4 Sheets—Sheet 1.

D. TRACY.

Railway-Switch.

No. 216,913. Patented June 24, 1879.

Fig. 1.

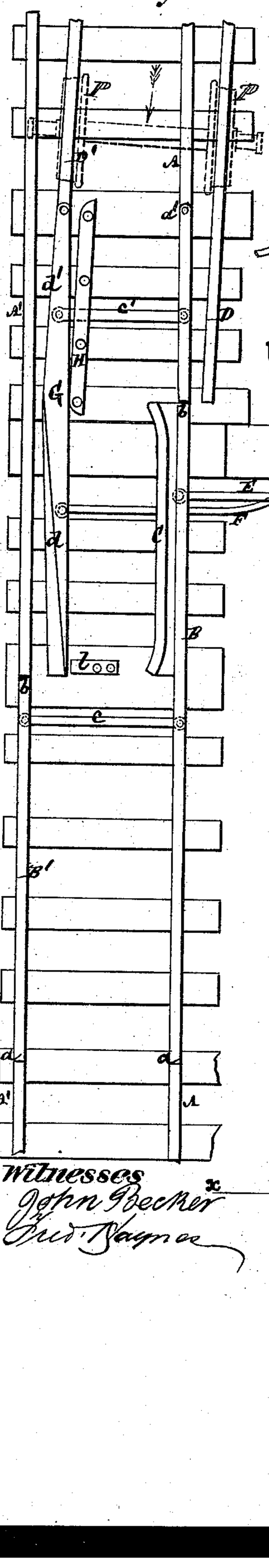


Fig. 2.

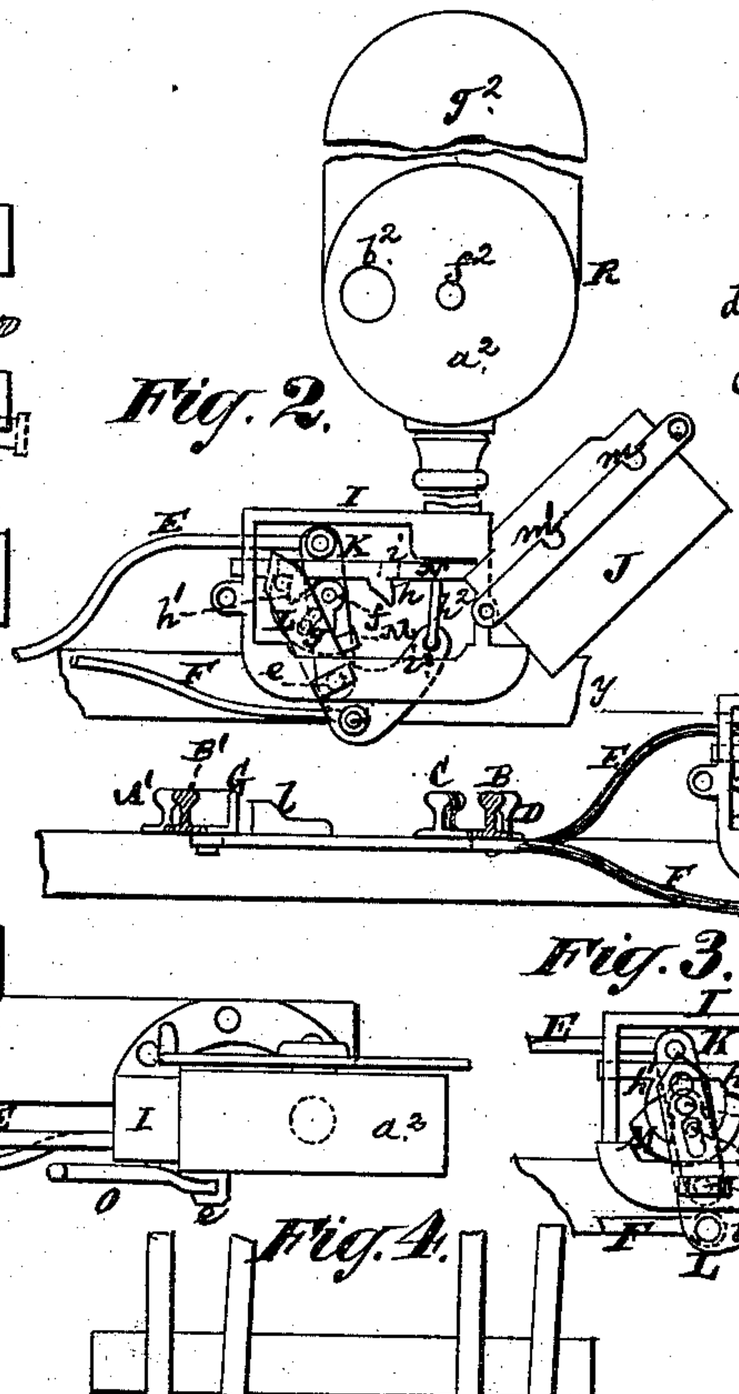


Fig. 3.

