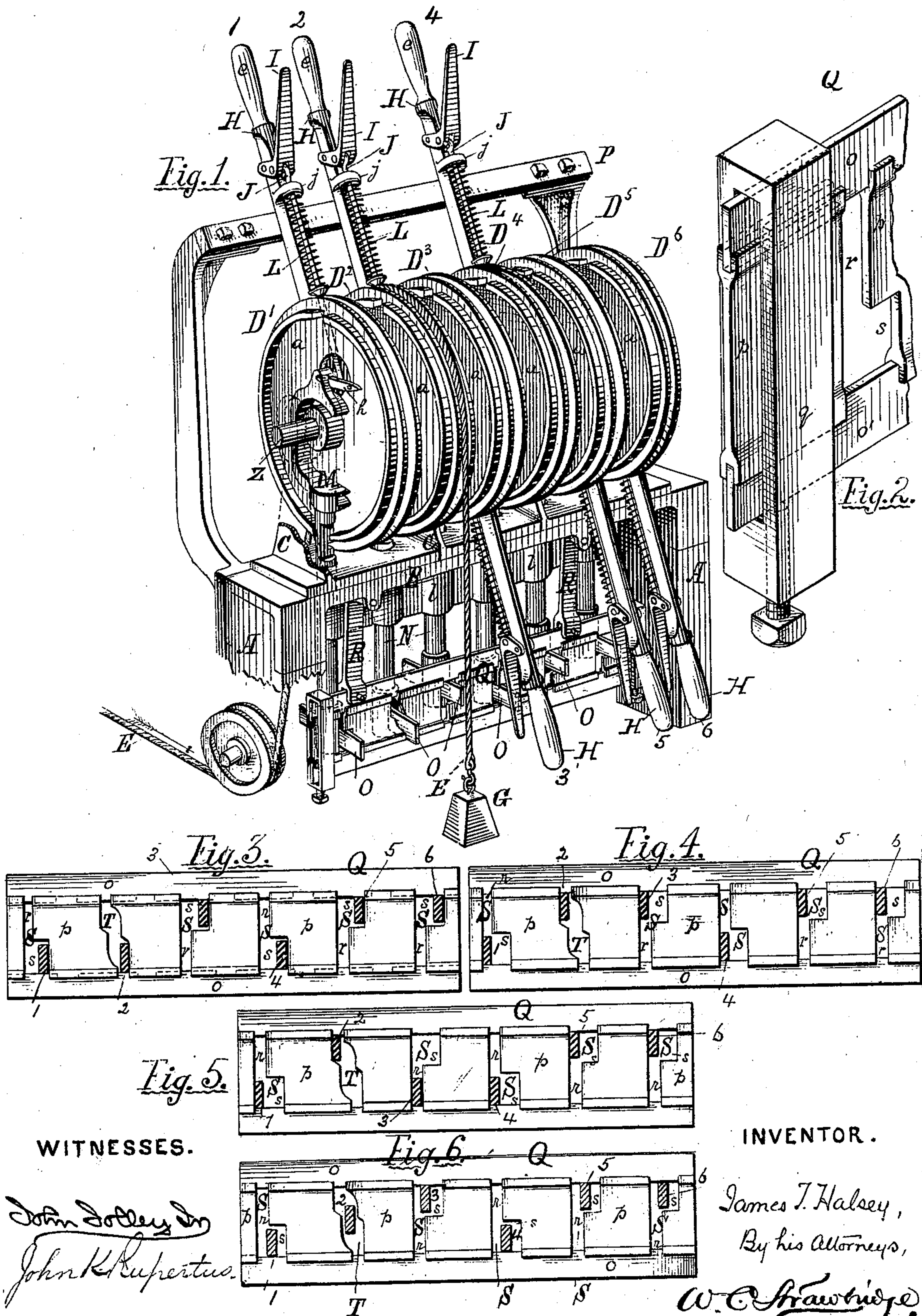


J. T. HALSEY.
Switch-Stand and Interlocking Apparatus.

No. 227,688.

Patented May 18, 1880.



WITNESSES.

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John K. Rupertus.

INVENTOR.

