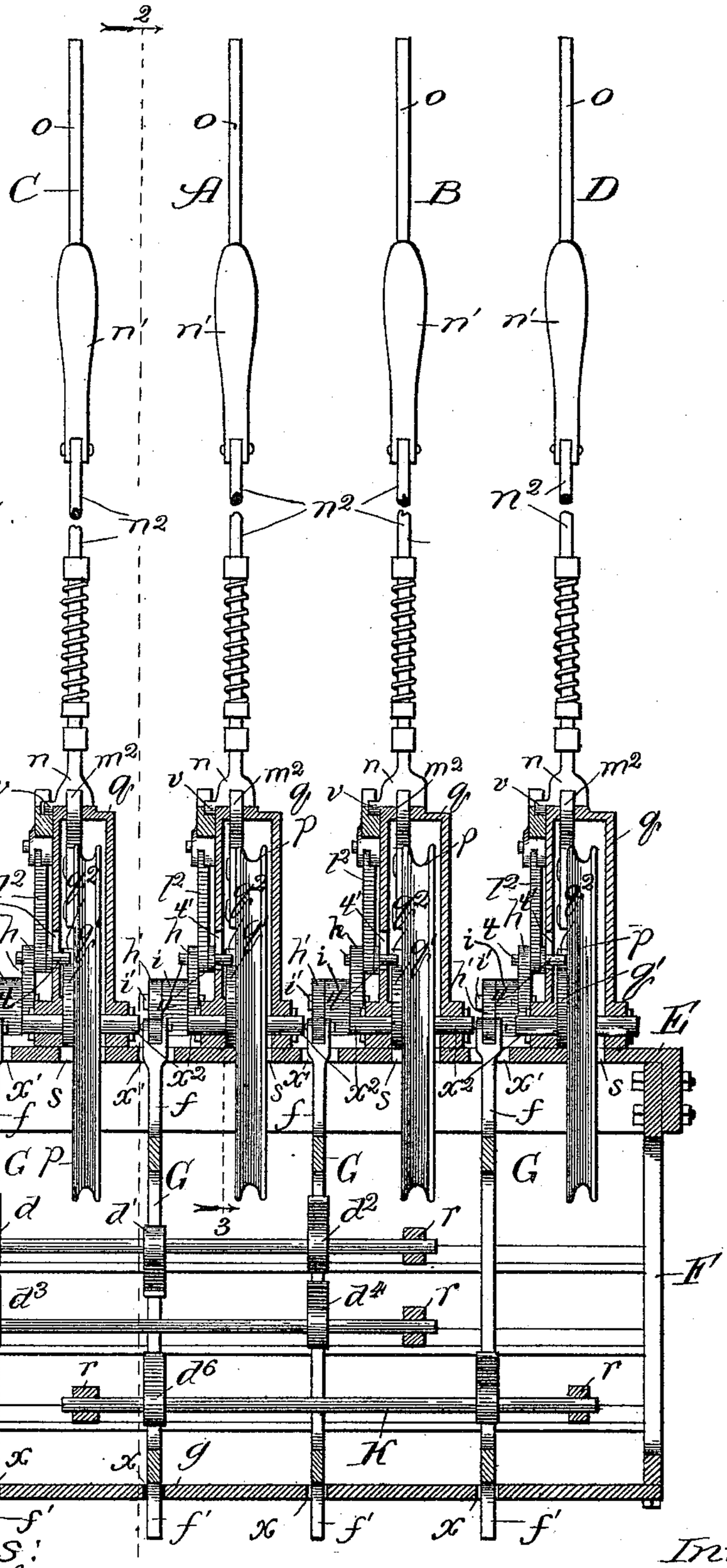
(No Model.) 3 Sheets—Sheet 1.

I. RANDOLPH.

INTERLOCKING APPLIANCE FOR RAILROAD SWITCHES AND SIGNALS.

No. 464,697. Patented Dec. 8, 1891.

Fig. 1.



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Inventor:
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(No Model.) 3 Sheets—Sheet 2.

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Fig. 4.

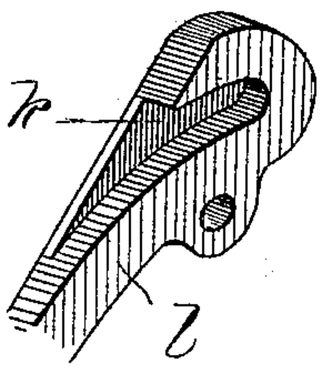

Fig. 5.