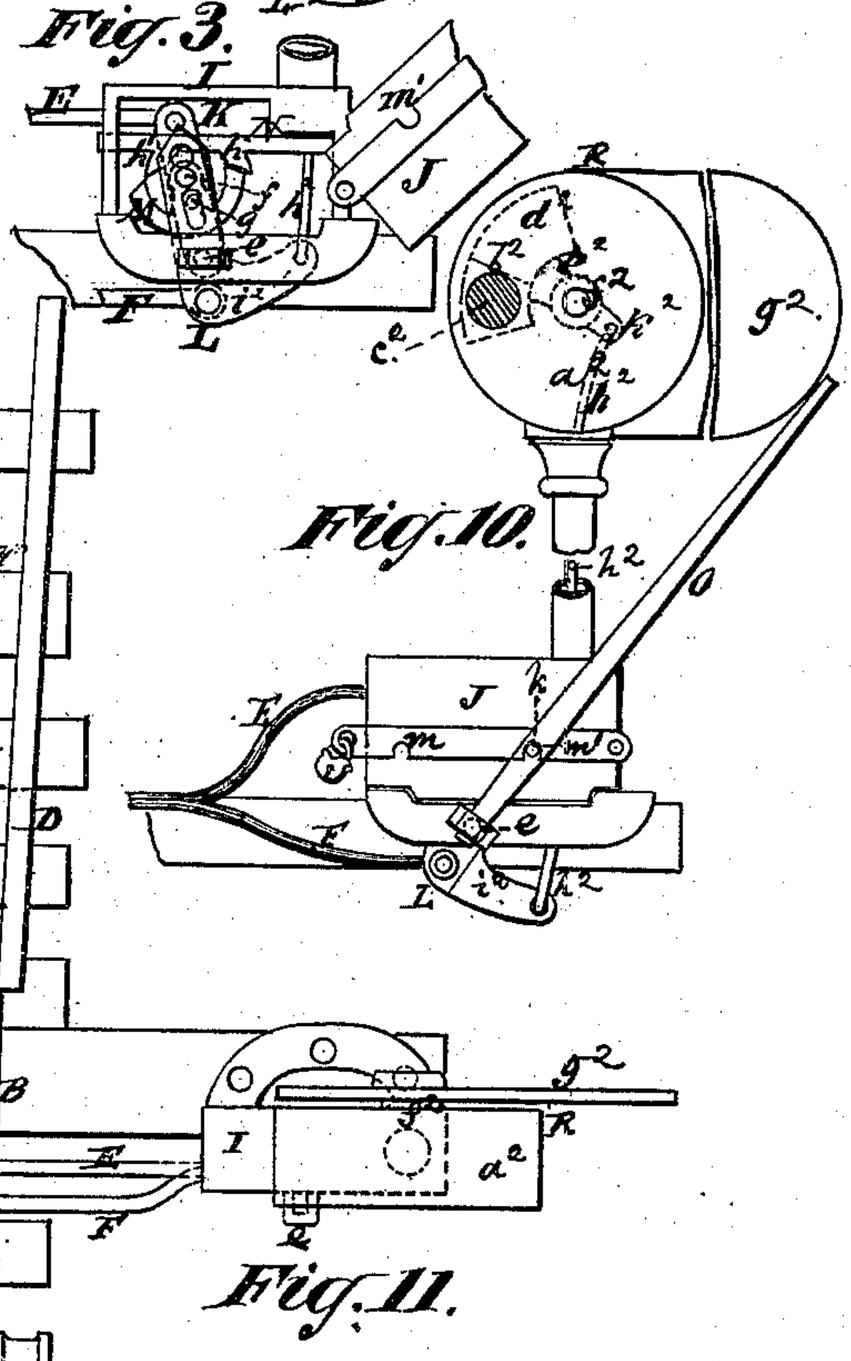


Fig. 4.

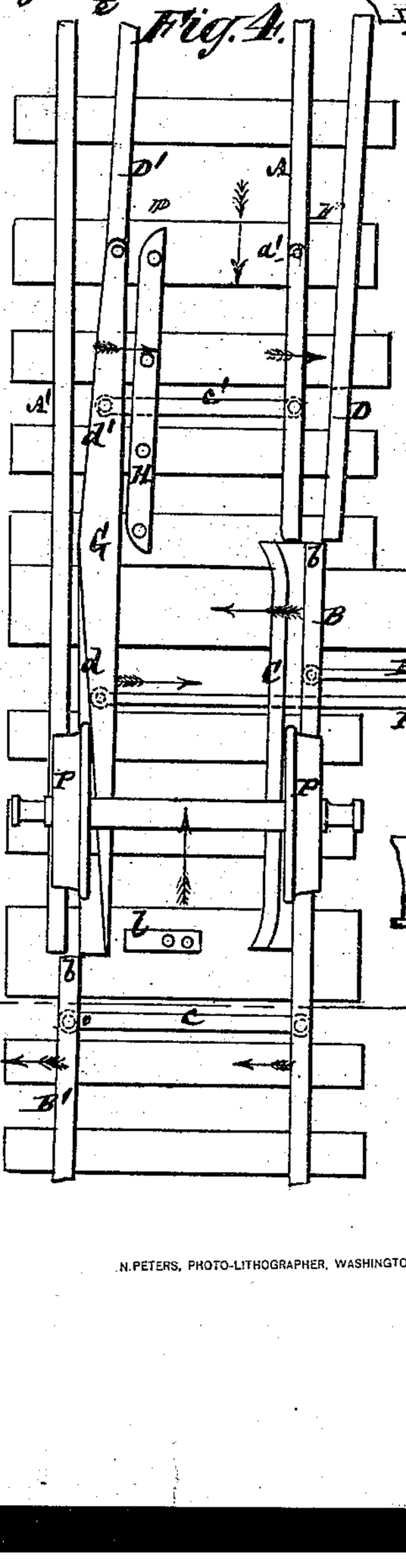


Fig. 5.

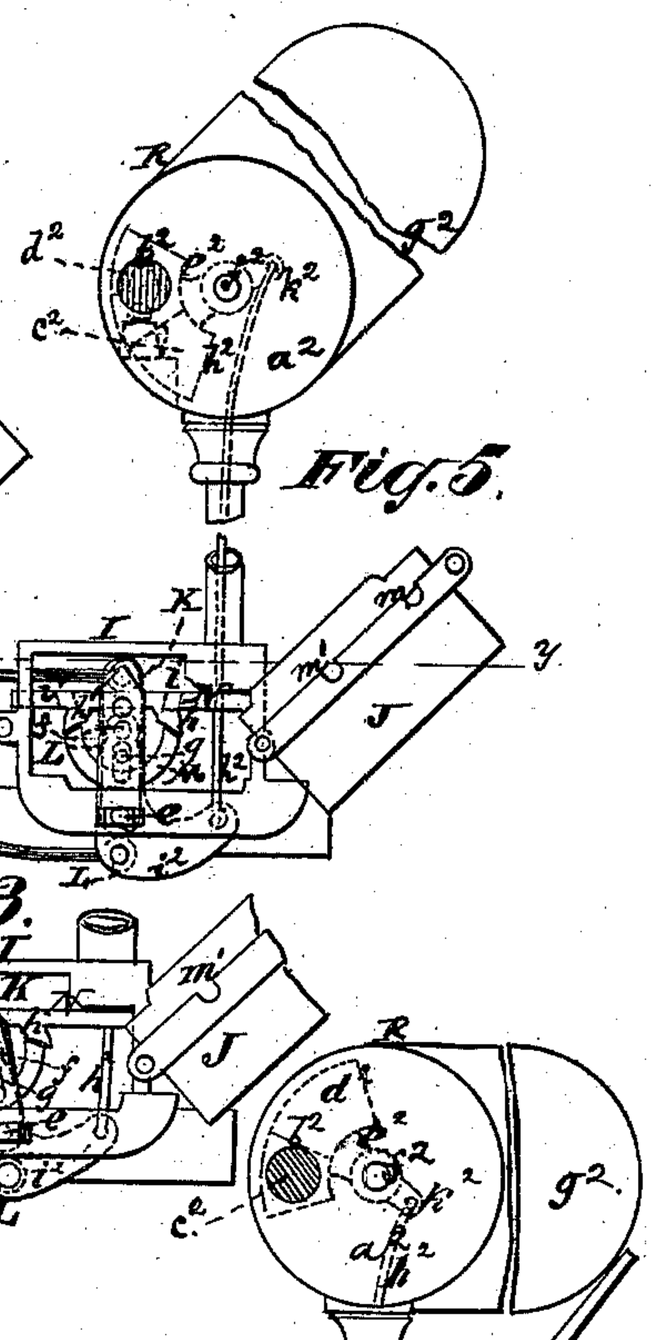
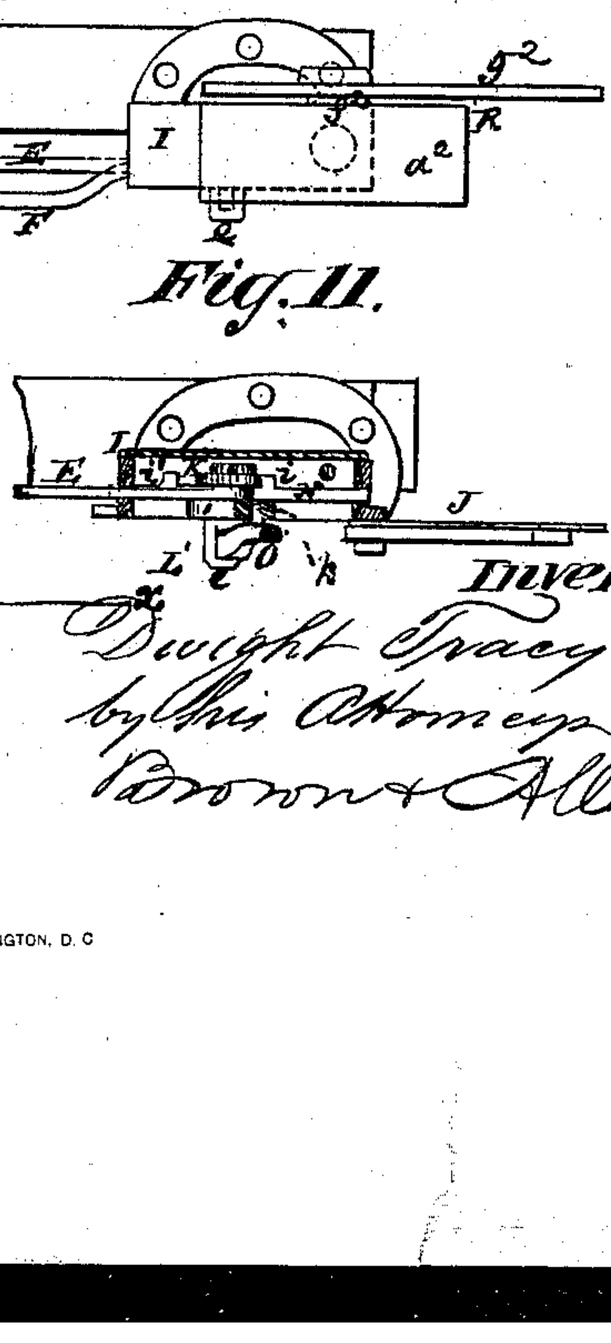