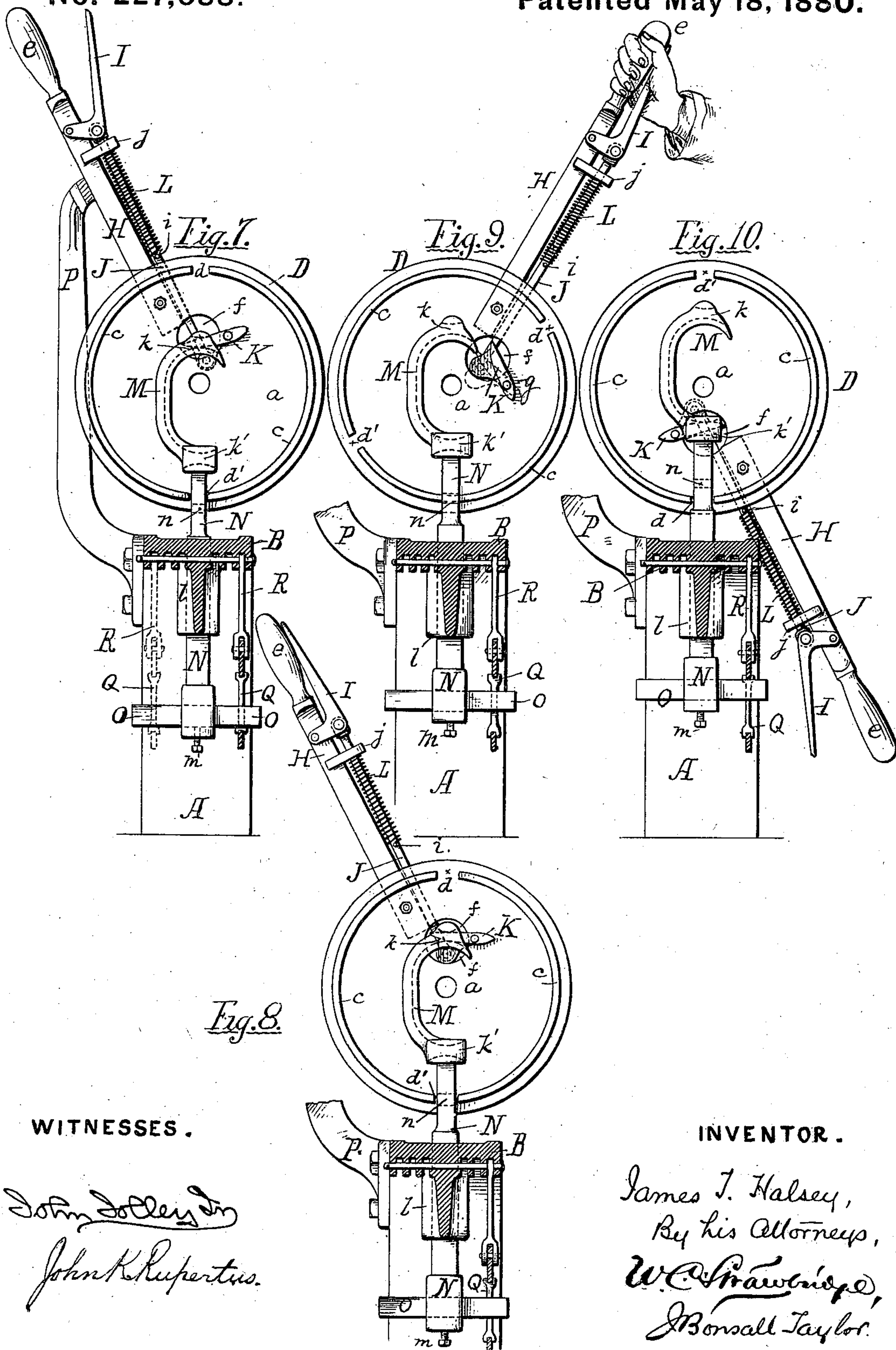
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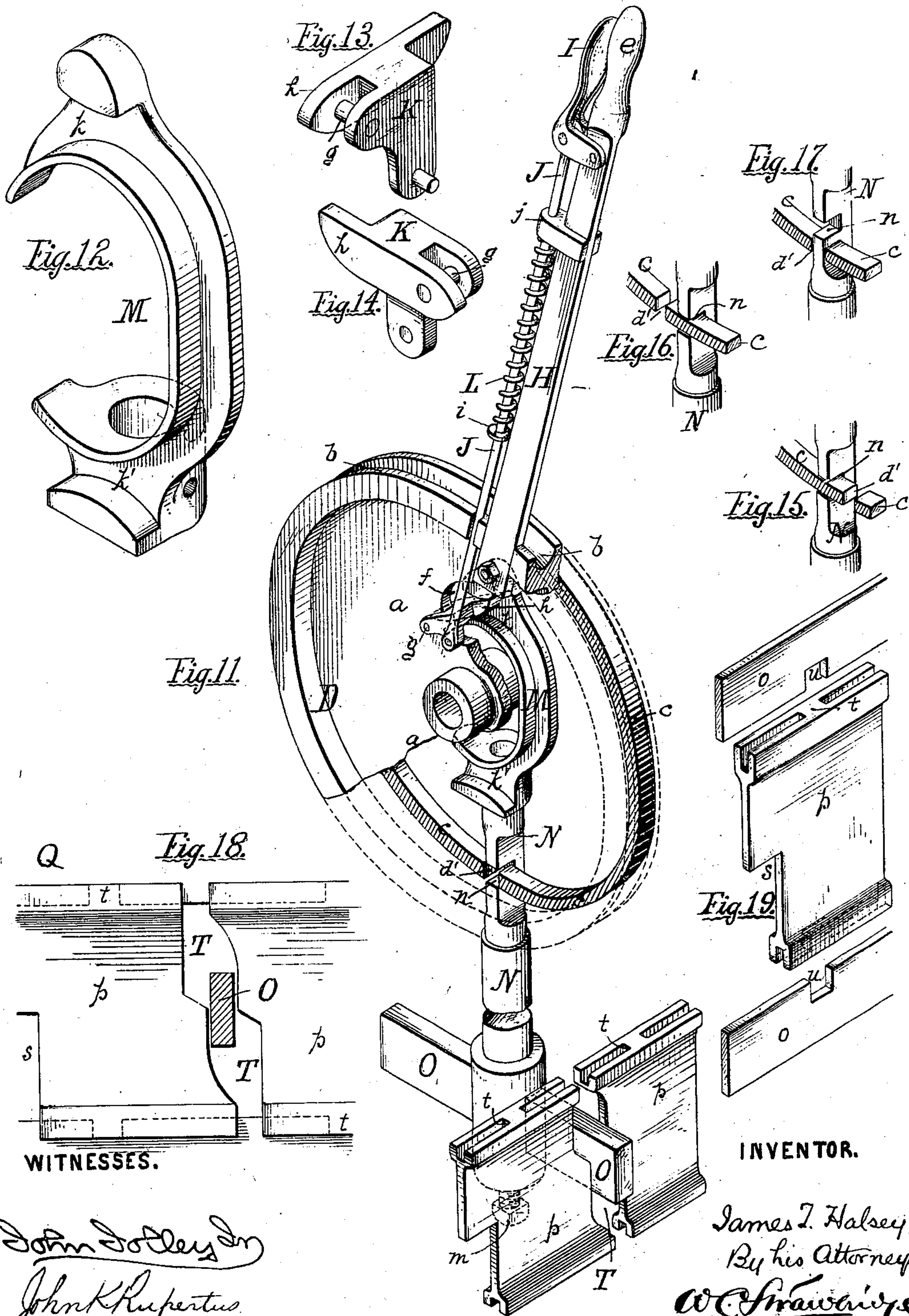
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UNITED STATES PATENT OFFICE.