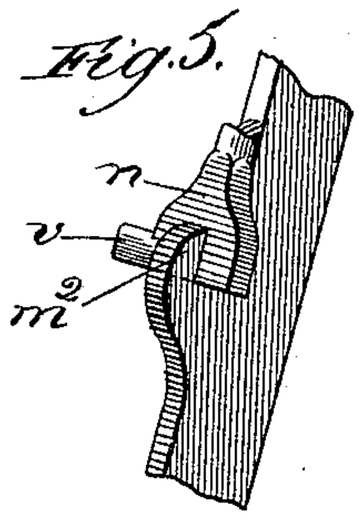

Fig. 2.

Fig. 3.

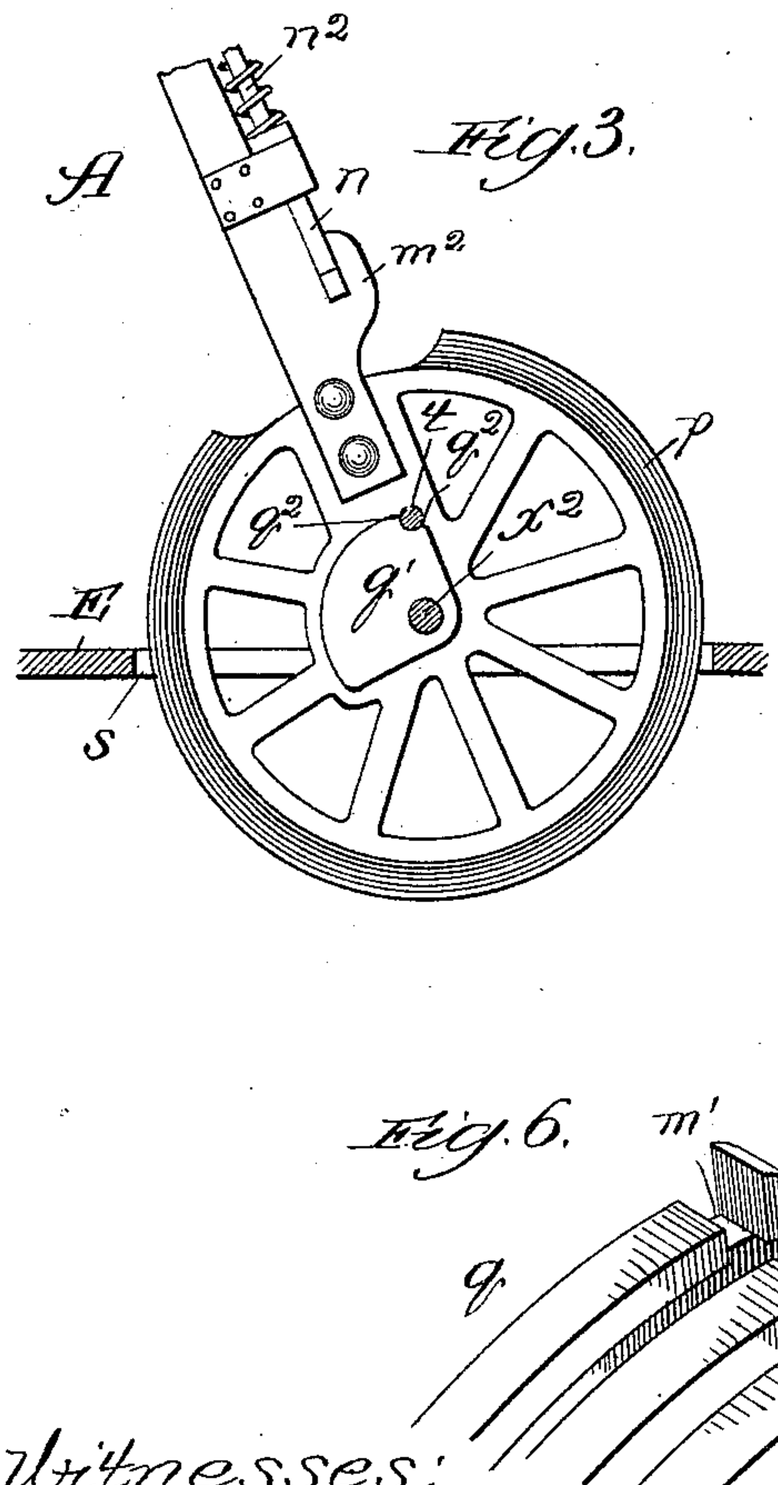

Fig. 6.

