in the same manner as in connection with the switch lever locking latch, included in a circuit, the terminals of which are located in position to close the circuit when the switch lever drops into its lowermost position.

I claim as my invention:—

1. In a switch stand and equipment, means for locking open an automatically closing switch, and a magnet circuit having opening and closing devices for releasing said locking means controlled by the passage of a train from a side track upon the main track.

2. In a switch stand and equipment, means for locking open an automatically closing switch, a magnet circuit having opening and closing devices for releasing said locking mechanism controlled by the passage of a train from the side track upon the main track, and means located adjacent to the switch for manually releasing said locking mechanism.

3. In a switch stand and equipment, means for opening and locking the switch open, and controlling means located adjacent to the stand designed to be operated by the last car of a train passing from the side track upon the main track, for releasing said locking means.

4. In a switch stand and equipment, means for opening and locking the switch open, and a magnet circuit for releasing the locking means which is controlled by a magnet circuit, including as a part thereof the rails of the main track adjacent to the switch.

5. In a switch stand and equipment, means operated at the stand for locking open an automatically closing switch, a signal device at the switch stand, means controlled by the passage of a train from the side track upon the main track for releasing the switch locking mechanism, and constructed to release the signal device to shift it to safety, and operative connections between the switch locking means and the signal, constructed and operating to shift the signal device only after the switch is closed.

6. In a switch stand, a swinging switch lever, and a swinging signal lever, means for locking said levers in position to open the switch and to operate the signal, and interlocking connections between the switch lever and signal lever locking means operating to release the latter locking means only after the full return of the switch lever to lock the switch closed.

7. In a switch stand, automatically returned swinging switch and signal levers, means for locking the levers to open the switch and to properly exhibit the signal, means for releasing said levers, and means controlled by the switch lever and independent of the signal lever locking means for preventing the signal lever dropping to its closing position at a time when the switch lever is in its opening position.

8. In a switch stand, an automatically returned swinging switch lever, a swinging signal lever hinged to the switch lever, means for locking the levers to open the switch and to properly exhibit the signal, means for releasing the levers, and means independent of the locking means for the signal lever for holding the signal lever from returning at a time when the switch lever is in its opening position.

9. In a switch stand, an automatically returned, swinging switch lever, a swinging signal lever hinged to the switch lever, means for locking said levers in position to open the switch and properly exhibit the signal, and locking connections on the stand and signal lever which are interlocked by the act of raising the switch lever.

10. In a switch stand, an automatically returned, swinging switch lever, a swinging signal lever hinged to the switch lever, means for locking said levers in position to open the switch and properly exhibit the signal, said signal lever being provided on its upper margin with an undercut notch and a pin or lug in the switch stand in the path of and entering said notch when the signal lever is in its uppermost position, whereby subsequent raising of the switch lever operates to engage the pin with the notched part of said lever to hold the latter in its uppermost position,

while the switch lever occupies its uppermost position, regardless of the locking means for the signal lever.

11. In a switch stand, a swinging, gravity returned signal lever, means for locking said lever in its uppermost position, said lever being provided on its upper margin with an undercut notch, a pin or lug adapted to interlock with said notch when the lever occupies its uppermost position to hold the lever in this position independently of the locking means therefor.

12. In a switch stand, a gravity returned switch lever, means on the stand for locking the lever in its uppermost position and the switch open to the main track, means controlled by a train after it has passed from the side track upon the main track for releasing said locking means to close said switch, and manually operable means for also releasing the switch lever.

13. In a switch stand, the combination with a switch lever, of a locking device therefor comprising latch levers provided to swing towards and from each other at their lower ends, and between which the switch lever is raised, means for automatically locking the latch levers upon the switch lever, and releasable locking means for holding said latch levers engaged with the switch lever.

14. In a switch stand, the combination with a switch lever, of a locking device therefor comprising latch levers provided to swing towards and from each other at their lower ends, and between which the switch lever is raised, means operated by engagement with the lever with the latch levers to close the latter on the switch lever, and releasable locking means for holding said latch levers engaged with the switch lever.

