No. 707,066. Patented Aug. 12, 1902.

D. H. FOREMAN.

UPRIGHT AUTOMATIC SWITCH STAND.

(Application filed Mar. 20, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

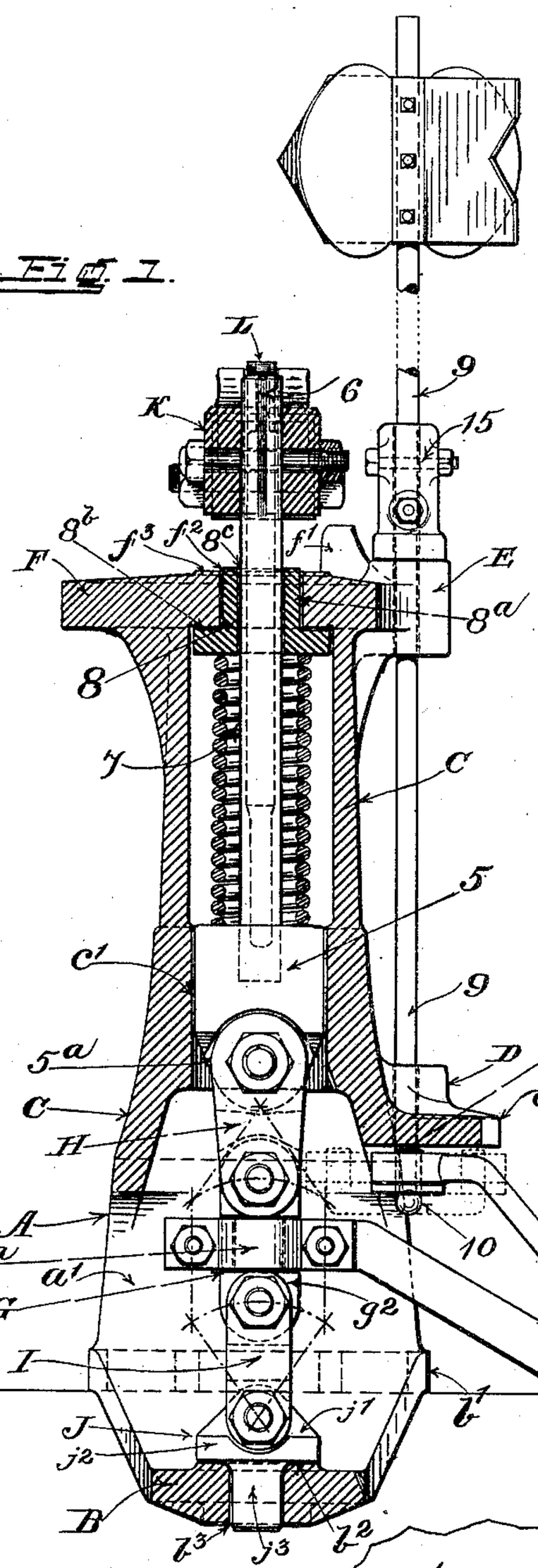


Fig. 2.

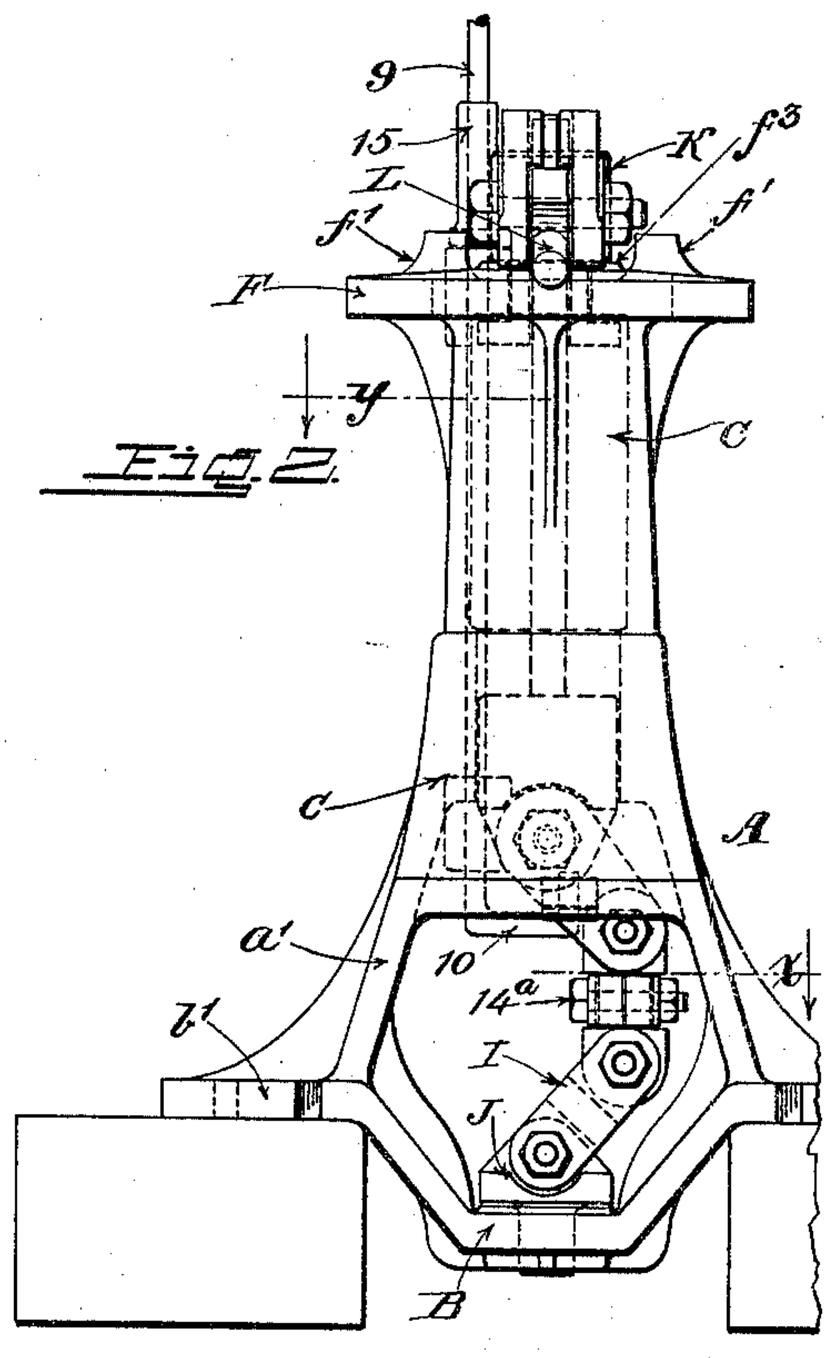
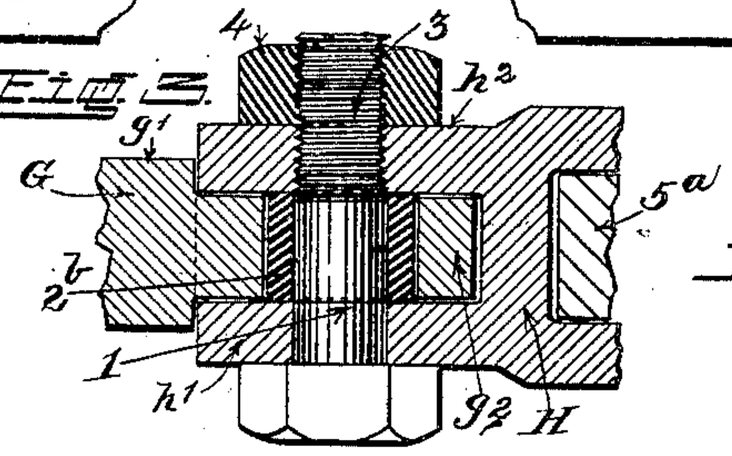