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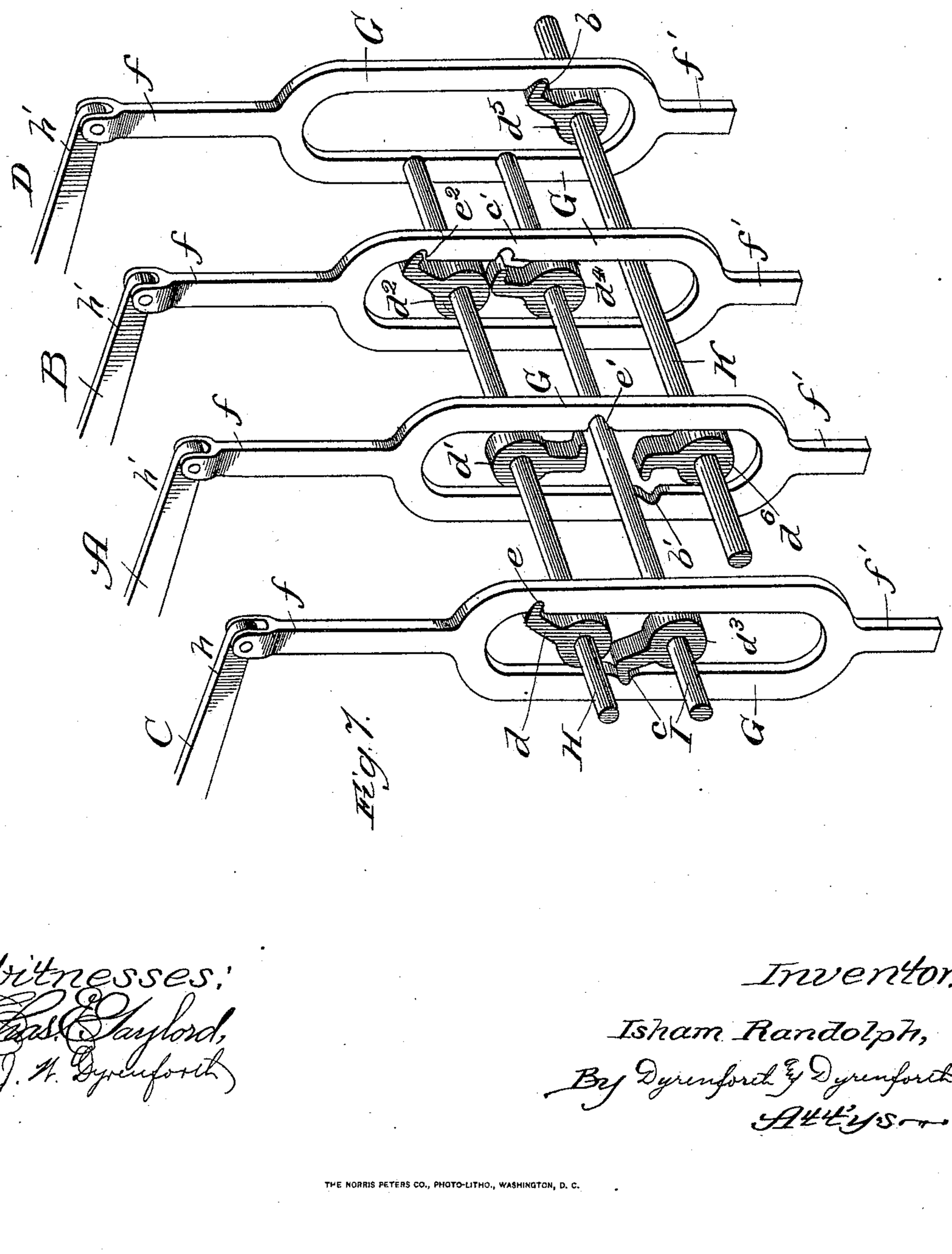

Fig. 1.

Witnesses:
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UNITED STATES PATENT OFFICE.

ISHAM RANDOLPH, OF CHICAGO, ILLINOIS.

