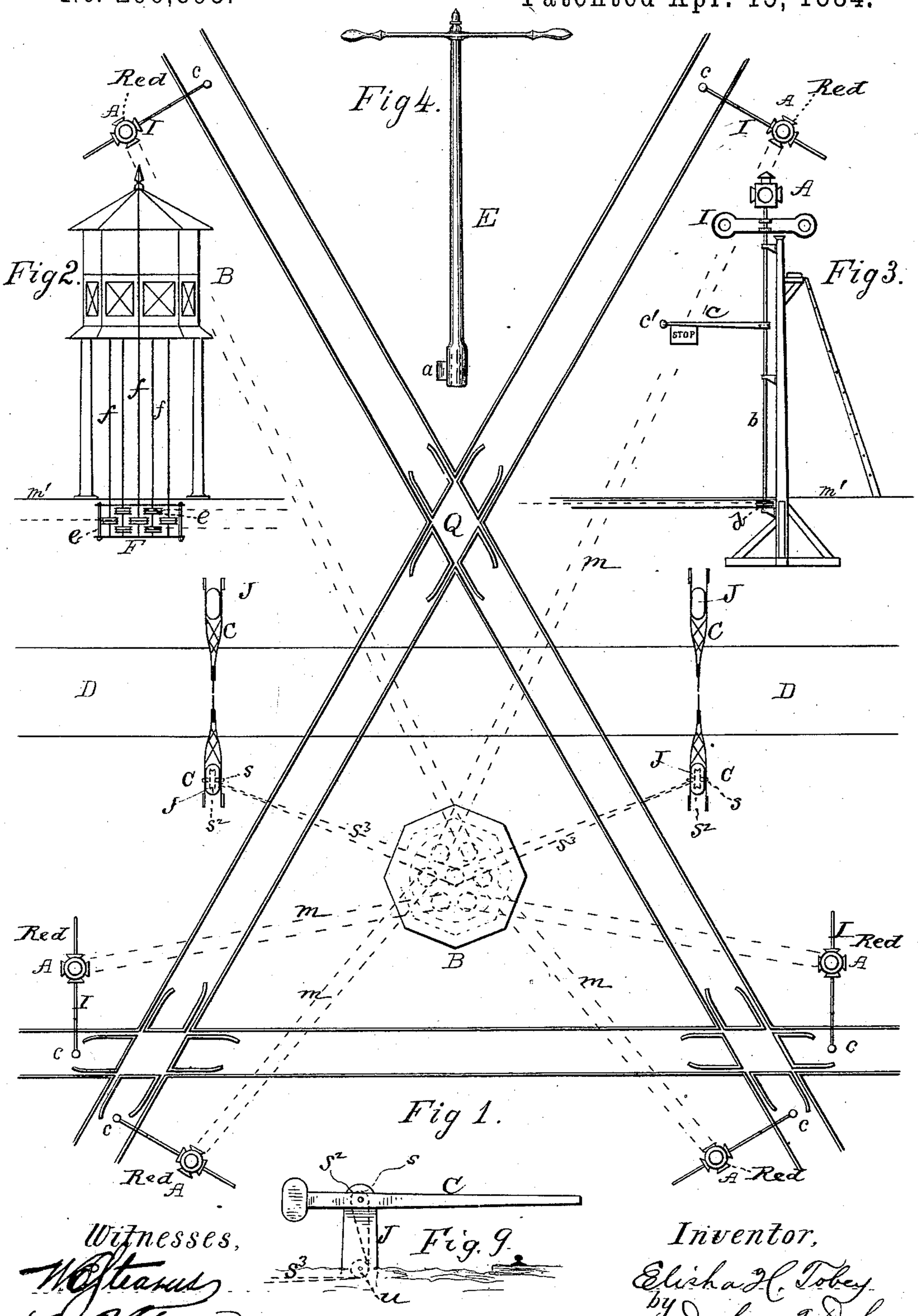
(No Model.) 2 Sheets—Sheet 1.

E. H. TOBEY.

RAILWAY SAFETY SIGNAL.

No. 296,893. Patented Apr. 15, 1884.



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(No Model.) 2 Sheets—Sheet 2.

E. H. TOBEY.

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Fig 5.