Fig. 3.



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No. 707,066. Patented Aug. 12, 1902.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 4.

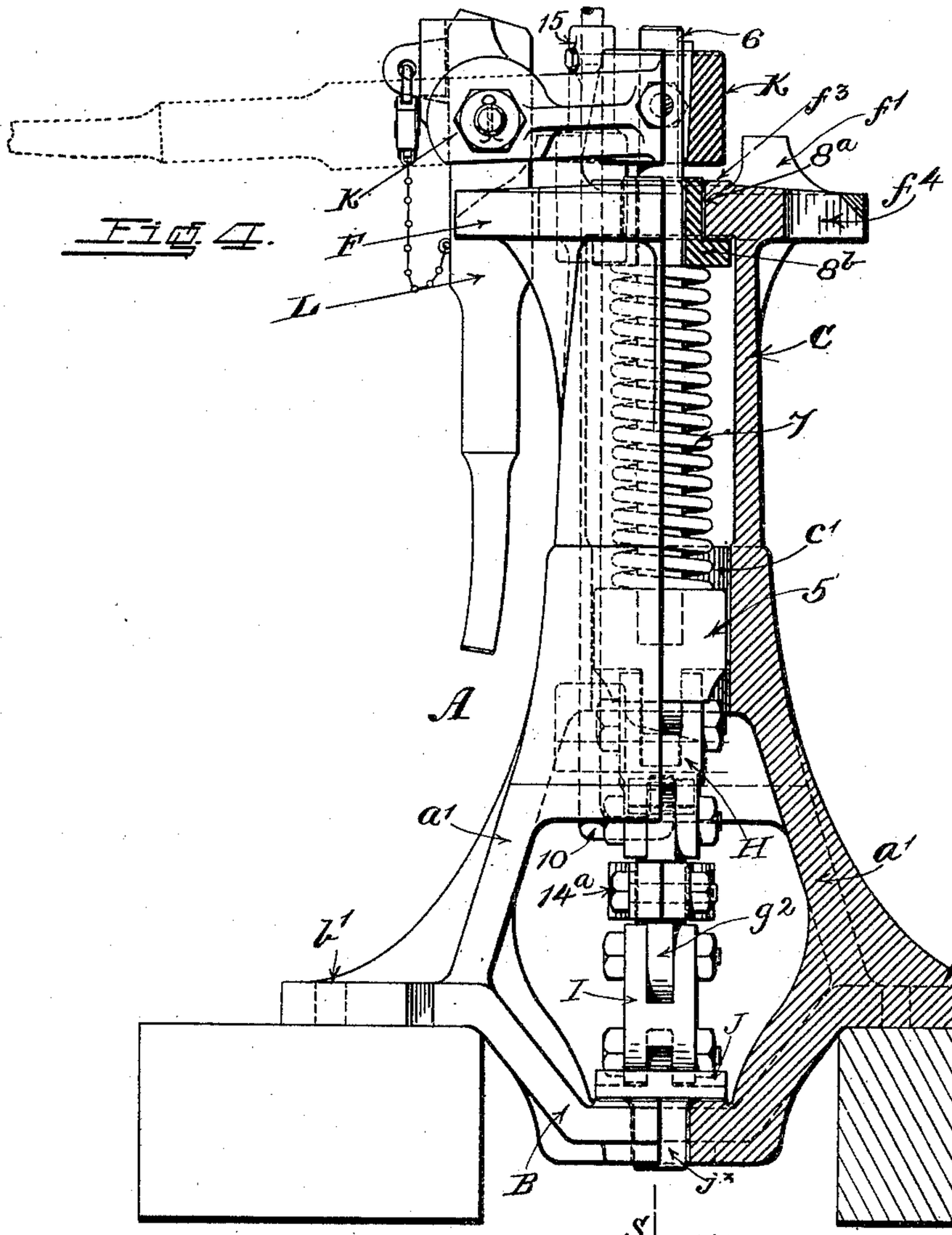

Fig. 5.