INTERLOCKING APPLIANCE FOR RAILROAD SWITCHES AND SIGNALS.

SPECIFICATION forming part of Letters Patent No. 464,697, dated December 8, 1891.

Application filed December 2, 1890. Serial No. 373,325. (No model.)

To all whom it may concern:

Be it known that I, ISHAM RANDOLPH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Interlocking Appliances for Railroad Switches and Signals, of which the following is a specification.

My invention relates to improved means for effecting so-called "preliminary interlocking" as applied to a system of levers located at the point of operation and connected with switches and signals to afford a medium through which to control and operate them, the term "preliminary" being employed to indicate the initial act or operation which must be performed with any one lever of the system before it can be moved from the position in which it is found by the operator. Two conditions are to be provided for—namely, that of having certain levers for respectively controlling different switches, each free, after releasing its aforesaid preliminary interlocking state, to be moved when all are in their normal position, say, with their respective switches at "danger," but the mere manipulation of one of which levers to release it from its locked condition will interlock all others conflicting with it against being moved, and that of requiring that one lever (as that for a switch) in the normal position shall lock one or more other levers for the signals protecting the said switch in the same (normal) position, either of which last-named levers, when moved, after being released by moving the first-named or "switch" lever, shall lock the other and the switch-lever against movement until it shall itself be returned to the normal ("danger") position. I provide for both these conditions in the same system, though the last-named may be independent of the first, the former being fully represented, while the latter is less fully represented, by the accompanying drawings, in which—

Figure 1 is a broken view in sectional elevation, representing my improvement, the section being taken at the line 1 on Fig. 2 and viewed in the direction of the arrow. Figs. 2 and 3 are sections taken, respectively, at the lines 2 and 3 on Fig. 1 and viewed in the directions of the arrows. Figs. 4, 5, and 6 are broken perspective views showing different details. Fig. 7 is a broken perspective view, diagrammatic in its nature and showing the normal relative positions of the interlocking details (links and dogs) of the system.

The more clearly to distinguish in the system the sets of devices, each performing a different purpose, one set for operating a switch is designated by A, which is flanked by signal-operating sets designated, respectively, as B and C, and all of these sets involve the same general construction, the main difference as to detail being that the feature hereinafter referred to as the curved lever on each quadrant extends at only one side of its fulcrum in each of the sets B and C, while in the set A it extends at both sides of its fulcrum. The set indicated by D is intended to perform as to another switch the same function as the set A, and to that end to be flanked by one or more sets like the sets B and C, which latter, however, are not shown in connection with it, as they would be mere duplications of those illustrated, and thus complicate the drawings, the purpose of showing the set D being to illustrate the interlocking function by or upon it upon or by the set A.

The entire mechanism of the system may be supported on a suitable bed or table E, suspended to extend along the center of which I provide frame-work F, to support bearings r for parts hereinafter described, and the lower guides x for the links, also hereinafter described, the upper guides x' for the same being preferably in the table E.

The set A comprises a bearing, preferably in the form of a quadrant q, formed in two halves, as shown, secured each at one of its straight edges to the bed E at opposite sides of a slot s therein, through which extends a pulley p, journaled at x^2 in the two halves of the bearing q. The pulley p forms the fulcrumed end of a lever having a handle o extending radially from the pulley, and on which is supported a well-known construction of spring-dog or spring-catch n, adapted to have its handle portion n' on its spring-actuated rod n^2 gripped by the hand in manipulating the lever $p\ o$ to control the catch, to receive which notches m and m' are provided in the quadrant q at opposite ends of the throw of the lever, and a guide m^2 is provided on the handle portion o of the said le-

ver for the catch n. On one side of the pulley p and concentric therewith is a quadrant q', having a recess q^2 in one corner and serving a purpose hereinafter described. To one side of the quadrant-bearing q is pivoted at y, Fig. 2, a curved lever l, extending from its pivotal point beyond the upper notch m', near which it is formed into a hook-shaped recess k, (see particularly Fig. 4,) normally in the path of a lateral extension v of the catch n, to receive the said extension at one end of the throw of the handle o. The lever l in the sets A and D (or switch-interlocking sets) is extended from the opposite side of its fulcrum and terminates in a hook-shaped recess k', adjacent to the notch m, to receive the lateral extension v on the catch n at the opposite end of the throw of the handle o. Back of the quadrant-bearing q and at one side thereof on the bed E is a bearing i for a journal i', to one end of which is rigidly secured an arm h, projecting thence forward underneath the uppermost end of the lever l, with which it is there linked by a bar l^2. A similar arm h' is rigidly fastened at one end to the opposite end of the journal i', and extends thence forward to a guide-opening x' in the bed E, and is there pivotally connected with an extension f on the upper end of a link G, projecting through the said guide, a similar extension f' on the lower end of the link projecting through a guide-opening x in the base g of the frame-work F.