JAMES T. HALSEY, OF PHILADELPHIA, PENNSYLVANIA.

SWITCH-STAND AND INTERLOCKING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 227,688, dated May 18, 1880.

Application filed December 19, 1879.

To all whom it may concern:

Be it known that I, JAMES TAGGART HALSEY, of Philadelphia, Pennsylvania, have invented certain Improvements in Switch-Stands and Apparatus for Locking and Controlling Switch-Rails and Signals Connected Therewith, of which the following is a specification.

My invention relates to that well-known class of inventions which have for many years been employed in connection with railway junctions and crossings as safeguards against accidents from misplaced switches and signals; and throughout varying mechanical constructions of which, the leading idea of all has been the provision of an arrangement of levers, in such combination with all switch-rails and signals of a given junction or crossing, that, after a change in the position of any given switch, all levers controlling conflicting switches and signals, and controlling signals then properly displayed to indicate the condition of the given switch, are locked in their respective positions; while other levers, in the same frame, controlling switches or signals not conflicting are unlocked and free to be moved.

The object of my invention is the construction of an "interlocking" apparatus for switch-stands or cabins, of less complex construction and arrangement than those heretofore devised; in which the parts and construction are simple, the operation certain, and the capability for numerous and varying permutations of the interlocking devices great; in which, also, I am enabled to employ metal rods or rope to transfer the movement imparted by the levers; which, finally, after complete erection in the shops, can be taken apart in given sections, and the given sections subsequently erected in the cabin or signal-tower.