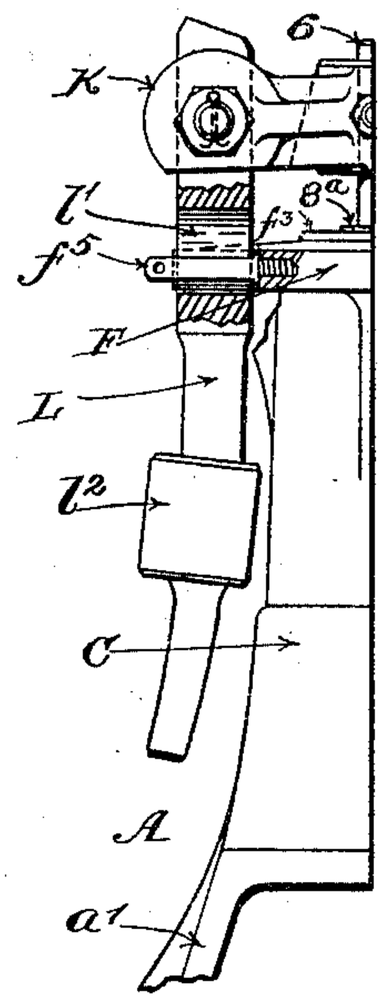

Fig. 6.

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UPRIGHT AUTOMATIC SWITCH STAND.

(Application filed Mar. 20, 1899.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 7.

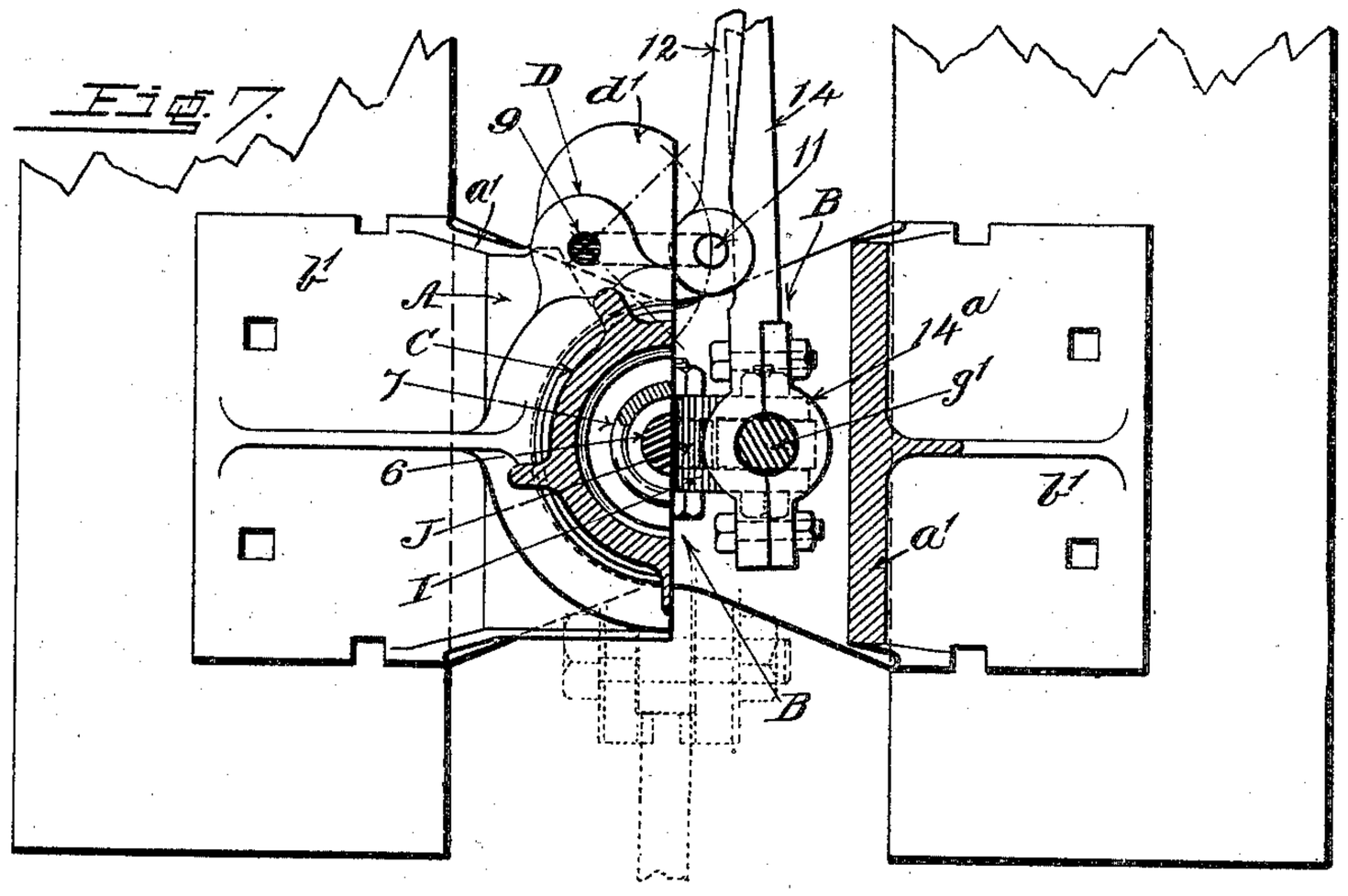


Fig. 8.