15. In a switch stand, a gravity returned switch lever, a locking latch in the upper part of the stand for locking the switch lever in its opening position, comprising latch levers which swing towards and from each other and between which the switch lever is raised, means for closing said latch levers on the switch lever to positively lock it in position, and means for releasing said latch levers from the switch lever.

16. In a switch stand, a gravity returned switch lever, a locking latch in the upper part of the stand for locking the switch lever in its opening position, comprising latch levers which swing towards and from each other and between which the switch lever is raised, means for closing said latch levers on the switch lever to positively lock it in position, and a magnet in the upper part of the stand for releasing the latch levers from the switch lever.

17. In a switch stand, a gravity returned switch lever, a locking latch in the upper part of the stand for locking the switch in its opening position, comprising latch levers, a floating link to which the latch levers are pivoted and between the ends of which the switch lever is raised, said latch levers and link being raised by the switch lever to effect the closing of the latch levers on the switch lever, and releasable means for locking the latch levers engaged with the switch lever.

18. In a switch stand, a gravity returned switch lever, a locking latch in the upper part of the stand for locking the switch in its opening position, comprising latch levers which swing towards and from each other and between which the switch lever is raised, a floating link to which the latch levers are pivoted between their ends, cams pivoted to the casing and to the upper ends of the latch levers, and releasable locking device coöperating with said cams for the purpose set forth.

19. In a switch stand, a gravity returned switch lever, a locking latch in the upper part of the stand for locking the switch in its opening position, comprising latch levers which swing towards and from each other and between which the switch lever is raised, a floating link to which the latch levers are pivoted, cams pivoted to the casing and to the upper ends of the latch levers, a locking device engaging said cams and adapted to engage notches therein to lock the parts, and means for releasing said locking device.

20. In a switch stand, a gravity returned switch lever, a locking latch in the upper part of the stand for locking the switch in its opening position, comprising latch levers which swing towards and from each other and between which the switch lever is raised, a floating link to which the latch levers are pivoted between their ends, notched cams pivoted to the casing and to the upper ends of the latch levers, a locking plate resting on the eccentric margins of said cams adapted to engage the notches therein, and means for releasing said plate from said notches.

21. In a switch stand, a gravity returned switch lever, a locking latch in the upper part of the stand for locking the switch in its opening position, comprising latch levers which swing towards and from each other and between which the switch lever is raised, a floating link to which the latch levers are pivoted, notched cams pivoted to the casing and to the upper ends of the latch levers, a locking plate resting on the eccentric margins of said cams and to engage the notches therein, and a magnet in the upper part of the switch stand for releasing said plate from the notched cams.

22. The combination with a rising and falling switch lever, of a lock for holding said lever in its uppermost position comprising rising and falling latch levers, a link to which the latch levers are pivoted and which rises and falls with said latch levers to close the latter on the switch lever, and releasable

locking means for locking the latch levers in their closed positions.

23. The combination with a rising and falling switch lever, of a lock for holding said lever in its uppermost position comprising rising and falling latch levers, a link to which the latch levers are pivoted and which rises and falls with said latch levers to close the latter on the switch lever, rotating cams hinged to the upper ends of said latch levers, and locking means engaging said cams.

24. In a switch stand, a gravity returned, swinging switch lever, a lock for positively locking the lever in its closing position and adapted to yield to permit the returning lever to pass the same to its locking position, a gravity returned locking device for locking said levers in their uppermost positions, and means controlled by the lower lock and operating after the switch lever has passed the same for releasing the signal lever lock.

25. In a switch stand, a gravity returned swinging latch lever, a lock for positively locking the lever in its closing position and adapted to yield to permit the returning lever to pass the same to its locking position, a gravity returned signal lever, locking devices for locking said levers in their uppermost positions, a reciprocating rod for coöperating at its upper end with said signal lever lock to release said lock, and operative connections between said rod and the lower lock operating to release the signal lever lock after the switch has passed the lower lock.