The link G is preferably of the form shown, and is provided on its opposite inner edges with notches e' and b', one higher than the other.

The description of the construction thus far set forth, while given with reference only to the set designated as A, applies as well to each of the other sets B, C, and D, the details of all the sets being exactly alike, (and indicated with corresponding reference-letters,) except that the levers l in the sets B and C have no extensions l' and that the relative arrangements of the notches in their links G differ, while the link G in the set D is shown as being provided with only one notch. Hence there is no necessity for describing of each set the details, as they are the same in all the sets.

To permit my improvement to be understood it is necessary that the further description of the construction shall apply to the juxtaposition of the several sets.

H is a rock-shaft journaled in the uppermost bearings r on the frame F to extend horizontally through the links G of the three sets C, A, and B, being provided in the first link with a dog d, extending upward from the shaft into position to engage, under certain conditions, as hereinafter explained, with a notch e in its link, with a similar dog d', extending downward from its shaft, (but facing the same way as the dog d,) to engage the notch e' in the second link, and inside the link G of the set B with a dog d^2, extending, like the dog d, to engage a notch e^2 inside its link. The dogs on the shaft H, as also those on the other shafts hereinafter described, are of course rigidly secured in place.

I is another rock-shaft supported in bearings r below the shaft H to extend parallel with the latter, and provided in the first link G with a dog d^3, projecting upward from the shaft and facing in the direction opposite that in which the dog d faces to engage a notch c in its link on the side thereof opposite that provided with the notch e, and with a dog d^4 in the third link G, projecting, like the dog d^2, above it to engage a notch c' in its link directly below the notch e^2.

The three links G, with the two shafts H and I, and the dogs thus described form parts of the system as composed of the three sets A, B, and C, which may be used without the set D (the description of which is hereinafter completed) for the second of the two conditions hereinbefore referred to, and the operation for that condition is as follows: In connection with the description of the operation it is to be borne in mind that, for the sake of due precaution in the operation of interdependent switch and signal controlling mechanisms, it shall not be possible for the operator to throw a switch from "safety" to "danger" until the signal shall have been thrown to "danger," and that the danger-signal shall not be removed until the switch shall have been thrown to "safety."

In the positions in which the operating-levers are shown (their normal positions) the relative arrangement of the mechanism is that which it assumes when a switch and the signal or signals operatively connected with its controlling mechanism are at "danger."

The set A is designed to control a switch, and the sets B and C signals at opposite approaches to the switch, and to those ends a cable or the like (not shown) is supposed to be provided on each pulley p to form the connecting medium between the latter and the switch or signal mechanism beyond the primary operating-station.

The set A in the aforesaid normal position of its parts, with those of the two signal-controlling sets in like position, is in condition to be moved to throw the switch to "safety," while the links G of the two sets B and C are locked by the dogs d and d^2. (See Fig. 7.) It will be noticed that with the details of set A in their aforesaid normal relative positions the dog d' is above its notch e' and bears at its free end against the plain inner surface of its link G, and that hence any attempt to turn the shaft H in a direction to take the dogs d and d^2 out of their respective notches would be prevented by the obstructing effect of the dog d', so that the position shown of the dog d' effectively insures locking of the links of the sets B and C by the dogs d^2 and d, and consequently prevents throwing of the handles o of the levers of the last-named signal-controlling sets. Then turning the handle o