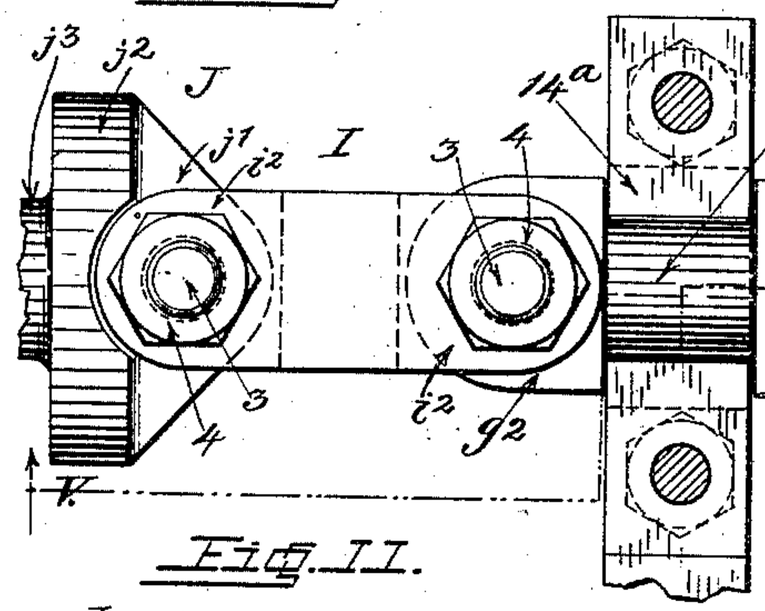


Fig. 9.

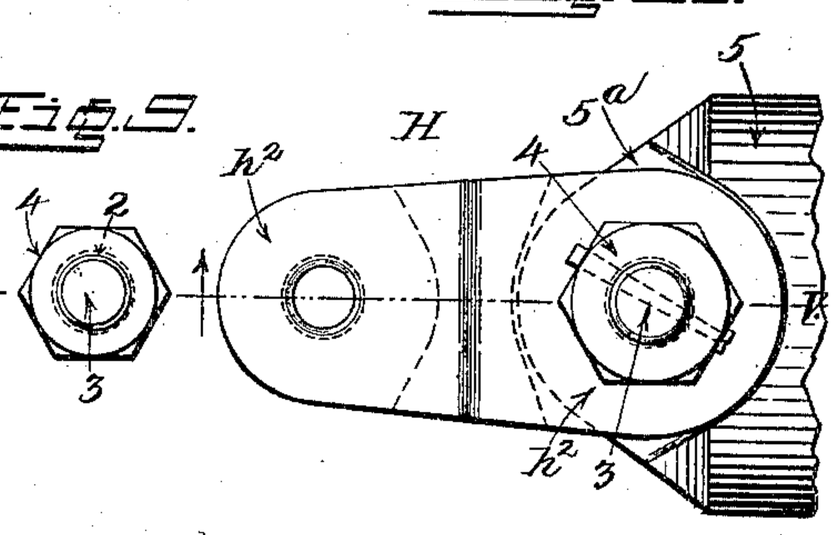


Fig. 10.

Fig. 11.

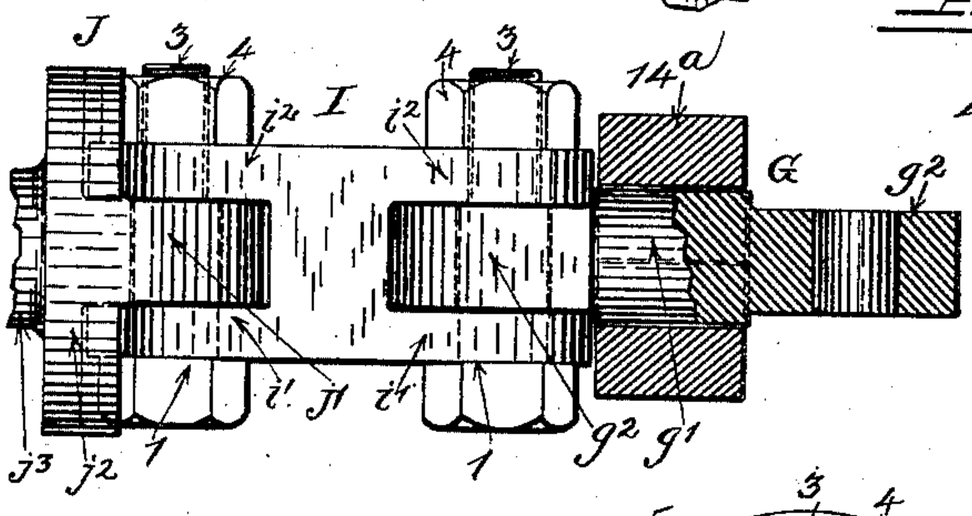


Fig. 12.

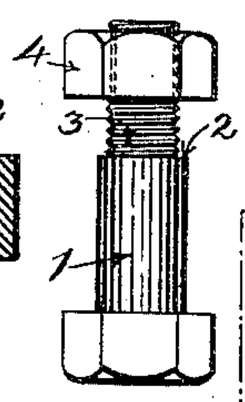


Fig. 13.