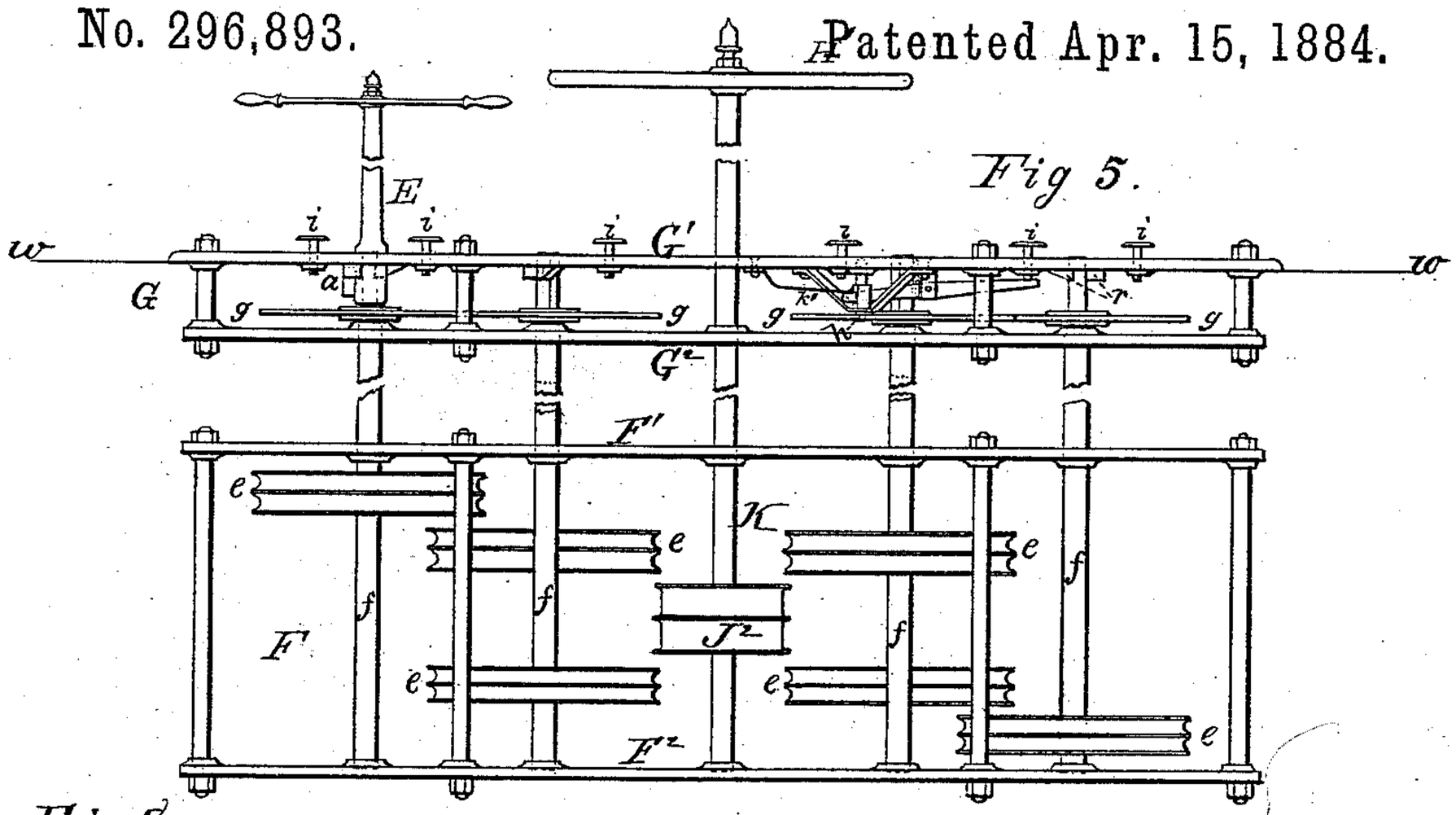


Fig 8

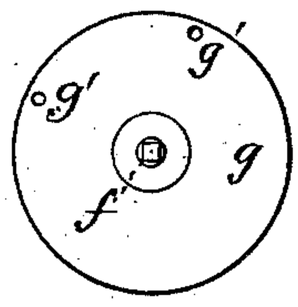


Fig 6.