I have represented in the accompanying drawings a convenient form of apparatus embodying my invention; it is, however, to be understood that in practice I resort to other and various allied mechanical expedients or arrangements for effectuating the same.

Of the drawings, Figure 1 represents in perspective a frame of six levers of a stand constructed according to my invention.

Fig. 2 is a perspective detail, illustrative of a good form of construction of the interlocking-

bar, showing the clamp as I apply it to the framing rods and shoes.

Fig. 3, a front elevation of the interlocking-bar, representing the position of its shoes with respect to the locking-bars when all the levers have been locked by the movement of lever No. 2, the position being the same as that indicated in Fig. 1.

Fig. 4, a similar view of the same when all the locking-bars have been unlocked by the reverse movement of lever No. 2, and are in position, any or all of them, to be moved.

Fig. 5, a view similar to Fig. 4, showing the position of the locking-bar of lever 3 after it has been shifted from the position which it occupied in Fig. 4.

Fig. 6, a view similar to Fig. 3, showing the position of parts when locking-bar No. 2 has been moved partially through its path.

Figs. 7, 8, 9, and 10, side elevations of any given lever and attachments, (the frame-girder being sectioned,) showing in Fig. 7 the position of the parts when the locking-bar is at the lowest point of its path and the lever against its top rest,—showing, in Fig. 8 the position the locking-bar is caused to assume when the latch has been compressed and the bolt raised so that the notches are thereby caused to coincide, and so that it has become possible to throw the lever in question forward, showing, in Fig. 9 the position of the lever as it is being thrown forward, and in Fig. 10 the position of the parts when the locking-bar is at the highest point of its path and the lever at its lowest, and when the latch has been recoiled by the spring.

Fig. 7 shows, also, in dotted lines a method of attachment of a second interlocking-bar.

Fig. 11 is a reversed (in regard to Fig. 1) perspective detail, illustrative of the construction of a drum and lever, and showing the coincidence of the notches when the latch is compressed and the bolt thereby raised.

Fig. 12 a reversed perspective view of the bolt-hook, showing its finger-ways.

Figs. 13 and 14 perspective details of the obverse and reverse of the cam-finger.

Figs. 15, 16, and 17, reversed perspective details of various positions of the notches.

Fig. 18 a side elevation showing a good con-

struction of a swaying slot in an interlocking-bar, and

Fig. 19 a perspective detail of the method of securing the shoes of the interlocking-bars in place in their framing-rods.

Similar letters of reference indicate corresponding parts wherever used.

A are two standards, erected, for instance, in the second story of a signal-tower contiguous to a junction or crossing, and overlooking the same.

B is a girder supported upon the standards; the standards and girder constitute the framework for a frame of six (as in the drawings) or any desired number of drums, D, which are in the drawings numbered 1, 2, 3, 4, 5, and 6, as are also the levers connected therewith.

It is here to be remarked that in the drawings the same parts connected with each of the six drums and levers have been indicated by the same letters, and that in the specification the use of the letters must be understood with reference to the number of the lever or drum referred to.

Upon the girder, which may be of any desired length, are bolted or otherwise secured a series of pedestals C, which sustain the drum-shaft Z upon which the drums are hung free for oscillation.

The pedestals are preferably constructed in sections, as represented in Fig. 1, to receive any given series of drums, and are thereby adapted to be easily set up or taken down.

The drums are circular; their centers flat disks or webs *a*, their peripheries provided with grooves *b*; while a circular flange *c*, concentric with the axis of the drum, extends horizontally from the web, preferably near its circumference; the flange is notched through at *d d'* at opposite extremities of a diameter which is vertical in the position of parts shown in Figs. 1 or 7 and Fig. 10.

A metal rod, wire rope, or other fit connection E is attached to the groove of each drum (illustrated at drum 2 Fig. 1,) by the oscillation of any one of which drums the rope connected therewith is caused to operate a switch or signal.

In the drawings, for clearness, but one rope is shown.

A counterpoise G, to equilibrate the weight of a signal-arm, is also represented in connection with lever 2 which is supposed to be connected with a signal.

Each drum is independent, upon the drum-shaft, of every other drum, the only connection being through and by means of the interlocking devices hereinafter described.