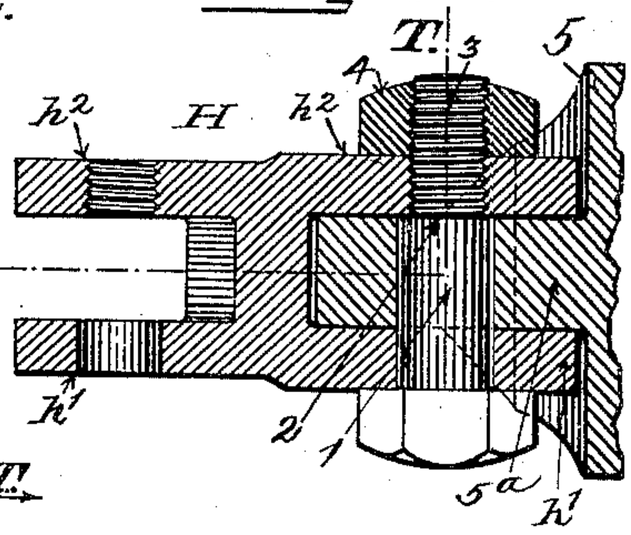
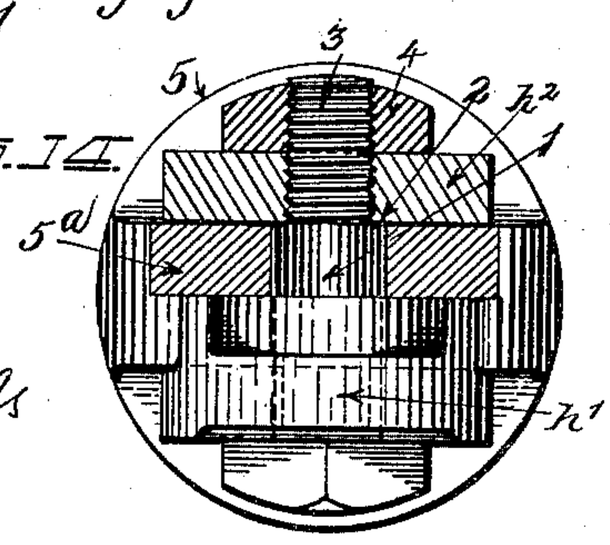


Fig. 14.



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By Wright Brown & Quinby
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UNITED STATES PATENT OFFICE.

DAVID H. FOREMAN, OF DENVER, COLORADO, ASSIGNOR OF ONE-FOURTH TO ARTHUR T. HERR, OF DENVER, COLORADO.

UPRIGHT AUTOMATIC SWITCH-STAND.

SPECIFICATION forming part of Letters Patent No. 707,066, dated August 12, 1902.

Application filed March 20, 1899. Serial No. 709,853. (No model.)

To all whom it may concern:

Be it known that I, DAVID H. FOREMAN, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Upright Automatic Switch-Stands; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My present invention relates to that class of switch-stands known in practice as the "upright" or "standard" pattern, and when used in conjunction with any standard construction of point or split switch embodies the safety or automatic action, the principal feature of operative construction by which the automatic function is attained being a flat-linked spring-retained flexible toggle-crank, the three component members of which are mounted bodily, both revolubly and slidingly, upon suitable bearings and which, with the connected extension, forms the upright main operative shaft of the stand.

The upright stand here shown is a modification in general design and an improvement in detail parts of construction upon a ground-lever pattern of switch-stand embodying similar constructive and operative functions for which I made application Serial No. 690,404, filed September 7, 1898.

The principal objects of my present invention are to provide a construction that will afford a durable, efficient, and reliable positive automatic action, particularly under the severe usage of high-speed main-line trains, which function is attained in this construction to the maximum degree because of there being few operative parts, said parts being elastically resisting and of powerful compact construction and required to perform a very limited excursion of movement under the destructive impact of quick action. This maximum of efficiency is attained largely, also, by the fact that the entire operative construction, including the hand-lever, is not brought into revoluble action when the stand is being thrown automatically, consequently permitting me to immovably lock the hand-lever without defeating the automatic function, as would be the case in prevailing patterns of automatic switch-stands. This function also largely diminishes the possibility of accidental displacement and affords protection against malicious manual interference with switches so equipped and locked. A further important function attained by the use of this bodily-supported flexible spring-retained revoluble toggle-crank is that while it at all times effects the established given throw upon the switch-points under normal conditions it will compensate expansively within the limit of the range of construction for any temporarily-increased throw of the points resulting from various conditions arising in practice, as wear on the points and rail-heads or spread of stock-rails, insuring the point-rails being at all times closed up tight against the stock-rail and securely held under the powerful pressure of the retaining-spring acting upon the flexible toggle.

The entire supporting-stand is constructed in one integral casting, requiring very little "machining" and this being plain boring, affording both economy and durability in production.

My improved construction, outlined as aforesaid, will now be described in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation taken on the line S S of Fig. 6, the operative construction being shown in full figure and at half-throw position automatically, the switch and operative parts of the stand being thrown by the car-wheel in the direction indicated by the arrow. Fig. 2 is an elevation in full figure showing the expanded flexible toggle-crank at half-throw position by hand, with the hand-lever released and in front elevation. Fig. 3 is a detail sectional elevation, drawn to an enlarged scale, of a part of the flexible toggle, showing a modified form in the construction thereof. Fig. 4 is an elevation in which the left half and the operative construction are shown in full figure, the right half showing the supporting-standard casting in section on line R, Fig. 6. In this fig-