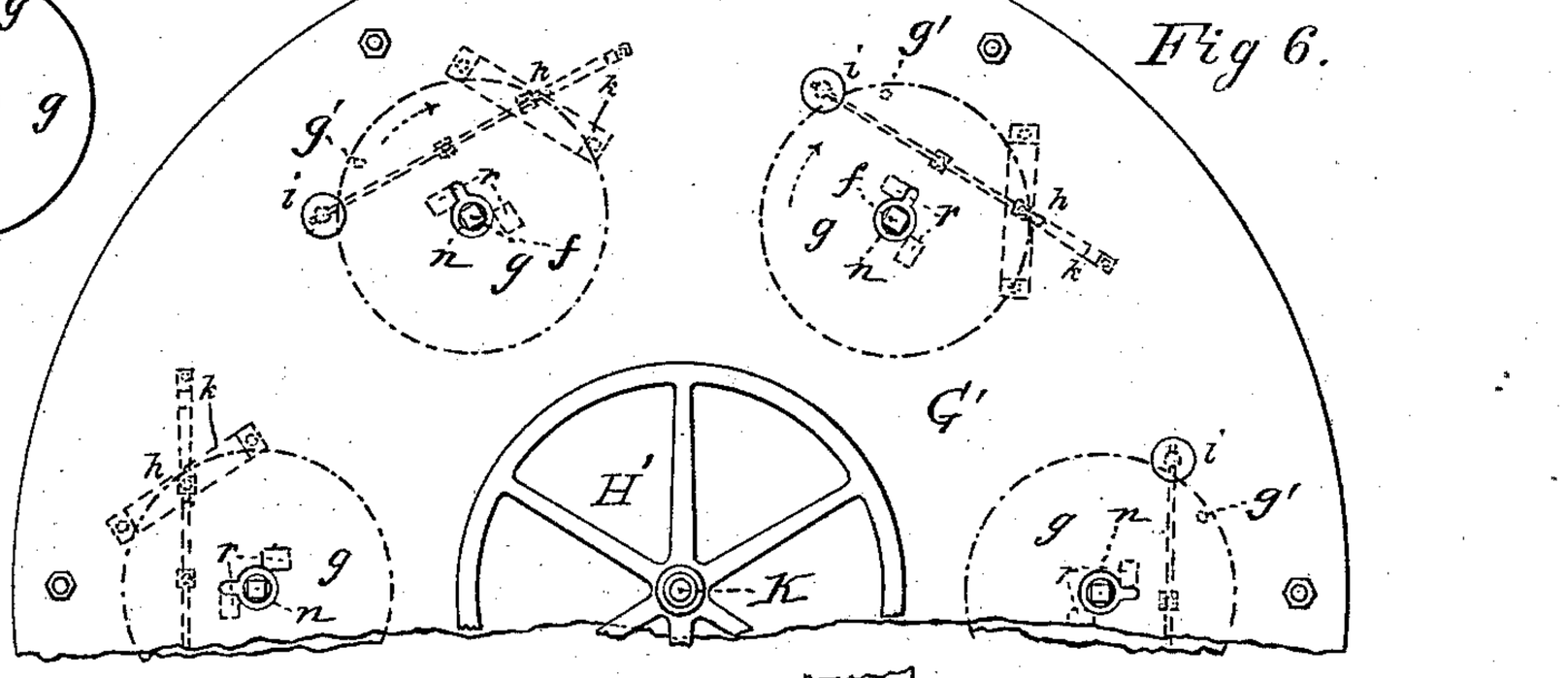
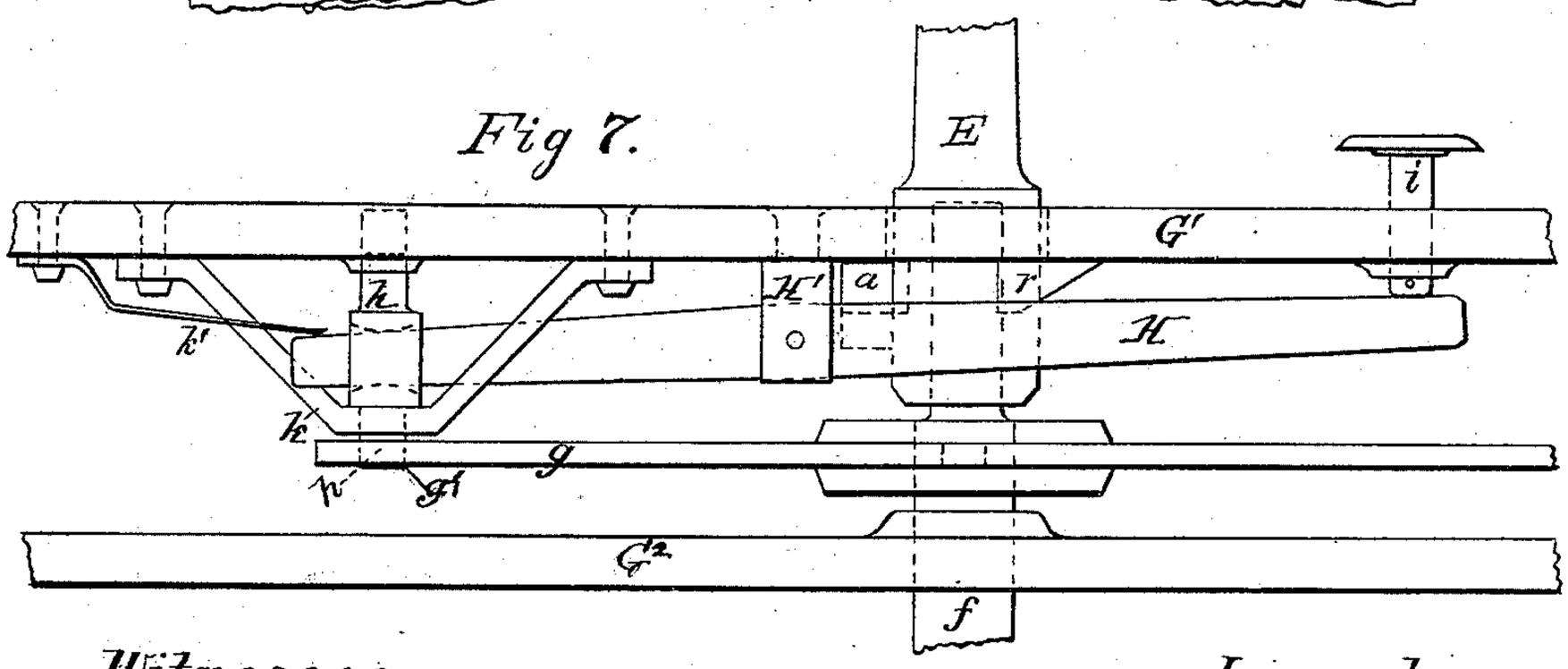