Fig. 10.

Fig. 11.



Witnesses

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4 Sheets—Sheet 2.

D. TRACY.

Railway-Switch.

No. 216,913. Patented June 24, 1879.

Fig. 8.

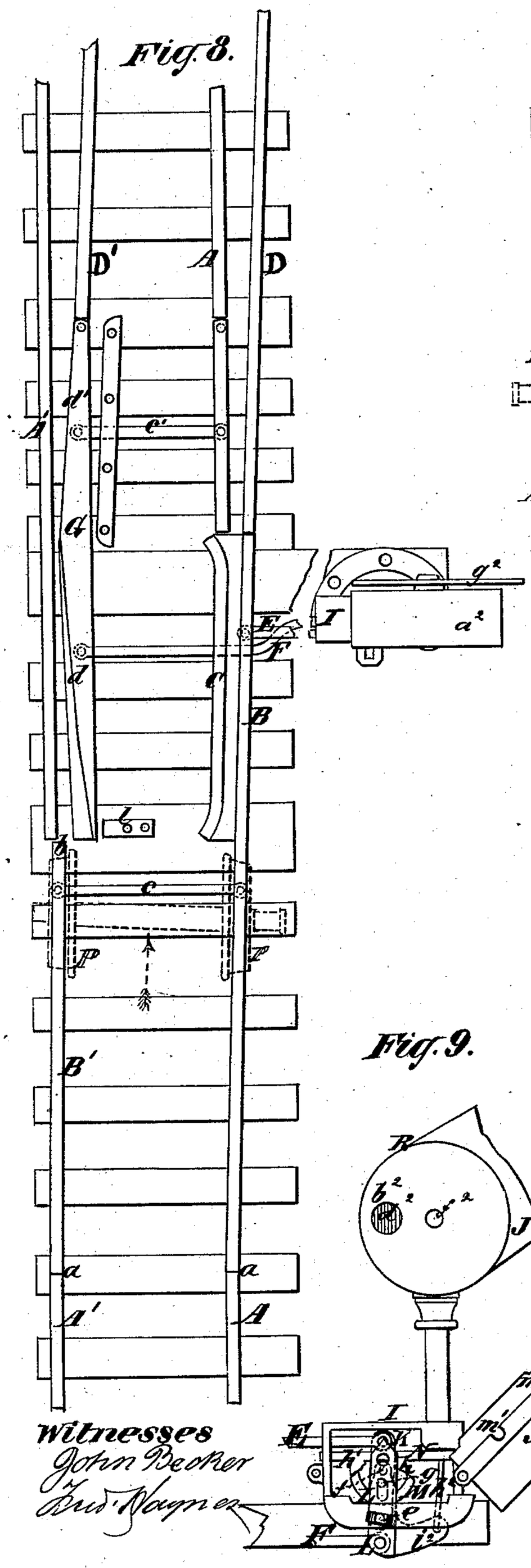

Fig. 6.

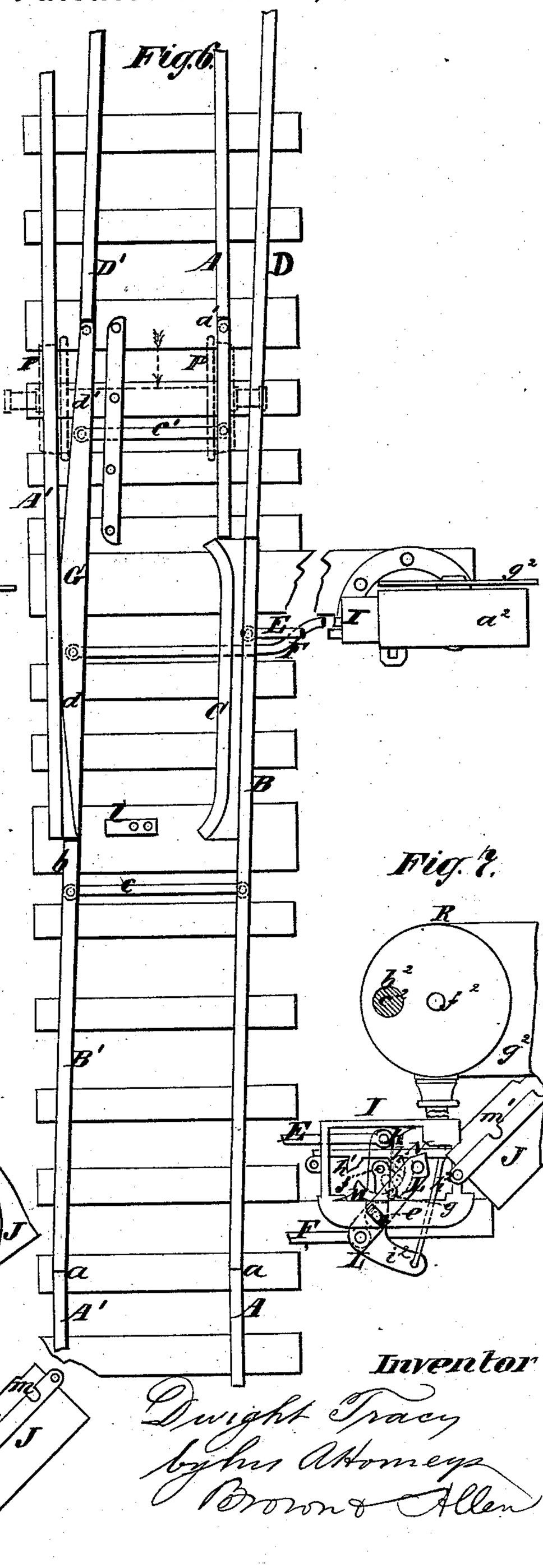

Fig. 9.