ure the operative construction is in the completely-thrown position, showing the hand-lever immovably locked against revoluble movement to the main supporting-standard. Fig. 5 shows a modified form of hand-lever construction in automatic half-throw position interlocked against revoluble movement. Fig. 6 is a plan view in full figure showing the operative construction in completely-thrown position corresponding with Fig. 4. Fig. 7 is a sectional plan, the left half being taken on the line Y, Fig. 2, and the right half on line X, same figure, except that the signal link or pitman and the switch-rod boxing are shown in full figure, the operative construction being shown in half-throw position by hand corresponding with Fig. 2. Fig. 8 is a detail plan view, drawn to an enlarged scale, showing the bored flanged foot-block, the adjoining connecting-link, the crank-pin link, and a part of the switch-rod boxing. Fig. 9 shows in plan one of the joint-bolts used in this method of connecting the flexible crank members. Fig. 10 is a detail plan of the connecting-link adjoining the main shaft-head, showing also a portion of the bored flanged headpiece to which this link is joined. Figs. 11, 12, and 13 show these several flexible crank members partly in side view, full figure, and partly in longitudinal section, taken on the line V V, Figs. 8, 9, and 10. Fig. 14 is an end elevation of the flanged headpiece and the adjoining connecting-link, the lower half in full figure and the upper half in cross-section, taken on the line T T, Fig. 13.

Similar letters and numerals indicate corresponding parts in all the figures, in which—

A designates the main cast-iron supporting-standard, the transversely outward-extending base-flanges b' b' of which rest upon and are spiked through suitable holes and notches formed therein to the extending ends of the two head-ties adjoining the switch-points. Short extensions a' a' adjoining each of the base-flanges, are carried upward into the upper cylindrical body of the stand. In the stand here shown these base-flanges are continued across from one to the other in the form of an inverted arch, thus forming the hanger B, designed to support the operative construction, which is journaled and fitted therein. Between the side walls a' a' and the hanger B an opening is formed, permitting the switch-rod connection and its movement therein. The upper body of the stand is formed into a hollow cylindrical column C, terminating in an overhanging semicircular flanged top or end covering F. Suitably disposed upon the one side of the stand-column adjoining the top F is formed a lug or boss E and adjoining the base of the column C a similar but flanged lug or boss D. These lugs are bored upon a vertical plane parallel to the central vertical plane of the main structure and form the supporting-brackets for the signal-standard rod 9. Upon the top F are formed two upward-extending lugs or stops f' f'. It will be understood that the entire construction, so far hereinabove described, is formed integrally of a single casting constituting the main supporting structure of the switch-stand. Mounted within this supporting structure and disposed in a vertical plane is the operative construction, consisting of a three-member flat-linked flexible toggle-crank, constructed, preferably, of cast-steel, the intermediate or crank-pin member G of which is turned upon the center g' and formed with bored flanged ends g^2 g^2, which ends are respectively suitably fitted into and jointed to the slotted jaw ends of the adjoining terminal connecting-link members H and I. Into the opposite jaw end of the connecting-link I is suitably fitted and jointed the bored flanged end j' of the foot-block J. This foot-block is formed with a circular head j^2, which takes thrust bearing upon a seat b^2, formed upon the main base-hanger B. The hanger is bored, as at b^3, within which a trunnion j^3 of the foot-block is fitted and takes axial bearing. Into the opposite enlarged jaw end of the connecting-link H is suitably fitted and jointed the enlarged bored flanged end 5^a of the headpiece 5. To the turned center g' of the crank-pin link G is fitted the switch-rod 14 by a suitable boxing 14^a.

In the present construction of the flexible toggle-crank as here shown important improvements have been made, the same being found necessary to meet the requirements of practice. To withstand the torsional strain to which the construction is subjected in throwing the switch by hand and to secure the required strength, the intermediate or crank-pin member G is formed with bored flanged ends g^2 g^2 in preference to having bored jaw ends, as shown in my previous patent, No. 357,475 and dated February 8, 1887. It is essential also that the bored jaw ends be rigidly and firmly supported or assembled in order to withstand this excessive torsional strain, and at the same time it is necessary to avoid undue clamping of the jaw members upon the flange members in connecting them, since such clamping to any degree would seriously retard the desired free flexible movement of the toggle (except as against the spring's resistance) under automatic action. In the former construction plain bolts or joint-rivets were used in connecting the members. In the present improved construction the body part 1 of a shouldered bolt (see Fig. 12) fits accurately into the bored jaw h' and the bored flange g^2, while the threaded end 3 is securely tapped into the threaded jaw h^2, the body of the bolt between the head and the shoulder 2 being of such a predetermined length as to firmly secure and support the jaws, but avoid clamping the flange member, the bolt being then permanently secured by the lock-nut 4, similar detail construction being used throughout the toggle-joints, as shown.

Fig. 3 illustrates a modification of the detail construction above described, in which

in lieu of the shouldered bolt a plain bolt is used with an interposed steel supporting-bush 2^b tightly fitted to the body of the bolt and upon which the flange g^2 is freely jointed.

The lower end of the hollow column C is formed into an interior annular rim, the inner periphery of which is bored or planed a suitable distance, as at c', forming a box or bearing, within which the enlarged circular headpiece 5 is fitted and takes rotary and sliding bearing. Thus it will be seen that the three-member flexible toggle-crank is supported bodily, both revolubly and slidingly, upon the terminal bearings.

Securely fitted into the headpiece 5 is an upright rod or main shaft 6, which extends through an enlarged circular opening f^2 in the center of the top F. To the extreme upper end of this shaft is securely keyed and bolted, as shown, and at right angles thereupon, the slotted hand-lever head-block K, designed to rotate through a half-circle in a plane immediately above the flanged top F, limited therein by engagement with either of the upright stops f' f'. This head-block K forms also a stop, limiting the downward thrust movement of the main shaft 6 to the point of engagement of the under face of the stop with the face of the raised central "seat" f^3, formed upon the outer center of the flanged top F.