Fig 7.



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UNITED STATES PATENT OFFICE.

ELISHA H. TOBEY, OF DENVER, COLORADO.

RAILWAY SAFETY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 296,893, dated April 15, 1884.

Application filed January 9, 1884. (No model.)

To all whom it may concern:

Be it known that I, ELISHA HENRY TOBEY, a citizen of the United States, residing at Denver, in the county of Arapahoe and State of Colorado, have invented new and useful Improvements in Railway Safety-Signals, of which the following is a specification.

My invention relates to improvements in safety-signals used at railway-crossings to indicate to the engineer "danger" or "safety" in the condition of the tracks for trains running or to be run thereon, and particularly where two or more tracks cross each other, or for tracks of a union depot, union freight-yard, or for tracks approaching a draw-bridge, in which all the signals are operated from a central tower.

The objects of my improvements in such a system of railway-signaling are to start out with "danger" to trains—that is to say, with all the signals indicating "danger;" to show that only one of the intersecting tracks has the right of way at once, and that all the others are blocked by signals indicating "danger;" to render it impossible to give the right of way to any other line embraced in the system without first returning the signal indicating "safety" back to the position indicating "danger." Thus are all the signals again indicating "danger" to approaching trains, so that it is only from a position indicating "danger" that a signal can be moved to indicate "safety."

The chief object and purpose of my invention is to prevent any possible mistake being made by the operator in giving a second signal of "all right" before he has returned the signal already giving the right of way to one line back to "danger," so that it is impossible that two lines can have the right of way at one time, the system as I have improved it being adapted to govern the operator to effect the desired result without the possibility of injury from negligence on the part of the operator.