of the set A to the end of its throw from the position in which it is illustrated turns its pulley *p* and effects throwing of the switch to "safety." The further effect of the described movement of the handle *o* is the following: Preliminary to the throw of that handle it is released by the operator, who in gripping it also grasps the spring-dog handle *n'*, thereby raising the catch *n* out of the notch *m'* in the quadrant *q* to or beyond the curved guide-edge of the latter. In rising, the lateral extension *v* on the catch *n* strikes against the upper side of the hooked recess *k* in the end of the lever *l*, thereby entailing a slight upward pull on the bar l^2, which raises the pivot-pin *t*, connecting that bar with the arm *h* and which projects at one end through an opening *t'*, Fig. 2, in the side of the quandrant *q*, and, with the other parts in their relatively normal positions referred to, rests in the corner recess q^2 in the quadrant *q'*. Thus the pivot-pin *t* is raised out of its seat, and by turning the pulley *p* the quadrant *q'* is turned with it, thereby removing the depressed portion q^2 or seat thereof away from the pivot-pin, to which by the turning the more elevated edge of the quadrant *q'* is brought, and prevents returning of the arm *h* from its slightly-raised position. The raising of the arm *h* on its pivot *i'* also obviously raises the end of the arm *h'* where it is connected with a link G, and consequently also raises the latter, but not far enough to bring its notch *e'* coincident with the dog *d'*, so that the links G of the sets B and C cannot yet be raised. By continuing the throw of the aforesaid handle *o* until the catch *n* reaches the notch *m* in the quadrant *q* and also the hook-shaped recess *k'* in the lower end of the extension *l'* of the lever *l* the catch springs into the notch *m*, and in doing so impinges against the base of the recess *k'* in the extension *l'*, thus bringing that recess laterally coincident with the aforesaid notch, and by doing so moving the extension *l'* inward, whereby the opposite end of the lever *l* is raised and through the media of the link l^2 and arms *h* and *h'* raises the link G far enough to bring its notch *e'* coincident with the free end of the dog *d'*. Then obviously the shaft H may be turned to take the dogs *d* and d^2 out of their notches and force the dog *d'* into its notch. Whichever, however, of the links G flanking that of the set A is raised to effect throwing of one of the signals the other of the two said links will be locked against movement, since one of the dogs d^3 and d^4 will be in its notch, while the other (that of the raised link) will abut at its free end against the plain surface of the link below its notch. Thus, to illustrate, suppose the signal controlled by the set B is first to be thrown to "safety" after the switch has been so thrown, as hereinafter explained. Then by manipulating the handle *o* of set B the same effect exactly will be produced on the details of that set as that already explained which was produced on the counterparts of those details by manipulating the handle *o* of the set A, the only difference being that the impingement of the catch *n* of sets B (as also of set C) against the lever *l* induces a sufficient rise in the link G thereby controlled to move the notches e^2 and *c'* above the free ends of their respective dogs d^2 and d^4, thus bringing the latter against the plain surface of the link and preventing thereafter such turning of the shaft I as would take the dog d^3 out of its notch *c*. The raising effect on the lever *l* of the catch *n* being that described, there is no requirement for an extension *l'* of that lever as provided in the set A for the purpose stated in describing the operation of that set. It should be stated that the important function of the notches *m* and *m'* is to lock the handles *o* at their opposite throws. After the handle *o* of the set B has been thrown in the manner stated the abutment of the dog d^2 against the link G below the notch e^2 obviously also prevents such turning of the shaft H as would take the dog *d'* out of the notch *e'*. Hence the switch-operating set A cannot thereafter be moved to throw the switch back to "danger" while the set B is in that position. Therefore before returning the switch to "danger" the signal controlled by the set B must be operated to return it to "danger," which is accomplished by manipulating the handle *o* of that set to withdraw the catch *n* from its notch *m* and throwing the handle back to the original position, where the catch *n* springs into the notch *m'*, and in doing so permits the adjacent lever *l* to fall, (by the weight of the parts attached to it,) and with it the link G. This brings the notches *c'* and e^2 and their respective dogs d^4 and d^2 into the initial relative positions illustrated in Fig. 7. The switch may then be returned to "danger" by manipulating the handle *o* of the set A in the same manner as just described of the set B, which brings the parts of the set A to the relative positions illustrated.

Obviously if, after the switch was thrown to "safety," instead of the set B the set C had been correspondingly thrown, the same operations would have been gone through as described in explaining the operation of set B, with the same resultant locking effect in the latter as it was described to exert on the set C.