Mounted upon the main shaft 6 under high elastic tension is a retaining-spring 7, which takes thrust bearing upon the shaft between the top of the headpiece 5 and the annular flanged steel sleeve or friction-collar 8. This collar is fitted into the enlarged circular opening f^2, the periphery of the sleeve 8^a having axial bearing therein, while the top face of the annular flanged portion 8^b takes upward thrust bearing (from the force of the retaining-spring 7) upon the under side of the top covering F. This flanged sleeve is bored centrally, as at 8^c, within which opening the main shaft 6 is fitted to rotate and slide freely. As will be seen, these operative parts of the construction are securely housed and protected from snow, ice, and dust within the covered cylindrical column C.

Jointed into the slotted head-block K is any suitable form of drop-pattern hand-lever L. Formed within the periphery of the semicircular flanged top F diametrically opposite and in a plane at right-angles to the line of switch-rod connection are the lever-interlocking slots f^4 f^4, with either of which the jointed hand-lever L is designed to register when in either the "open" or "closed" completely-thrown position. With the hand-lever dropped into the slot, as shown in Figs. 4, 5, and 6, and suitably locked it will be seen that the operative construction is immovably secured against revoluble action. In Figs. 4 and 5 are illustrated the usual methods of locking the drop-lever into the slot, in Fig. 5 it being observed that the lever-slot l l, into which the locking-staple f^5 enters, is sufficiently elongated in a plane parallel to the line of the hand-lever to permit the free vertical sliding movement to which the operative construction is subjected under automatic action, the construction shown in Fig. 4 embodying like functions. In Fig. 5 the parts are shown at half-throw automatically or in the position of maximum vertical displacement corresponding with the position shown in Fig. 1. In Fig. 5 a weight b^2 is shown upon the lever L, which construction may be preferred upon stands used in freight or car yards, where active switching and expeditious handling does not ordinarily permit the "locking-up" of the stands, the weighted hand-lever insuring the interlocking of the construction against revoluble displacement, even when under automatic action, as shown.

Into the bored supporting-brackets D and E is revolubly mounted the upright signal rod or staff 9, upon the lower end of which is formed an angular crank-arm 10, upon which is an upturned crank-pin stud 11. The signal-rod is operatively connected with the switch-points direct by a connecting-link 12, the upper end of which is fitted upon the crank-pin stud 11 and the opposite end to an upright stud-bolt 13, formed upon the main switch-rod 14, as shown. The supporting-bracket D is provided with an enlarged semicircular flange d', which interlocks the link 12 upon the crank-pin stud 11 when the signal-rod is secured within the supporting-brackets by a friction-collar 15, suitably bolted to the rod 9 immediately above the supporting-bracket E, as shown. The signal-rod is carried to the desired height and fitted with the usual vanes and lantern. The length of the crank-arm 10 is so proportioned and the stud so placed that a full throw of the points will give the signal-rod a quarter-turn, as shown in Fig. 7.

When the stand is operated automatically, either from the main line or from the side line, by the wheels of a passing train, the operation is as follows: The points are "trailed" aside by the passing wheels, as shown in Fig. 1, carrying the spring-retained flexible toggle-crank from the completely-thrown position (shown in Figs. 4 and 6) against the powerful resistance of the retaining-spring 7 into the half-thrown position shown in Fig. 1, beyond which point the spring 7 aids in completing the throw of the switch, forcing the point completely home and securely retaining it tight up against the stock-rail in the changed position. It will be observed that the main shaft operative construction and the drop-lever L during this action is not subjected to any revoluble movement whatever and that the lever remains immovably locked against such rotation. The crank-pin member is thrown from dead-center to dead-center within a plane projected directly through the central line of the terminal axial bearings, while either construction of the hand-lever shown in Figs.

4 and 5 permits the vertical sliding movement of the main-shaft extension (against the retaining-spring's force) in effecting this action.

In the usual construction of automatic switch-stands the crank-pin makes a quarter-throw, being rendered automatically inoperative, if revolubly thrown to dead-centers, compared with which construction my center-throw flexible crank has important advantages in operative functions. With the hand-lever immovably secured, while the quarter-throw crank has (yieldingly) independent revoluble automatic action, it is found necessary to provide four locking-points for the lever, (corresponding with the quarter-throw revoluble crank.) Persons skilled in the art to which these devices appertain and familiar with the practical manipulation thereof will readily comprehend that such construction is operatively impracticable, notwithstanding it may be mechanically perfect, since one of eight possible combinations can arise under these conditions as between the relative positions of the locked hand-lever, the independent quarter-throw crank, and the position of the switch-points, the construction being automatically operative from either the main or the side line. It will be understood that no such operative confusion can arise with the switchman in handling switches with my stand, my immovable locked lever requiring but two locking-slots, since the flexible crank when automatically thrown independent thereof moves from dead-center to dead-center. The construction provides for the free revoluble movement of the expanded flexible crank within the supporting-standard upon either side of the axial center.

The signal being directly connected with the switch at all times indicates the exact position of the points.

When the switch is to be thrown by hand, the lever L is lifted from the locking-slot f^4 into the position shown by broken lines in Fig. 4 and carried around, as shown in Fig. 2, to the opposite slot, during which movement the retaining-spring 7 sustains the flexible crank in the expanded position as against the weight and resistance of the moving switch. The revoluble travel of the crank-pin center is somewhat greater than the throw of the points, enough to completely throw the switch before the lever is carried to the completely-thrown position. During this revoluble movement the head-block K rests upon the raised seat f^3, as is clearly shown in Fig. 2. Forcing the hand-lever L home to the fully-thrown position, where it will register with the locking-slot f^4, compresses the expanded flexible crank, causing a vertical thrust movement on the shaft 6, and lifts the head-block K clear of the seat f^3, as shown in Fig. 4, compressing the retaining-spring, and thus establishing an elastic retaining force upon the switch-point, providing a compensating throw within the limit of the head-block's clearance.