A distinguishing feature of my invention consists in securing the operating mechanism so that access thereto cannot be had by the operator except to use the proper key for giving the signal. The key being once locked in the apparatus, the operator can only obtain possession of it again for use on other signals by turning it from "safety" to "danger."

I have produced a mechanism which, so far as I know and can find, is new in its essential matters of combinations of construction and of security from unauthorized tampering, which I will now proceed to describe preparatory to a designation of the combinations and devices claimed as my invention.

Referring to the accompanying drawings, Figure 1 represents a plan view of a crossing of three single tracks and a roadway to which my railway-safety-signal system is applied. Fig. 2 represents an elevation of the central tower, showing in section the bottom pulley-box placed below the ground-line, containing the pulleys for connecting with the several signals. Fig. 3 represents an elevation of one of the signal devices. Fig. 4 represents the key by which the operator operates the signals. Fig. 5 represents a side view, enlarged, of the mechanism for operating the signals, consisting of the lower box containing the pulleys for connecting with the several signals, the signaling-shafts, and a top key-box containing the means for locking the signals, the key for operating the signals being shown in position on one of the pulley-shafts. Fig. 6 represents a partial top view of the top or key plate of the top key-box. Fig. 7 represents a side view, enlarged, of one of the locking devices of the key-box for the signal-operating shafts, a portion of one of the latter being shown with the key applied thereto. Fig. 8 represents one of the perforated disks of the pulley-shaft, and Fig. 9 a detail of the weighted gate and its opening connections.

The three single tracks are provided with the usual crossings, and each track has at each end a signal device, A, arranged a suitable distance beyond and outside of the crossings, and connected with the operating mechanism in the tower or station B, which is centrally located in relation to the signals. This central operating mechanism is the essential matter of my safety-railway-signal system, because it embraces an organized mechanism, under which it is practically impossible to have more than one line showing the right of way at any one time, which for union depots and other places where trains arrive and depart from one point, using all the tracks jointly,

is of the greatest importance. The central operating-station is preferably constructed in the form shown in Fig. 2, called a "tower," because it has an inclosed top lookout for the operator. At the bottom of the tower and below the surface of the ground is arranged a cast-iron box, F, incased in stone, containing the pulleys for operating the signals, and to which access cannot be had by the operator. Above this bottom pulley-box, F, and preferably on a line with the floor of the tower, is arranged what I term a "key-box," G, Fig. 5, because it contains the mechanism for locking the signals in their two positions of "safety" and "danger" by a key. There are as many pulleys *e* as there are signals A, and each pulley is mounted upon a vertical iron shaft, *f*, suitably stepped in the lower plate, with the pulleys arranged at different levels between their top and bottom plates, F′ F², which are firmly bolted together. The shafts of these pulleys extend up through the top plate F′ and up through the bottom and top plates, G′ G², of the key-box G, and terminate with an angular end within a key-hole, *n*, in the top plate G′, on a level, or nearly so, with the top surface thereof, as shown in Figs. 6 and 7. The top and bottom plates of the key-box are firmly bolted together, and form an inclosed box with the flooring of the tower, abutting up to it on all sides, to which access cannot be had by the operator, it being important that he should be excluded from access to any of the mechanism except only to apply the key. Within this key-box the several vertical shafts *f* are each provided with a disk, *g*, placed near the lower plate, and having two holes, *g′ g′*, near their circumference, (shown in Fig. 8, Sheet 2,) to receive a locking-pin, *h*, fitted and held in vertical position in a hole in the key-plate G′, and in a hole in a bracket, *k*, depending from the under side of the top plate, so that the lower end of the pin will enter one of the holes *g′* in the disk *g*, and thus lock it to the key-plate G′, to prevent the shaft *f* from being turned. The locking-pin is shouldered. and is thereby supported upon the bracket, so that it can descend only sufficient to enter the hole *g′* to make the lock.

For unlocking the pin *h*, I provide a foot-lever, H, pivoted to a hanger, H′, on the under side of the key-plate G′, having one end passing through a slot in an enlarged body of the pin *h*, and the other end free to receive the pressure of a vertical treadle-pin, *i*, fitted in a hole in the key-plate, so that in its normal position its upper end stands above the key-plate. A spring, *k′*, is adapted to bear upon the pin-connected end of the foot-lever H, and thus hold the treadle-pin up and the locking-pin down into the hole in the pulley-shaft disk, so that the operator placing his foot upon the treadle-pin *i* will depress that end of the lever, and raising its pin-connected end withdraws the pin *h* free of the disk *g* and allows the latter to be turned by the key. In Fig. 5 this locking device is only shown as applied to one of the signal-operating shafts; but it will be understood that each shaft is provided with such a locking device.