H are levers, marked 1, 2, 3, 4, 5, and 6, so secured each to a separate drum as to throw the drums in either direction according to the movement of the levers, any rigid attachment which enables such double throw being adapted for the purpose; the attachment, moreover, being so effected that when the notches *d d'* of the drum-flanges are in a vertical line, the levers assume either the position represented in

Fig. 7 or in Fig. 10, according as notch *d* or *d'* is uppermost.

The other attachments and connections being supposed removed, each drum is free to be turned by and with its lever.

I are latches pivoted to the levers near their handles *e*, and coupled to latch-rods J, which latter extend the length of the levers and are connected with cam-fingers K, pivoted to the drums.

The cam-fingers are conveniently formed as represented in Figs. 13 and 14, and are connected to the web in the following manner: On the line of the radius of the drum which connects its axis and the notch *d*, an opening *f* is cut through the web; in this opening is placed the cam-finger, which is connected by the pivot-pin *g* to the web; the operative portion of the cam-finger proper, or the portion which in its passage through the finger-ways of the bolt-hook controls the movement of the bolt, is indicated by the letter *h*, and hereinafter termed the "finger."

Compressed spiral or other springs L are coiled on the latch-rods, or otherwise connected with the latch or latch-rod; and abut, in the arrangement shown, between pins or collars *i* on the latch-rods and slide-bearings *j* on the levers, through which bearings the latch-rods play.

Considered without regard to other parts therefore, the expansion of the spring tends to keep the latch away from the lever-handle and also to keep the cam-finger down against the base or portion of the web-opening *f* which is nearest the axis of the web, all as shown in Figs. 7 and 10.

M are the bolt-hooks, elliptical or double-hook-shaped castings, well made of the form represented in Fig. 12; they are rigidly affixed to the upper extremities of the bolts N.

The hooks are so set as to lie closely against the webs of their respective drums, that portion of the hook which, by the reversal of the view, faces out in Fig. 12 lying in practice against the web.

k k' are the finger-ways of the bolt-hooks, into which opposite extremities of the finger enter at the completion of the upward and downward throws of the lever.

The bolts N, which carry the hooks, extend down through slide-bearings *l* in the girder, being feathered or otherwise prevented from rotating therein.

At their lowermost extremities the bolts are slotted to receive transverse locking-bars O, Fig. 11, which are secured in place in the slots by tightening-screws *m* or other similar devices.

n are notches in the bolts facing toward the drums, and registering with the flanges *c* of the drums in such manner that the bolt rides upon the flange, Fig. 9, during the oscillation of the drum excepting at the times of extreme uppermost and extreme lowermost positions of the lever, at either of which positions, Figs. 7 and 10, either the notch *d* or *d'* of the flange

coincides with the notch *n* of the bolt, and in consequence it becomes possible for the bolt to be moved in a vertical direction, Fig. 8, so as to raise and lower the bolt and locking-bar to effect interlocking and movement of switches and signals as hereinafter set forth.

The raising and lowering is effected as follows:

Consider for illustration the lever represented in Figs. 7, 8, 9, and 10, and suppose it, in the first place, in the position represented in Fig. 7. The cam-finger *h* is entered within the uppermost finger-way *k* of the hook, the expansion of the spring on the latch-rod having thrown the rod down from the handle, having opened the latch, and having deflected the cam-finger into the base of the opening *f* in the web, that is to say into the portion farthest from the handle.

In the position of the drum represented in Fig. 7 the notches *d d'* in the flange are in a vertical line, *d* being of course uppermost; in consequence the bolt, not being upheld by the riding of its notch upon the flange, has passed down through the notch *d'* in the flange, so that the bolt depends from the finger which is engaged within the upper finger-way *k* of the bolt-hook, the locking-bar in consequence is at its lowest point.

It will now be comprehended that in the relationship of parts just described, and shown in Fig. 7, the drum and lever under consideration cannot be oscillated forward, for the reason that the portions of the flange of the drum contiguous to the notch *d'* abut against the bolt, whereby the drum is held rigid. In order, therefore, to oscillate the drum forward and down it becomes necessary to raise the bolt until its notch *n* registers with the notch *d'* of the flange as is shown in Fig. 8, whereupon a forward oscillation of the drum becomes possible and will throw the front half of the flange down and back through the bolt-notch, as is shown in Fig. 9, causing the bolt to ride upon the flange.

The raising of the bolt (shown in Fig. 8) is effectuated by grasping the latch of the lever and compressing it against the handle, whereby the latch-rod is elevated, its spring being compressed, and the end of the finger farthest from its pivot likewise raised, raising with it the hook-bolt and locking-bar, which latter by this movement alone is raised through about half its path.