Fig. 7.

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D. TRACY.

Railway-Switch.

No. 216,913. **Patented June 24, 1879.**

Fig. 15.

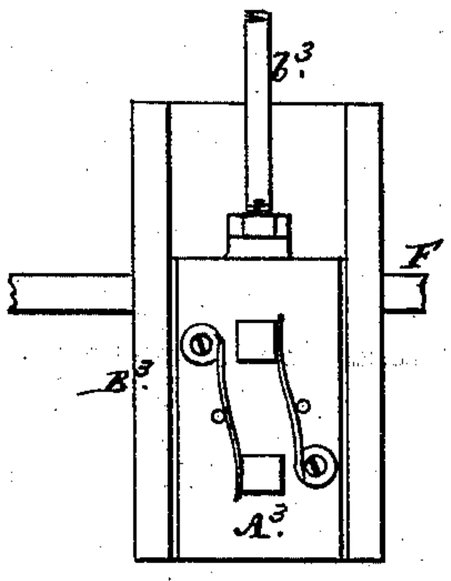
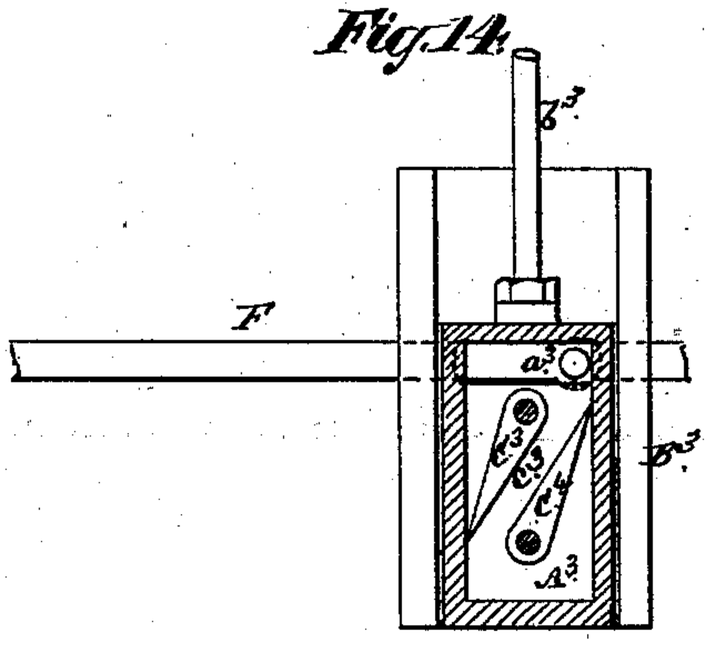


Fig. 14.



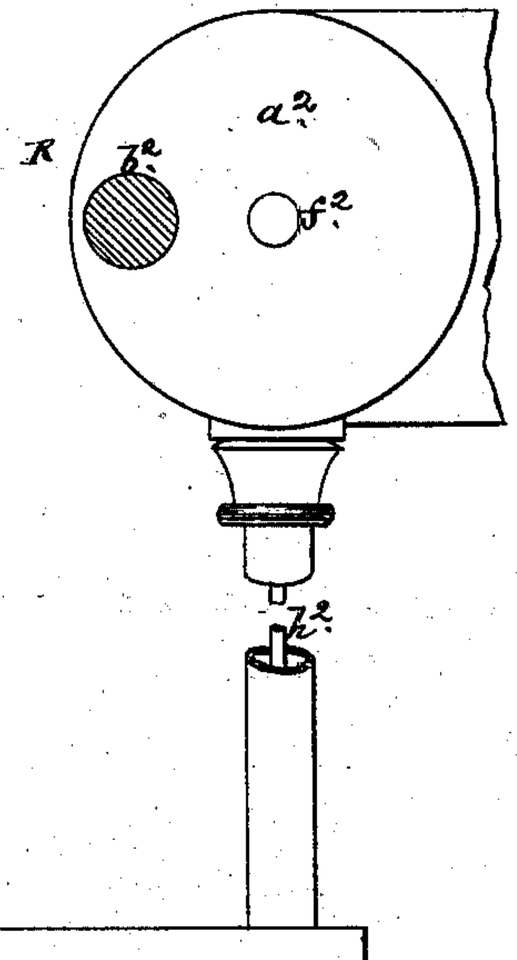


Fig. 13.