As stated, I use a key, E, to operate the signals A, and its barrel is fitted to receive the angular end of the shaft *f* when inserted through the key-hole *n* in the top plate. In operating the signals, the key only makes a quarter-circle, which is determined by a lip or arm, *a*, on its barrel end, adapted to move, between two stops, *r*, on the under side of the key-plate, as shown by dotted lines in Fig. 6, so that the key cannot be turned around.

The signal device which I prefer to use is shown in Fig. 3, and consists of a vertical shaft, *b*, carrying day and night signals, the day-signal being an arm, I, painted white on one side and red on the other, so that when extended it will be at right angles to the track and the red color will stand on the outer side and give notice to the approaching train of "danger," while when the arm is turned parallel to the track the track is indicated as clear for approaching trains. The night-signal is the usual lantern, A, with red and white colors, the red light indicating "danger" to all approaching trains, and the white light indicating a clear way. These signal-shafts have each a pulley, *d*, on its lower end, as shown in Fig. 3, around which the cables leading from the central pulley-box pass, and thus connect the signal-shafts with the key-box shafts. The cables *m* are of wire, and are inclosed in gas-pipes or wood boxes under ground, and are pinned to the pulleys *e*, so that they cannot slip in operating them to operate the signals. Each cable may be provided with one or more turn-buckles for tightening it, as may be required, suitable provision being made for access to the turn-buckles for this purpose. The signal-shaft *b* is mounted in suitable bracket-bearings upon a post, and the pulleys of the several shafts are placed below the ground-line, which is represented by *m′* in Figs. 2 and 3, so that their cable-connections cannot be tampered with. Should the engineer, from negligence or other cause, not observe the danger-signal, provision is made for placing the fault upon the engineer by means of a light wooden arm, *c*, carrying an iron ball, *c′*, attached to and standing out from the signal-shaft in position to come in contact with the glass of the head-light and break it, thus showing that the danger-signal was displayed.

Where a road crosses the tracks, as at D in Fig. 1, I provide for operating road-gates C C at each side of the track or tracks. These gates are what are known as the "weighted gates," raised and lowered upon a pivot, *s*, at one end, as shown in Fig. 9. Each gate is pivoted to the top of a post, J, its pivot having a pulley, *s²*, around which passes a cable, *s³*, which, passing around a pulley, *u*, at the foot of said post, passes thence to a pulley, J², on a vertical shaft, K, mounted in the pulley-

box of the central station, and, extending above the key-box G, is provided with a hand-wheel, H′, by which to operate the gates as may be required, as shown in Fig. 5. The gates are raised to an upright position by turning the hand-wheel once around, and while so raised the danger-signals are shown on all the tracks. This operation is effected at the will of the operator by first placing all the signals at "danger" independently of the gates.

If desired, two or more signals can be operated from each pulley-shaft by increasing the number of the pulleys on each shaft; but such an arrangement is not generally practicable.

Instead of the signal device shown, any other suitable signal device may be used, so long as it is combined, for operation in the way described, with operating mechanism controlled by a key, which is itself locked in the mechanism when the right of way is given to any one of the tracks.

I have stated that the pulley-box is walled in to prevent access, and it will be understood that the cables pass from the pulleys through suitable holes drilled in the walls.

Referring to the signal indicating a clear track, it will be understood that a single white light is shown outward to the approaching train between it and the intersection Q, and a white light also shown inward to the train on the other side of the crossing, while in the direction opposite to that in which the train is coming the red lights of these two signals will show "danger" to a train approaching from the opposite direction.

In Fig. 1 all the signals are supposed to be set to indicate "danger," and this being their normal or first condition on all the tracks, only one signal can be changed at a time on any one track to indicate "safety," and all the rest must show "danger;" otherwise the key cannot be used to show "safety" on any track.