When the latch is fully compressed, if the adjustment be correct, the notch in the bolt will correspond to that in the flange, (as very clearly shown in Fig. 11,) and it will be possible, still keeping the latch compressed, to draw the lever forward. (The movement would be backward in Fig. 11 which is reversed.)

P is a rest or upper stop, for the levers when elevated to rest against.

When the lever has been drawn forward to any extent sufficient to cause the bolt to ride, the latch may be released and it becomes possible to draw the lever still farther forward, (as

in Fig. 9,) and thereby oscillate the drum through the arc of a semicircle until the lever encounters the girder or other lower stop, the opposite or pivot extremity of the finger simultaneously entering the lower finger-way *k'* of the hook, as shown in Fig. 10, and until the upper flange-notch *d* coincides with the notch of the bolt, in which position the recoil of the spring, (which latter was compressed as the finger entered the lower finger-way and was deflected thereby,) acting through the latch-rod and finger upward against the hook, raises the latter and its bolt and locking-bar until the bolt-notch is raised above the flange, and the drum and lever by the abutting of the flange against the bolt fixed in the position represented in Fig. 10, the locking-bar being at the highest point of its path.

To reverse the lever from the position of Fig. 10 to its first position of Fig. 7, the latch is again compressed, whereby the finger draws down the hook and bolt until the notches shown in Fig. 10 coincide and until the riding of the bolt upon the flange is again rendered possible. As the finger, after oscillation of the lever, again enters the upper finger-way, its deflection thereby compresses the spring, which recoils as the notches again coincide and thereby throws down the shoe and hook so as to cause the locking-bar again to assume the lowest position of its path, as in Fig. 7.

The office of the latches in short is to control the movement of the bolt, so as to release the same when locked, to permit the turning of the drum, while the spring throws the bolt up or down according to the position of the handle.

In Figs. 15 and 16 a very clear representation is made of the riding of the bolt upon the web-flange; while in Fig. 17 is shown how the raising of the bolt causes the ends of the flange contiguous to a notch to lock the drum against the bolt.

Such being the mechanism of each one of the drums, and the construction of parts for giving movement to each one of their locking-bars, it is obvious that irrespective of any further device each drum in a given frame could be oscillated and locked in either of its extreme positions, irrespective of the position of any other drum.

The object, however, of every system of interlocking is either to prevent the movement of given levers in a given frame when other given levers are free to move, or else to permit the movement of given levers when other given levers are prevented from moving; to effectuate which relationship in a frame of levers equipped to lock separately in the manner hereinbefore recited, I interlock my levers by the following device:

Q is what I term an "interlocking-bar," being a longitudinal frame or bar of greater or less thickness, of considerable vertical depth, and of the length of the frame of levers; suspended by means of links R from the girder, or otherwise placed or arranged in such manner as to be capable of being swayed or moved

endwise in either direction; and provided with slots or barways S T, into which the locking-bars of the bolts project, and which, according to their form and combination one with the other, effectuate interlocking of the frame of drums.

The interlocking-bar may be constructed in any desired manner. I find the following to be a convenient method:

10 *o o'* are framing-rods, of the full length of the bar.

p are shoes or plates, grooved at top and bottom, Figs. 2 and 19, to fit over the framing-rods, which are clamped to them so as to retain them in given positions by means of clamps *q q'*, as shown in Fig. 2.

t w are respectively lugs and seats in the shoes and framing-rods, to aid in keeping the shoes in proper lateral position.

20 The sides of the shoes are so fashioned that the sides of adjoining shoes which face each other, form between them, and by reason of their relative outline and location, slots or barways of any desired form, to accomplish the interlocking.

I employ in the interlocking-bar two general forms or classes of slots or barways for the locking-bars, which I term "swaying-slots" T and "locking-slots" S; the first, or swaying-slots, of the character represented at T, Figs. 1, 3, 4, 5, 6, 11, and 18; the second, or locking-slots, of the character represented at S, Figs. 1, 2, 3, 4, 5, 6.

35 Considering, first, the swaying-slots, the type of which is T, the same being substantially a slot oblique to the longitudinal axis of the interlocking-bar, it is obvious that an up or down movement of the locking-bar which is within this slot will, in the absence of an opposing agent, sway or move the interlocking-bar to the right or to the left.

40 If, therefore, the interlocking-bar be not fixed, lever 2, the locking-bar of which is entered in a swaying-slot, can be moved at will in either direction, the swaying-slot not opposing but causing the swaying of the interlocking-bar.