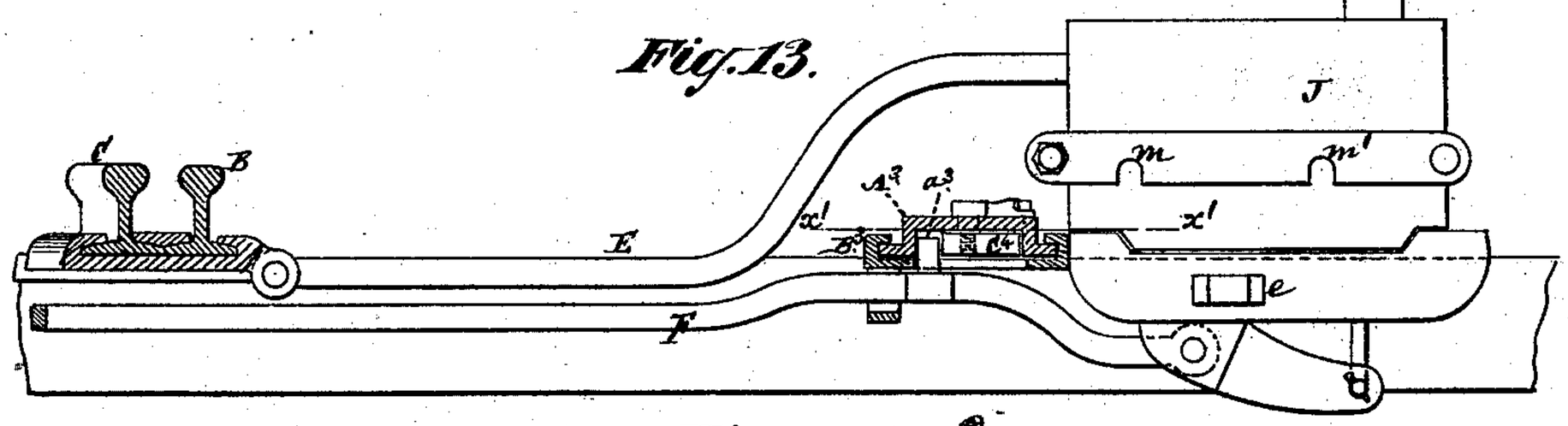
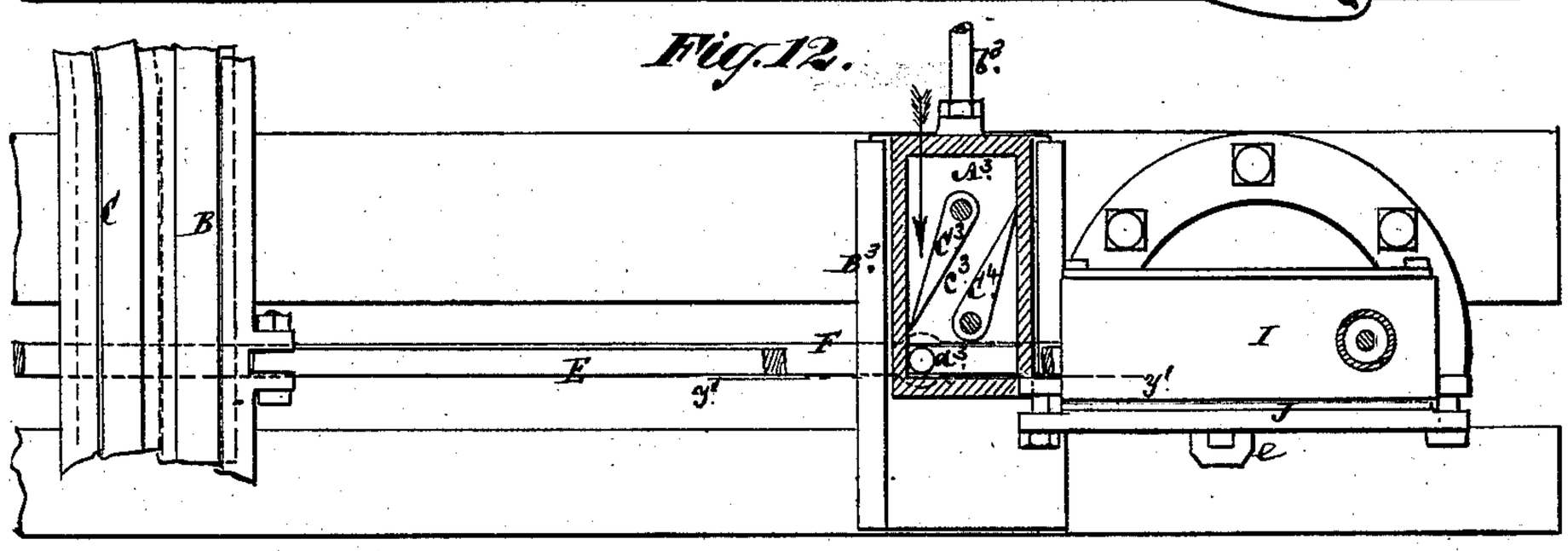


Fig. 12.



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Railway-Switch.

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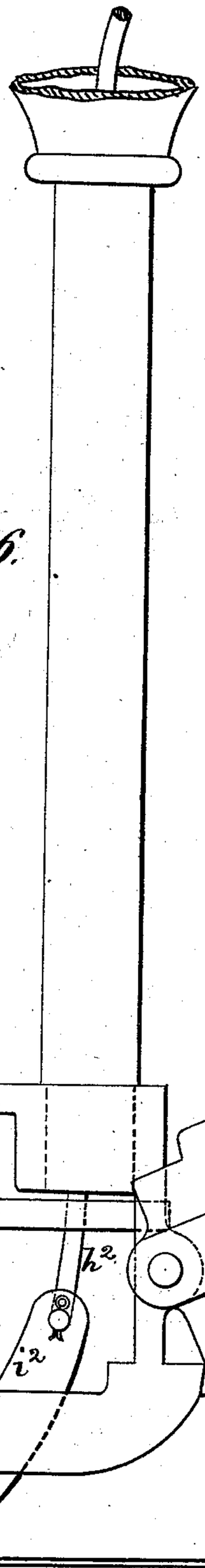
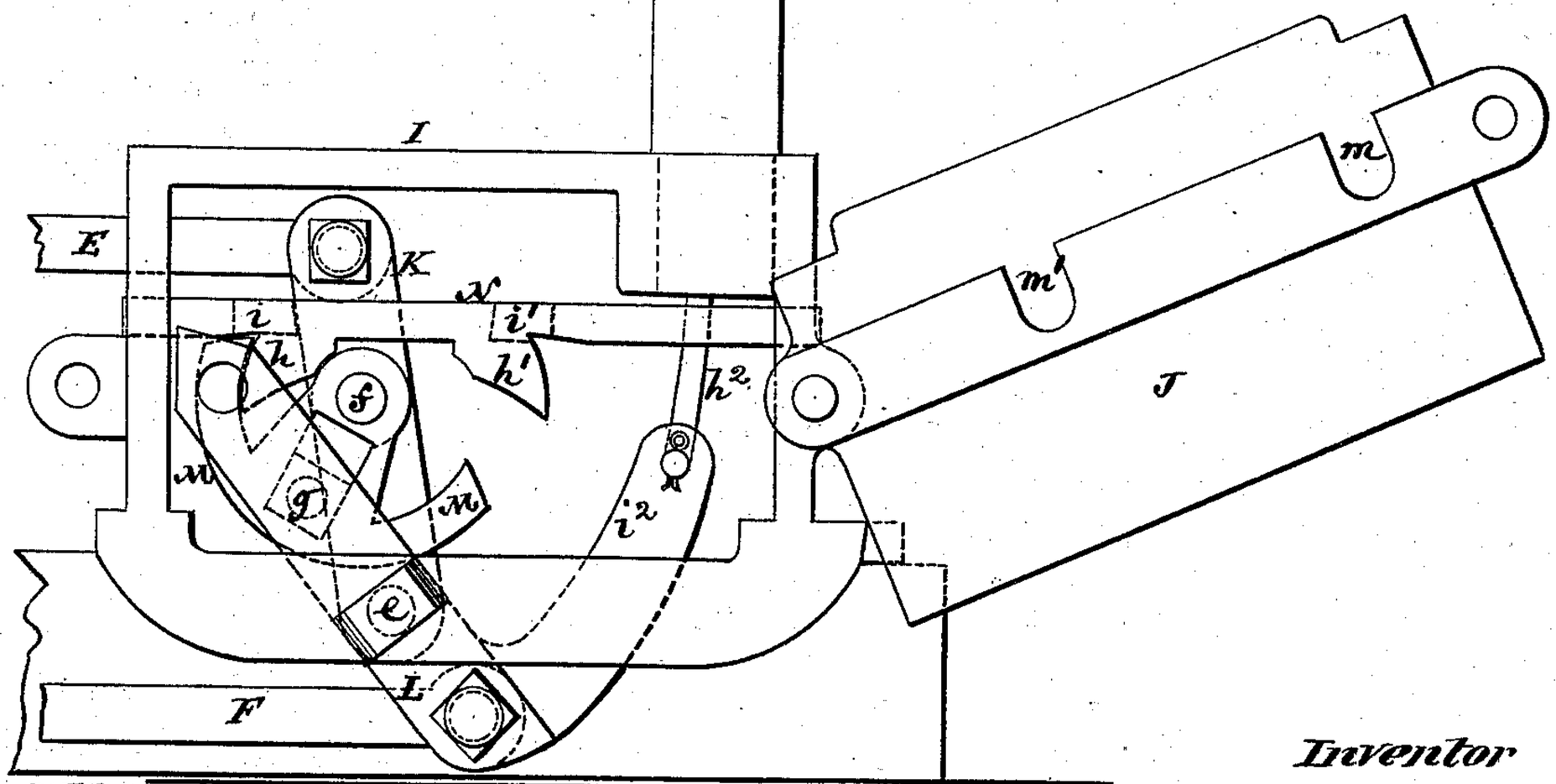


Fig. 16.