In Fig. 5 the key-plate G′ of the key-box is shown as forming a part of flooring *w* of the tower B, so that there can be no access by the operator to the operating mechanism except to use the key upon the ends of the pulley-shafts through the key-holes *n* of said floor-plate. The operating mechanism, however, may be protected by any suitable inclosure placed in any suitable position that will allow the operator to have full view of the intersecting tracks.

I have stated that the disks *g* of the pulley-shafts are provided with two holes, *g′ g′*, to receive the locking-pin *h* to lock the signal-operating pulley-shafts with the key-plate when the signal is operated to indicate "danger" and when it is operated to indicate "safety," and that the movement of the key to turn the pulley-shafts is limited by the stops *r r* on the key-plate, and it will be understood that the turning of the key between these stops will bring either disk-hole *g′* in exact central position beneath the pin, to receive it when the treadle is released. The stops *r r* and the holes *g′ g′* therefore are relatively placed to register with each other to determine the movements of said disk to receive the locking-pin.

Referring to the pivoted weighted gates C, it will be understood that each gate is formed of two sections, C C, which meet in the middle of the road, each section being mounted upon a post, J, and each section controlled by a separate cable-connection, s^3, with the pulley J^2 of the operating-shaft K; but I have only shown two of the sections having the cable-connections s^3, (indicated by dotted lines in Fig. 1,) the double pulley shown in Fig. 5 serving to receive the cables of the two sections of one gate.

I have stated that the signal is operated by a key applied to the pulley-shafts by inserting it through a key-hole in the top plate G′, and it will be understood that the key is so inserted only sufficiently to bring its lip or arm *a* just beneath the key-hole plate G′, so that the key can be turned to bring its lip or arm *a* against either of the stops *r r*, which thus limit its turning. I have also described means for locking the signals when set in either position, and it will be understood that the function of the key lip or arm *a* is two-fold—*i. e.*, to register the locking-pin *h* with the holes *g′* in the pulley-shaft disk to lock the signal, so that it cannot be changed except by the operator in the central station, and to prevent the withdrawal of the key from the key-plate except when the signal is restored to "danger." The key is so prevented from being withdrawn because its lip or arm *a* is under the key-plate against the stop *r* to one side of the key-hole when the signal-operating mechanism is locked in "safety" position. From this position the key can only be removed by turning it so as to bring its lip or arm *a* against the other stop *r*, which thus operates the same signal to show "danger" and places the key lip or arm *a* in position coincident with the key-hole, and thus allows the key to be withdrawn to operate the signals of another track.

I claim—

1. The combination of day and night signals of a railway-crossing with mechanism for operating the same, a key for directly actuating said signals, and means by which it is locked to said mechanism after being operated to give the right of way over one track only, substantially as set forth.

2. The combination of a signal-operating mechanism for railway-crossings, and a key for directly actuating the same, with mechanism, substantially such as described, whereby the signal and its operating mechanism are automatically locked in the position to indicate "danger" or in the position to indicate "safety" to approaching trains.

3. The combination of a signal-operating mechanism for railway-crossings, a key directly operating the same, and means for retaining said key locked to said mechanism

after being operated to give the right of way over one track only, substantially herein described, with a locking device for said mechanism, and a treadle device to release said lock, substantially as described.

4. A signal-operating mechanism for railway-crossings, and a key directly actuating the same, combined with means, substantially herein described, for retaining the key in its actuating position when the signal is moved to indicate "safety," and an automatic signal-locking device.

5. A signal-operating mechanism for railway-crossings, consisting of pulley-operating shafts, cables connecting their pulleys with the signals of all the tracks, a key-box into which said pulley-shafts extend, suitable locking mechanism for said pulley-shafts, a suitable device for unlocking said pulley-shafts, a key-plate, a key for directly actuating the signals, and means for retaining the key within the key-plate, substantially as set forth.

6. The combination of the signal-operating pulley-shafts formed with angular ends, as described, with a key-box, G, having a key-hole plate, into which said angular ends extend, an inclosed device for locking said shafts with said box, a device for unlocking said shafts, a key for directly actuating the signal-operating pulley-shafts, and means for retaining the key within said box, as set forth.

7. The combination, with a signal-operating mechanism for railway-crossings, substantially such as described, and a central tower or station therefor, of the box G, having a top key-hole plate G′, arranged to form a part of the tower floor, and to serve as a cover to prevent access to said signal-operating mechanism except by means of a key, by which the same is directly actuated, substantially as set forth.