45 Considering now the second class of slots, or the locking-slots represented by S, which consist in a vertical way *r* with a lateral extension or recess *s* at either top or bottom thereof; it is obvious that an up or down movement of a locking-bar which is within this form of slot is only possible when the interlocking-bar is in such lateral position that any given locking-bar is in the direct line of the vertical way *r* of its slot, and that said locking-bar cannot be moved when the position of the interlocking-bar is such that said locking-bar lies in the recess *s*; it is obvious, also, that when all the locking-bars which are within locking-slots in a given frame of drums have been placed by their levers at the extremity (be it at top or bottom) of their respective locking-slots at which the recesses of said slots are, have been placed for instance in

the position represented in Fig. 4, that a movement of the locking-bar of lever 2 (which has been previously placed at the upper extremity of the swaying-slot T within which it plays) from the top to the base of said swaying-slot will sway the interlocking-bar into the position represented in Fig. 3, in which position all the locking-bars except that of lever 2 are locked.

75 It will also be understood that in the position of parts represented in Fig. 4, any lever and locking-bar can be moved, whereas after the movement of any lever except No. 2, as, for instance, of No. 3, into the position represented in Fig. 5, lever No. 2 cannot be moved, but is locked, because the position of locking-bar No. 3 in the vertical way of its slot, prevents the lateral movement of the interlocking-bar which movement is necessary to that of locking-bar No. 2.

When desired more than one interlocking-bar can be employed in a given frame, for the purpose of effecting given interlocking combinations, as shown in dotted lines in Fig. 7; and in such case the locking-bars are entered into all of the interlocking-bars, the slots therein being formed to suit given combinations.

It may be found convenient in certain combinations to omit some of the shoes so as to form simple openings for the locking-bars.

The swaying-slots as stated are openings in the interlocking-bar oblique to its longitudinal axis, any opening therefore which is of the desired obliquity will effectuate the swaying of the bar; I find in practice, however, that swaying-slots of the form represented in Fig. 18 of the drawings are practical forms.

105 It is obvious, however, that the interlocking-bars may not be suspended, but may be arranged in ways or the like so as to slide laterally, and that other means than a swaying-slot may be used to sway them.

I have described with some minuteness a mechanism which conveniently connects the locking-bars and interlocking-bars with the drums and levers, and which conveniently enables the operation of the former devices by the latter devices, but I desire to distinctly state that the gist of such portion of my invention as relates to the connection of the locking-bars and interlocking-bars with the drums and levers lies not in the connection of the same by the specific mechanism described, but in such connection when effectuated by any mechanism or means which transmits the action of the drums and levers to the locking-bars and thence to the interlocking-bars.

125 I desire also to state that the construction of the interlocking-bars in sections or independent portions adapted to be readily put and held together by any means, of which, for instance the framing rods and clamps are only a convenient type, is novel with me, and that in such sectional construction and adaptability to be secured together to form vary-

ingly-arranged barways lies a portion of my invention so far as it relates to the interlocking-bars.

In the matter of the attachment of the levers to the drums, it is of course obvious that many expedients of positive connection may be resorted to other than that represented, which will positively connect the levers to the drums; but any rigid device which enables the positive throw of the drum by the lever in both directions I regard as within the scope of my invention, so far as the drums and levers are concerned.

I also desire to state that the construction of what I term "locking-slots" in the interlocking-bars is such that the vertical way or portion thereof, designated *r* in the drawings, is of the width only of the locking-bars, and that therefore when a locking-bar is in a vertical way the interlocking-bar is prevented from being swayed endwise, and also to state that the swaying-slots have no lateral extensions at either end, similar to the recesses *s* of the locking-slots, into which a locking-bar entered within such slots can be caused to enter and be vertically locked, but that the locking-bars of swaying-slots when locked are locked by the position of locking-bars in locking-slots.

I do not desire in every case to construct my drums exactly as shown in my drawings, but contemplate the employment of segmental portions of wheels, pulleys, disks, or drums, and even, under certain modifications of arrangement, of quadrants, to effectuate the throw of the ropes and the other offices of the drums herein described; and I likewise contemplate the use of sunken grooves, channeled-out openings, or cam-ways of suitable path, in lieu of flanges on the drums, and also the substitution of pins or studs both on drums and bolts, in combination with the grooves, openings, or cam-ways, in lieu of notches, together with other changes of detail obvious to a skilled mechanic.