26. In a switch stand, a gravity returned switch lever, releasable locking means in the upper part of the stand for locking the lever in its opening position, and a lock at the lower part of the stand for locking the lever in its closing position, comprising a rocking plate provided with a detent which stands normally in the path of said lever, a device for positively locking said plate in the last mentioned position and adapted to be released by a key applied to the lock, said plate being adapted to rock when its locking device is so released to permit the lever to swing past the detent thereof and to yield backwardly when said lever returns, and being again positively locked when the key is withdrawn from the lock.

27. In a switch stand, a gravity returned switch lever, releasable locking means in the upper part of the stand for locking the lever in its opening position, and a lock at the lower part of the stand for locking the lever in its closing position, comprising a rocking plate provided with a detent which stands normally in the path of said lever, a sliding bolt carried by said plate and adapted in one position thereof to engage a stationary lug in the lock to lock the plate from swinging upwardly, a key applied to said lock for retracting said sliding bolt in the forward direction of rotation of the key, whereby the lock plate and its detent may be swung upwardly by the lever to permit the lever to pass the same, and a locking lever operating to hold said plate in its uppermost position, said key, in the reverse rotation thereof, operating first to release said locking lever and to thereafter return said bolt, said plate being so mounted to permit the lever to swing past the detent thereof in the return movement of the switch lever and to positively lock said lever in its lowermost position.

28. In a switch stand and equipment, a gravity returned switch lever, means for locking it in its opening position, a normally open magnet circuit operating when closed to release the locking device, and two magnet circuits for controlling the lock releasing circuit, including, respectively, two insulated near and far sections of the main track for the purpose set forth.

29. In a switch stand and equipment, a gravity returned switch lever, means for locking it in its opening position, a normally open magnet circuit operating when closed to release the locking device, two insulated near and far sections of the main track, two normally closed magnet circuits, each including one of said sections, and operating to control the closing and opening of the lock releasing magnet circuit, said parts operating so as to maintain the lock releasing magnet circuit open until the last car has passed off the near section.

30. In a switch stand and equipment, a gravity returned switch lever, means for locking it in its opening position, a normally open magnet circuit operating when closed to release the locking device, two insulated near and far sections of the main track, two normally closed magnet circuits, each including one of said sections, and operating to control the closing and opening of the lock releasing magnet circuit, said parts operating so as to maintain the lock releasing magnet circuit open until the last car has passed off the near section, and operating to restore said controlling devices and open the lock releasing magnet circuit when the last car of a train passes off the far section of the main track.

31. In a switch stand and equipment, a gravity returned switch lever, means for locking it in its opening position, a normally opening magnet circuit operating when closed to release said locking device, two normally closed independently controlled magnet circuits, two armatures, one controlled by each of said normally closed circuits, provided with arms which are directed towards, but are normally separated from, each other, the conductors of said lock releasing magnet circuit being connected, one permanently to one of said armatures and the other having make and break connections with the other armature, means whereby one of said normally closed circuits is opened by the en-

trance of a train from the side to the main track, whereby its associated armature is swung out of contact with the make and break piece included in the lock releasing magnet circuit, the other normally closed circuit being subsequently opened by the passage of the train farther along the main track, whereby the armature associated therewith swings towards the other armature to bring their arms into contact, said first opened circuit being first closed to swing its armature into contact with said make and break device while maintaining contact with the arm of the other armature, and thereby close said lock releasing magnet circuit, the last opened magnet circuit being finally closed and separating the arms of said armature to break the lock releasing magnet circuit.

32. In a switch stand and equipment, a gravity returned switch lever, means for locking the same in its closing position, a normally open magnet circuit adapted, when closed, to release the lever locking means, and means for closing said circuit controlled by a train on the main track headed towards the open switch.

33. In a switch stand and equipment, a gravity returned switch lever, means for locking the same in its closing position, a normally open magnet circuit adapted, when closed, to release the lever locking means, and means for closing said magnet releasing circuit constructed and arranged to be closed either by a train entering the main track from the side track, or a train on the main track headed towards the open switch.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 20th day of September A. D. 1906.

ARTHUR D. CLOUD.

Witnesses:
WILLIAM L. HALL,
A. M. BUNN.