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UNITED STATES PATENT OFFICE.

DWIGHT TRACY, OF RIDGEWOOD, NEW JERSEY.

IMPROVEMENT IN RAILWAY-SWITCHES.

Specification forming part of Letters Patent No. **216,913,** dated June 24, 1879; application filed May 1, 1878.

To all whom it may concern:

Be it known that I, DWIGHT TRACY, of Ridgewood, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Railway-Switches and means of operating and indicating the position and condition of the same, of which the following is a description, reference being had to the accompanying drawings, forming part of this specification.

This invention more particularly relates to what are known as "safety-switches," in which the switch, while capable of being shifted to any required position by hand, is free to be automatically operated by a passing locomotive or car when said switch is not set in line with the track on which the locomotive or car is traveling.

A leading object of the invention is to construct the switch in such a manner that its rail or rails cannot be put in a dangerous position, and so that the switch shall be exempt from all liability to derail a car, split a train in two, or do other damage to the rolling-stock. This may be explained by the following statement:

With switches as ordinarily constructed or now in general use there are only two safe positions for traffic in the direction of the divergence of the switch—viz., when set for the main track and the siding—the intermediate positions being of inherent danger. Also, there is only one position that traffic in this direction can be kept on the main line, which is when the switch is locked in line or in connection with the main track. In all other positions the cars will be derailed or run onto the siding. These conditions the present invention reverses, and instead of there being only one position of the switch that traffic can keep the main line, there is by the present invention only one position of the switch in which the traffic can leave the main line, and that is when the switch rail or rails are locked in line with the siding. In all other positions of the switch traffic cannot leave the main line, and all intermediate positions are inherently safe. Consequently no derailment of cars, splitting of trains, or other damage can be done. When the switch is set for the siding, by simply unlocking it, and without moving the switch rail or rails, access to the siding is entirely cut off.

To these and other ends the invention consists in certain combinations of a movable safety-rail, against which the flange of one of the advance wheels of the car, engine, or train acts; a switch, the rail or one of the rails of which has attached to it a guard-rail, and the moving ends of which rails, when the switch has two rails, are arranged to extend one beyond the other; a fixed guide-rail to secure the operation of the safety-rail when a car, engine, or train is being run from a siding onto the main line, when the switch is improperly set; and switch operating and locking mechanism, connected, respectively, with both the switch rail or rails and movable safety-rail, substantially as hereinafter described, and whereby the switch may be operated automatically to insure safety, or by hand to control the course of the traffic.

The invention also consists in a combination, with certain levers in a lock-box, with which the movable safety-rail and the switch rail or rails are connected, of a locking-bolt and its keeper or locking-bar, constructed to provide for the locking, unlocking, and setting of the switch by the action of the flanges of the wheels on the safety-rail without regard to the thickness of the flange which actuates the safety-rail.

The invention likewise consists in a certain combination, with the lid of the lock-box of the switch, of a lever for operating the switch by hand, and a movable fulcrum-pin of the switch operating and locking mechanism, whereby said lever is locked by said box when the latter is closed and secured.

Furthermore, the invention consists in a combination of a signal or signals for indicating the position and locked or unlocked condition of the switch with switch operating and locking mechanism and a movable safety-rail and switch rail or rails, connected, respectively, with said mechanism in a positive manner, and whereby the signal is also positively operated by the movement of the safety-rail.

The invention also consists in a combination, with a connecting means between the movable safety-rail and the switch operating and locking mechanism, of a slide capable of operation

by hand, and provided with devices for controlling through said connecting means the movement of the switch by hand, and providing for the automatic disengagement of said means with the devices by which the switch is controlled by hand, to adapt the switch to a combination of switches, all controllable from the same point or place, and in which no single switch can be moved and locked without the other switches in the combination are properly set in relation with it, which combination of switches is known as the "interlocking system."

Having thus specified the objects and nature of the invention, its description will be proceeded with in reference to the accompanying drawings.

Figure 1 represents a plan of a railway-switch constructed in accordance with the invention, together with means for operating and for indicating the position of the same, and showing the switch as set and locked in line with the main track. Fig. 2 is a side view of the lock-box open, showing the position of the switch operating and locking mechanism and signals when the switch is locked in line with the main track. Fig. 3 is a further side view of the lock-box open, showing the position of the switch operating and locking mechanism and signals when the switch is unlocked in line with the main track. Fig. 4 is a plan of the switch, showing the latter as unlocked and out of line both with the main track and with a siding. Fig. 5 is a section on the line *x x*, Fig. 4, and side view of the lock-box open, showing the switch operating and locking mechanism and signals in position when the switch is as represented in Fig. 4, and in fuller illustration also of a signal or signals actuated by the switch to indicate the position and locked or unlocked condition of the latter. Fig. 6 is a plan of the switch when locked in line with the siding. Fig. 7 is a side view of the lock-box open, showing the position of the mechanism and signals when the switch is locked in line with the siding. Fig. 8 is a plan of the switch when in line with the siding, but unlocked; and Fig. 9 is a side view of the lock-box open, showing its mechanism and signals in position for such adjustment and condition of the switch. Fig. 10 is an exterior side view of the lock-box with attached signals, and showing the lever which is used to operate the switch by hand as locked by the lid of said box; and Fig. 11 is a horizontal section on the line *y y* in Fig. 5, with the lever used to work the switch by hand in working position. Fig. 12 is a horizontal section on the line *x' x'* in Fig. 13, mainly of certain means for adapting the invention to an interlocking system of switches, and with the parts arranged when the switch is in line with the siding; and Fig. 13 is a section of the same on the line *y' y'*. Fig. 14 is a similar view to Fig. 13 of like devices, in part, but showing them in position when the switch is set for the main line. Fig. 15 is a plan of a box and slide shown in Figs. 12, 13, and 14, and forming the means, in part, by which the invention is or may be adapted to the interlocking system. Fig. 16 is a side view, upon a larger scale, of the lock-box open, for the purpose of more clearly illustrating the lock-box mechanism.