8. A signal-operating mechanism for railway crossings, operated by a key in the manner described, consisting of a box, F, arranged below the surface of the ground and containing pulleys and shafts, the cables connecting them with the track-signals, a key-box, G, arranged above the ground, having a top key-hole plate within the key-holes, in which said pulley-shafts terminate, suitable locking and releasing devices for said pulley-shafts arranged within said key-box, the signal devices, and a key directly actuating the same, substantially as set forth.

9. The combination, with the closed boxes F and G, the winding-shafts *f*, mounted therein, their pulleys *e*, the cables *m*, the signal-shafts *b*, their pulleys *d*, and a key, of an automatic locking device for said winding-shafts, arranged within the box F, means, substantially such as described, whereby said key is retained in a locked position in the box G, and means, substantially such as described, whereby said automatic locking device is released.

10. The combination, with a signal-operating mechanism for railway-crossings, operated directly by a key, of a key-box, G, having a top key-hole plate G′, affording access to said mechanism, and a key provided with an arm, means arranged on the inner side of said box for limiting the turning movements of the key, an automatic locking device for said mechanism, and means, substantially such as described, for releasing said locking device, controlled by the foot of the operator.

11. The combination, with an inclosed signal-operating mechanism for railway-crossings, operated directly by a key, and means adapted to engage said key to limit its turning movements, of an automatic locking-pin for said mechanism, which, when locked in "safety" position, acts to prevent the release of the key, and a treadle device connected with said locking-pin for releasing the lock, substantially as described, for the purpose specified.

12. The combination, with an inclosed signal-operating mechanism for railway-crossings, operated directly by a key, and means adapted to engage said key to limit its turning movements, of a spring-depressed locking device for said mechanism, a lever carrying said locking device, an inclosing key-box for the latter, and a releasing treadle-pin adapted to be operated outside of said box, substantially as set forth.

13. The combination, with an inclosed signal-operating mechanism for railway-crossings, and the track-signals, both operated directly by a key, of a key-hole plate permitting the application of a key to operate a single signal, and a key which is fastened to said key-plate by the means substantially as herein set forth.

14. The combination, in a system for operating signals for railway-crossings, of day and night signals I A, the independent winding-shafts *f* and pulleys *e*, each shaft having a disk, *g*, provided with perforations *g′ g′*, cables *m*, signal pulley-shafts *b*, pulleys *d*, the foot-levers H, locking-pins *h*, means for locking said pins with said disks, the treadle-pin *i*, a key for operating the system, closed boxes for the operating mechanism, and means for retaining the key within the key-hole plate when the signal is moved to indicate "safety," substantially as described.

15. The combination, with the winding pulley-shafts *f*, each having a perforated disk, *g*, of a closed box, G, having a key-hole plate, G′, provided on its under side with stops *r r*, a key having an arm, *a*, the treadle H, having a pin, *h*, the spring *k′*, the treadle-pin *i*, cables *m*, and the signal-carrying shafts, the said stops being arranged to determine the movements of said disk to receive the locking-pin, substantially as described.

16. A signal-operating mechanism for railway-crossings, comprising the following instrumentalities, viz: a number of key-operated shafts, *f*, having each a pulley, *e*, inclosed beneath the surface of the ground, and a disk, *g*, near its upper end. a key-box, G, arranged above the pulleys and containing the disks *g*,

an automatic locking device for each shaft-disk, a device for releasing each shaft-disk from its lock, a key-plate having key-holes corresponding with the pulley-shafts, through which access is had thereto for operating them, a key, stops *r r*, co-operating with said key to limit the turning of said shafts, signals, and cables connecting the key-operated shafts with the signal-shafts, all combined for operation substantially as described, for the purpose specified.

17. In combination, the central station or tower, B, provided with mechanism for operating the signals of railway-crossings, the pivoted weighted gates C, the pulleys *s w*, the cables s^3, the shaft K, its pulley J^2, and hand-wheel H′, all constructed and adapted for operation independent of the signals, said gates being opened from the signal-station only when a safety-signal is displayed.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ELISHA H. TOBEY.

Witnesses:
A. E. H. JOHNSON,
H. B. ZEVELY.