As to the set D, it is connected with the set A by a rock-shaft K, supported in suitable bearings *r* in the frame F below the shaft I and carrying inside the link G of the set D a dog d^5 to engage a notch *b* and inside the link of the set A a dog d^6 to engage a notch *b'*, the two dogs projecting in the same direction from the shaft, but facing in opposite directions. Like the set A, the set D is designed to control a switch, and the object of providing for their being so interlocked as to prevent one being manipulated while the switch controlled by the other is at "safety" is obvious. That this effect is produced, and thus answers

the first of the two conditions hereinbefore referred to, will be readily understood, since if the link G of one or the other is raised as a result of manipulating the handle *o* of its operating-lever to raise the catch *n* its dog on the shaft K will bear against the flat surface of the link and prevent turning of the shaft to withdraw the other dog from its notch.

As hereinbefore suggested, the set D in practice, if used and protected by one or more signals, would, like the set A, be provided with one or more sets like and for the purposes of the sets B and C, which, however, would have no interlocking connection with the latter otherwise than by the interlocking connection, through the medium of the shaft K and its dogs, of the set D with the set A. According to the number of switches to be controlled from one station, any desired number of my approved appliances in combinations adapted to meet required conditions may be provided, and all the switch-controlling sets thereof may be interlocked, as are the sets A and D.

Details of the construction thus described may be variously changed without departing from the spirit of my invention. Hence I do not wish to be understood as intending to limit my improvement to such details. For example, to suggest one change that occurs to me, the pulleys *p* may be supplanted by other forms of lever appliances to produce the same result.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an interlocking appliance for railroad switches and signals, the combination, with a suitable support, of switch-operating mechanism and signal-operating mechanism, each having a lever device to be connected, respectively, with its switch and signal and each being provided with a catch operating to lock the lever at the ends of its throw, and interlocking mechanism for the levers, having vertically-movable links G, provided with notches and connected with the levers, and dogs supported to engage the links at the notches, substantially as and for the purpose set forth.

2. In an interlocking appliance for railroad switches and signals, the combination, with a suitable support, of switch-operating mechanism and signal-operating mechanism, each having a lever device to be connected, respectively, with its switch and signal and provided with a spring-controlled catch *n*, operating to lock its lever at the ends of the throw thereof, and interlocking mechanism for the levers, comprising vertically-movable links G, provided with notches, dogs supported to engage the links at the notches, and means forming the connecting medium between each link and lever, comprising the arms h' and h on a common shaft i', a support q' on the lever for the arm h, and a curved lever linked to the arm h and engaged by the catch, substantially as and for the purpose set forth.

3. In an interlocking appliance for railroad switches and signals, the combination, with a suitable support, of a set of switch-operating mechanism and two sets of signal-operating mechanism, each having a lever device to be connected, respectively, with its switch and signal and provided with a spring-controlled catch *n*, operating to lock its lever at the ends of the throw thereof, and interlocking mechanism for the levers, comprising vertically-movable links G, having the notches e', e, and c and e^2 and c', respectively, rock-shafts H and I, supported to extend, one above the other, through the said links and carrying the dogs d', d, d^3, d^2, and d^4, respectively, and means forming the connecting medium between each link and its lever, comprising the arms h' and h on a common shaft i', a support q' on the lever for the arm h, a curved lever l, having a recess k for each of the signal-lever catches n, and a curved lever l, having a recess k and an extension l', provided with a recess k' for the switch-lever catch, substantially as and for the purpose set forth.

4. In an interlocking appliance for railroad switches and signals, the combination, with a suitable support, of two sets A and D of switch-operating mechanism and two sets B and C of signal-operating mechanism, each comprising a quadrant-guide *q*, provided with recesses *m* and m' and having fulcrumed upon it a lever device to be connected, respectively, with its switch and signal and provided with a spring-controlled catch *n*, operating to lock its lever at the ends of the throw thereof in the recesses *m* and m', and interlocking mechanism for the said lever devices, comprising vertically-movable links G, one for each said set, and having the notches e' and b', b, e^2, and c', and e and c, respectively, rock-shafts H, I, and K, supported to extend, one above the other, through the links and carrying the dogs d d' and d^2 d^3 and d^4 and d^5 and d^6, respectively, and means forming the connecting medium between each link and its said lever device, comprising the arms h' and h on a common shaft i', a support q' on the lever device for the arm h, a curved lever l, having a recess k for each of the signal-lever catches n, and a curved lever l, having a recess k and an extension l', provided with a recess k' for each switch-lever catch n, the whole being constructed and arranged to operate substantially as described.

ISHAM RANDOLPH.

In presence of—
J. W. DYRENFORTH,
M. J. FROST.