Such being a description of a convenient form of apparatus effectuating my invention, certain advantages incident to it are, that it renders practicable for the first time in an interlocking apparatus the employment of drums for the transmission of the power exerted by hand-levers; that the girder supports not only the drums and levers, but also the interlocking-bar which depends therefrom; that the construction of the apparatus is such that, after erection in the shops, its sectional structure enables its taking down in sections, and shipment in sections, and final setting up in sections; that the floor of the tower in which the apparatus is erected does not require to be cut through, it being possible to erect the apparatus on any existing floor without alteration of the same; that the compactness of parts enables the approximation of the levers to within four, or less, inches of each other; that the construction of the interlock-

ing-bars enables any desired change of combination by simply removing the shoes and inverting, rearranging, or replacing them at will, so as to effectuate changes of combination without interference with the frame of drums; that the location of the axes or centers of oscillation of the levers above the floor insures to the power of the operator as exerted upon them the greatest possible effect.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In an apparatus for interlocking switches and signals, a frame or given series of rope-drums, and a corresponding frame or given series of levers, said levers and drums being connected by means substantially as set forth, whereby the levers operate the drums to rotation in both directions, through the medium of said rotation the rope-drums being caused to operate the switches and signals.

2. The interlocking-bar hereinbefore described, or its equivalent, provided with a series of slots or barways some of which are properly formed to either lock or permit the free movement of locking-bars which enter them and are connected with and operated by drums and levers, and others of which are formed to cause said locking-bars to move the interlocking-bar endwise in either direction.

3. In combination with a frame of drums and operating-levers connected with signals and switches, one or more interlocking-bars adapted to be acted upon in the manner hereinbefore described by locking-bars operated by said levers.

4. In an interlocking apparatus for switches and signals, the combination, with a frame of drums suitably adapted to be rotated, of a corresponding frame of locking-bars, substantially of the character set forth by means of connecting mechanism acting to raise or lower the locking-bars.

5. In an apparatus for interlocking a frame of levers and rope-drums connected with switches and signals, the combination of a frame of drums adapted to be moved in both directions by levers or the like attached thereto, with a frame of locking-bars, by means of mechanism operating to effectuate the raising or lowering of the locking-bars and brought into action by the movement in a given direction of the drums and levers.

6. In an apparatus for interlocking a frame of levers and rope-drums connected with signals and switches, the combination of a frame of levers, with a frame of locking-bars substantially of the character set forth combined with one or more interlocking-bars, by means of a frame of drums connected with and operated by the levers, and by means of connecting mechanism intermediate between the levers and the locking-bars, the arrangement being such that the connecting mechanism is brought into action to operate the locking-bars by the oscillation of the drums.

7. As a device for raising or lowering a locking-bar through the medium of a hook connected with said locking-bar in the apparatus hereinbefore described, a cam-finger piv-
5 oted to a drum and combined with a latch and spring in such manner that while the latch is adapted to move the finger in one direction, the spring upon the release of the latch moves it in the opposite direction.

10 8. In combination with a cam-finger, a bolt-hook or its equivalent connected to a locking-bar, and provided with finger-ways or the like into one of which, at either extremity of its rotary movement the finger enters, the ar-
15 rangement being otherwise such that, when entered into the ways, a movement of the finger will move the locking-bar up or down, according to the position of the lever.

20 9. A flange or its equivalent upon a drum, provided with two notches, in combination with a bolt connected with a locking-bar and likewise provided with a notch, the arrange-
25 ment being such that when a flange-notch and that in the bolt can be caused to coincide either the drum or the bolt is free to be moved, while if the notches cannot be caused to coincide either the drum or the bolt must of neces-
sity be locked.

10. The combination of one or more interlocking-bars with the girder or supporting 30 frame-work of the stand, by means of links which sustain said bars and permit a longitudinal movement of the same in both directions.

11. An interlocking-bar constructed of sep- 35 arate pieces or shoes adapted when in place to form openings of the shape desired, and further adapted to be united together by suitable binding and uniting devices.

12. In an interlocking apparatus for switches 40 and signals, the combination with a frame of drums and levers, of a corresponding frame of locking-bars substantially of the character herein set forth, by means of connecting mechanism operating to transmit the action of 45 the drums and levers to the locking-bars.

In testimony whereof I have hereunto signed my name this 8th day of December, A D. 1879.

JAMES T. HALSEY.

In presence of—
J. BONSALE TAYLOR,
WM. C. STRAWBRIDGE.