Referring, in the first instance, to the several figures of the drawings from 1 to 11, inclusive, A is one of the permanent continuous rails of the main track, and A^1 the other rail thereof. B is one of the switch-rails, and B$'$ the other switch-rail, also forming part of the main track. These switch-rails may be connected at their fixed ends *a a* with the sleepers of the main track at or in the same perpendicular line to the track, but terminate in different lines that are perpendicular to the track. When connected at their fixed ends with the main track in the same perpendicular line the switch-rail B must then be the longer of the two. Said switch-rail B has attached to the inner side of its moving end a guard-rail, C, the object of which, in connection with a safety-rail hereinafter referred to, is to draw the switch in line with the main track when the car or engine is running in direction of the divergence of the switch and the latter is in line with the siding, but unlocked.

D D$'$ are two rails of the siding or turn-out with which the switch-rails B B^1 are brought in line and locked when it is desired to run a train onto the siding. A rod, *c*, connects the rails B B^1, to provide for their action in concert.

E is a rod or bar by which the switch-rails are connected with operating and locking mechanism. G is a movable safety-rail arranged on the inside of the permanent rail A^1; but detached from it. This safety-rail extends from the side rail D$'$, where it is pivoted, to the switch-rail B^1, where it is loose, and free to work inward or outward relatively to the center of the track. Said safety-rail, which may either be of a single piece or in sections, is constructed to present on its outer side a convex or double-inclined surface, which is here shown as formed of two reverse inclines, *d d*^{1}.

F is a rod by which the safety-rail G is connected with the switch operating and locking mechanism; and *c*^{1} is a rod connecting the safety-rail G with a laterally-movable portion of the rail A, (here represented as pivoted at *a*;) but said portion of A may be made movable by the elasticity of the main rail, and is only required to be laterally-movable when the switch-rail is so short that there is insufficient room for the flanges of the wheels of the rolling-stock between said main rail A and the rail D of the siding. The safety-rail G, it should be observed, is arranged to meet the moving end of one rail, B^1, of the switch, and extended in both directions from a point opposite the moving end of the other switch-rail, B.

H is a fixed guide-rail, arranged on the inside of the safety-rail G, and the use of which will be hereinafter described.

I is the lock-box, containing the switch operating and locking mechanism, and J its locking-lid.

K is a lever within said box and loose on a fulcrum-pin, *e*. Said lever has pivoted to it the rod E, which connects with the switch-rails. Loose on the same fulcrum *e* is another lever, L, to which the rod F, connecting with the safety-rail, is pivoted.

M is a double-ended vibrating bolt, pivoted to the lever K at *f*, and having a slot, in which the lever L engages by a stud, *g*.

N is a fixed locking-bar, with one or other of two horns, *h* h^1, on which the double-ended vibrating bolt M engages or laps over when locking the switch either in line with the main track or with the siding; and *i* i^1, (seen more clearly in Fig. 11,) are stops on said locking-bar, for limiting the movement of the lever K when the switch is set in either of said positions.

O is the lever for operating the switch by hand. This lever fits an eye in the fulcrum-pin *e*, which is loose in its bearings, and said lever is provided with a stud, *k*, which engages with a hole in the lever L to move the latter.

The operation of the mechanism in the lock-box I is as follows: Supposing the bolt M to be locked with or over either horn *h* or h^1, and it be required to move the switch and to lock it in a reverse position, then the first movement of the lever L, whether effected automatically by the switch or by the hand-lever O, is simply to vibrate the bolt M on its pivot *f*, to disengage it from the horn *h* or h^1 over which it laps. This necessarily involves a movement of the rod F and safety-rail G, but no movement of the rod E and switch-rails. So soon, however, as the bolt M is disengaged at its one end, then further movement of the lever L in the same direction cannot take place without a joint movement of the lever K, rod E, and switch-rails, by reason of the opposite end of the bolt striking the inside face of the horn *h* or h^1 next adjacent to it. Such movement of the lever K is continued till the bolt M slides over the inside face of the horn struck by it, when any continued movement of the lever L in the same direction causes the bolt to lock with or lap over said horn and again lock the switch in its changed position, the lever K striking the stop *i* or i^1 so soon as the switch is set and the bolt begins to lock.

Supposing the parts to be in the position represented in Figs. 1 and 2, when the switch-rails B B^1 are locked in connection with the main line, the bolt M locking over the horn h^1, then the safety-rail G remains adjusted against the guide-rail H, so that the flange of the advance wheel of the engine or car is free to pass in both directions between said rail and the main rail A^1 without moving the safety-rail. But if a train should run out of the siding, as indicated by the wheels P P in Fig. 1, then the flange of the advance wheel, entering between the fixed guide-rail H and the safety-rail G, will move the latter in an outward direction relatively to the center of the track, and so put the switch-rail B in line with the siding-rail D, and the safety-rail G in line with the other switch-rail, B^1, and cause the switch to be locked in its changed position, as represented in Fig. 6.

When the switch-rails B B^1 are set and locked in line with the siding, then the parts assume the position represented in Figs. 6 and 7, the bolt M locking over the horn *h*, and the safety-rail G being brought close up to the rail A^1, with which it forms a continuous connection for the tread of the wheels of the car or train between the switch-rail B^1 and the siding-rail D'. Cars are then free to enter and leave the siding without acting on the safety-rail. Should a train, however, be moving on the main line toward the convergence of the switch, as represented by the wheels P P in Fig. 6, and the switch still be locked into the siding, then the flanges of said wheels will enter between the safety-rail G and main rail A^1 and move the safety-rail inward relatively to the center of the track, to first unlock the bolt M from the horn *h*, then to move the switch to bring its rails in line with the main track, and subsequently to lock the switch in such changed position.

Supposing a train to be moving on the main line in the direction of the divergence of the switch, as represented by the forward wheels, P P, in Fig. 8, and the switch-rails to be set in line with the siding, but not locked, then the flange of one of said wheels will run between the safety-rail G and the rail A^1, and the flange of the opposite wheel between the guard-rail C and the switch-rail B, and by the action of the flanges of the wheels on the inclined sides of the safety-rail and guard-rail, as shown in Fig. 4, the switch will be brought into line with the main track by the action of the flanges of the wheels directly on the rails themselves, the operating-levers and bolt moving in unison. This is the reverse of the action in the opposite direction, or when the switch is worked by hand.

By the foregoing explanation it will be seen that the mere unlocking of the switch when set for the siding shuts off all access to the latter, and that the only possible way to get off the main line is to lock the switch-rails in line with the siding.

The motion for changing and locking the switch is a direct and positive one, whether done by hand or by the wheels of the car or engine. Furthermore, the thinnest wheel-flange changes the switch, and causes it to be locked as effectually as the thickest flange does, or as can be done by hand, the locking-bolt M locking the switch so soon as its engaging end passes the horn *h* or h^1, with or over which it laps to effect the lock, and any continued motion of the lever L, or levers K and L, in the same direction only increases the locking-lap of the bolt.

It is not absolutely necessary that there should be more than one movable switch-rail

B, and the rail opposite to it (here represented by the switch-rail B^1) may be a fixed rail or simple continuation of the permanent rail A^1, as by simply extending the guard-rail C as far or nearly as far as the center of motion *a* of the switch-rail B, said guard-rail will guide the engine, car, or train onto the siding when the switch is locked in line with the siding. This modification involves no change in the general principle of action or changes the operation under different conditions of the switch from that hereinbefore described.

To provide for the movement of the switch by the engine or car, the hand-lever O is disengaged by its stud *k* from the lever L; and to prevent loss or displacement of said hand-lever when the lock-box I is closed and secured, a notch, *m* or *m'*, in the lid J of the box is made to engage with said lever, as shown in Figs. 10 and 11.

A semaphore-signal, R, suitable both for day and night use, may readily be used in connection with the switch, and be operated in as equally simple and direct a manner as the switch by the mechanism controlling or connected with the latter without having resort to gearing or complicated devices for automatically changing the signal in accordance with the position or condition of the switch. Thus the semaphore-signal R may consist, in part, of a fixed hollow drum, a^2, mounted on a suitable post, and having corresponding glazed apertures b^2 in opposite sides of it, for the display at night of different colored lights to indicate the position or condition of the switch.

The necessary changes in color may be obtained by a stationary lamp or light within the drum, and a movable series of different colored segmental glasses, c^2 d^2, covering the apertures b^2, from the inside of the drum, Figs. 5 and 10, and attached, one in rear of the other, to arms e^2, which are fast on a horizontal spindle, f^2. Attached also to this spindle f^2 is the day-signal or signaling-arm g^2 of the semaphore, which arm is set so that it occupies an upright position when the switch is locked and in line with the main rails, as shown in Fig. 2, an oblique position, as represented in Figs. 3, 5, and 9, when the switch-rails are not locked in line with the main rails, and when they are out of line both with the main line and with the siding, or when they are not locked in line with the siding, and a horizontal position, as shown in Figs. 7, 10, and 13, when the switch-rails are locked and in line with the siding. Said signal, however, may be variously constructed and arranged to give reliable information as to the position and condition of the switch, and so that it is impossible to give a wrong signal; but in all cases like simple and direct means may be used to operate it—that is to say, positive means deriving their motion from the devices operated by the safety-rail G, as, for instance, a rod, h^2, connecting an arm, i^2, of the lever L with an arm, k^2, on the spindle f^2 of the signal.

Various changes also may be made in the construction of the switch operating and locking mechanism without departing from the principle of operation herein described, and whereby the same mechanism is used both when the switch is operated by hand and when it is automatically operated by the rolling-stock, thereby doing away with liability to accident consequent on disuse of the parts, as in the case of certain automatic so-termed "safety-switches."

In the preceding description the invention has been explained with reference to an isolated switch. When applied to one of a series of switches capable of operation from the same switch-house under what is known as the "interlocking system," and so that no one of said switches can be operated and locked without the other switches in the series are in proper relative position with it, a certain change of details becomes necessary, as regards the control of the switch by hand with freedom for its adjustment, as hereinbefore described, by the rolling-stock. Thus, referring to Figs. 12, 13, 14, and 15 of the drawings, in which the same letters as are used in the previous figures refer to like parts, the lock-box I may be provided with the same mechanism as has hereinbefore been described; but instead of applying a hand-lever to the lever L to operate the switch by hand, the rod F, which connects said lever L with the movable safety-rail G, is provided with a stud, a^3, which enters up within a recessed slide, A^3, that is fitted to move in ways within a box, B^3, transversely to the line of motion of the rod F. This slide A^3 is connected by a rod, b^3, with the hand-lever by which the switch is controlled from the switch-house, and is provided internally with two reversely-arranged and pivoted spring-guides C^3 C^4. These spring-guides are so constructed and are so arranged relatively to each other that in their normal positions, and as controlled by their springs, they leave a channel or way, c^3, between them, running in an oblique direction relatively to the length of the slide A^3, so that when the switchman moves said slide from the position shown in Fig. 14 to the position shown in Fig. 12, said guides C^3 C^4 act upon the stud a^3 to move the rod F in a direction and to an extent which will put the switch out of line with the main track and in line with the siding, and so that when the switchman reverses the movement of the slide A^3, changing it from the position shown in Fig. 12 to the position shown in Fig. 14, the guides C^3 C^4 will act upon the stud a^3 of the rod F to move the switch out of line with the siding and back again in line with the main track. In either extreme movement of the slide A^3 the stud a^3 of the rod F is carried out of or beyond the ends of the channel c^3 between the guides C^3 C^4, so that the rod F is free to be operated by the action of the wheels of the rolling-stock on the safety-rail to automatically adjust the switch, as hereinbefore described, no change being made in the safety action of said switch. When the switch has been left by the train in a certain

position, and it is required to change it to a reverse position by hand, it is only necessary to move said slide first in one direction, and then in an opposite direction, either pivoted spring-guide yielding to pass, as it were, the stud a^3 back of it and into position at the opposite end of the slide for either wall of the channel c^3 to act upon it when the motion of the slide is reversed.

When the switch has been changed except by the switchman in charge, warning may be given to him of such change by means of some moving part of the mechanism making or breaking the current of any approved form of electric signals.

I claim—

1. The combination, with the switch-rails, of a movable safety-rail arranged to meet the moving end of one rail of the switch, and extended in both directions from a point opposite the moving end of the other rail of the switch, substantially as and for the purpose herein specified.

2. The movable safety-rail, constructed to form a part of the track on one side of the latter, and arranged to extend in both directions from a point opposite the moving end of a switch-rail on the opposite side of the track, in combination with a guard-rail attached to said switch-rail, substantially as and for the purpose herein described.

3. The combination, with a safety-rail and switch rail or rails, of switch operating and locking mechanism and rods or means for connecting the latter with the safety-rail, substantially as herein described, whereby the switch rail or rails cannot be in an unlocked condition without shutting off access to the siding.

4. The combination, with a switch, the safety-rail G, and the two operating-levers K L, connected with said switch and said safety-rail, of a switch-locking device which forms part of the means of transmitting motion from said lever L to the switch, substantially as herein described.

5. The combination of the fixed guide-rail H with the switch and the movable safety-rail G, constructed to form a part of the track on one side, and arranged to extend in both directions from a point opposite the moving end of the switch-rail on the opposite side of the track, substantially as and for the purpose herein described.

6. The combination, with the levers K L, with which the switch rail or rails and movable safety-rail are respectively connected, of the bolt M and locking-bar N, for operation essentially as described.

7. The combination of the notched lid J of the lock-box I with the hand-lever O of the switch, having a stud or projection, *k*, and the fulcrum-pin *e* of the switch operating and locking mechanism, substantially as and for the purpose herein set forth.

8. The combination, with a switch and a movable safety-rail, constructed to form a part of the track on one side, and arranged to extend in both directions from a point opposite the moving end of the switch-rail on the opposite side of the track, of a signal directly connected with said safety-rail and switch operating and locking mechanism, essentially as described, whereby the position of said safety-rail is indicated.

9. The combination of the slide A^3 and pivoted spring-guides C^3 C^4 with the rod F of the movable safety-rail G and switch operating and locking mechanism, substantially as and for the purposes herein set forth.

DWIGHT TRACY.

Witnesses:
FRED. HAYNES,
A. BURHORN.