In the ground-lever construction of stand referred to above a plain friction-washer equivalent to the flanged portion 8^b of the flanged sleeve here shown was used upon the rod 6 under the thrust-bearing of the spring 7, while the rod fitted directly into the opening f^2. It was found that during the revoluble throw of the stand, as illustrated by Fig. 2, the expansive force of the spring 7, thrusting the washer against the under side of the top covering and bearing the head-block (or stop-nut) upon the outer side thereof, was sufficient to cause the members to "grip" the same and seriously retard the free revoluble movement of the main-shaft construction when throwing the stand by hand. By using the flanged sleeve here shown with the sleeve portion 8^a enough longer than the thickness of the top F that it extends slightly thereabove, as shown in Fig. 4, this difficulty is overcome, since the head-block K in being forced downward by the spring 7 into the position shown in Fig. 2 first engages the protruding end of the sleeve 8^a. Up to this time the flange 8^b is being pressed upward against the top plate F by the spring 7; but this thrust-bearing is now thrown against the under side of the head-block K by the intervening elongated sleeve 8^a. Simultaneously with this movement the revoluble construction drops by gravity and the head-block K rests upon the top bearing f^3, relieving the upward pressure of the flange 8^b upon the under side of the top plate, as is clearly shown in broken lines in Fig. 2. The thrust pressure of the spring 7 being now removed from the supporting-standard top and wholly supported upon the shaft 6 between the head-block K and the headpiece 5 the spring and flanged sleeve rotates bodily thereupon without thrust friction during the movement of the switch-points.

Having thus described my invention, what I claim is—

1. In an upright switch-stand construction the combination of the revoluble toggle-crank arranged to be rotated by hand, and suitably connected by a switch-rod to the switch-points, an upright main shaft secured to the toggle-crank, a jointed hand-lever secured to the shaft, and a semicircular flanged supporting-top provided with two diametrically opposite lever-locking slots with which the hand-lever is designed to register when in either completely-thrown position, thereby interlocking the toggle-crank against revoluble movement, the interlocking slots being in a plane at right angles to the line of switch-rod connection.

2. In an upright switch-stand construction, the combination with a revoluble, spring-actuated, flexible toggle-crank suitably connected with switch-points, adapted for automatic use and arranged to be rotated by hand, of a main shaft secured to said toggle-crank, a jointed hand-lever secured to the shaft and arranged to interlock the toggle-crank con-

struction against revoluble movement when in position for automatic action, the hand-lever being interlocked to the supporting-standard in a plane at right angles to the line of automatic action of the toggle-crank.

3. In an upright switch-stand construction, the combination with a revoluble, spring-actuated, flexible toggle-crank suitably connected with switch-points, adapted for automatic use and also arranged to be rotated by hand, of an upright column or standard upon which the toggle-crank is mounted, said column having a flanged top provided with slots, an upright main shaft secured to the toggle-crank, and having free rotary and vertical sliding movement within said column, a retaining-spring mounted upon the main shaft between the toggle-crank and the supporting-top of the column, and a jointed hand-lever secured to the main shaft and arranged to interlock the main shaft and the flexible toggle-crank, when completely thrown and in position for automatic action, against revoluble movement, but to permit the free, vertical, sliding movement of the main shaft and the hand-lever during the automatic action.

4. The combination with the flexible toggle-crank, of an upright, hollow column, within and upon which said toggle-crank is mounted, said column having an opening in its top and an interior shoulder surrounding said opening, a sleeve located in said opening and adapted to protrude above the top of the column, said sleeve having a flange engaging the interior shoulder of the column, a shaft attached to one end member of the toggle-crank and protruding through said sleeve in which it is permitted both axial and rotary movement, a block K attached to the outer extremity of the shaft above the column, a hand-lever mounted on the block, and a spring interposed between a shoulder surrounding the lower extremity of the shaft, and the flanged sleeve near the top of the column, whereby the head-block K normally rests upon and forces said sleeve downwardly sufficiently to overcome the friction incident to the engagement of the flange of the sleeve with the top of the column during the turning of the toggle-crank and shaft by the use of the hand-lever.

5. In an upright switch-stand construction, the main supporting-standard, comprising an integral casting having the traverse base-flanges, the adjoining bored supporting-hanger, an upright cylindrical column with semicircular flanged covering, provided upon the periphery thereof with two diametrically opposite interlocking slots and upon the top thereof with suitably-disposed stops or lugs, and a raised, centrally-located bored seat and interior shoulder for supporting the main shaft, and signal-standard brackets for supporting a signal-standard shaft, one of which is provided with a semicircular locking-flange, substantially as described.

6. The combination with the upright hollow column having openings formed in its top and bottom, a flexible toggle-crank, a revoluble foot-block connected with one end member of the crank, said block engaging the opening in the base of the column, a revoluble sliding headpiece connected with the other end member of the toggle-crank, a suitable connection between the center member of the toggle-crank and the switch-point, a shaft secured to said headpiece and protruding through the opening in the top of the column, a spring surrounding the shaft and interposed between said headpiece and the top of the column, a hand-lever connected with the upper protruding extremity of said shaft and adapted to turn in a plane above the top of the column, which is provided with locking-slots for the engagement of the hand-lever.

7. In a switch-stand, the combination of an upright column, a revoluble toggle-crank arranged to be rotated by hand, a rod for connecting said crank with the switch-point, an upright main shaft secured to the toggle-crank, a jointed hand-lever secured to the upper protruding extremity of the shaft, and suitable means for locking the hand-lever to the column in a plane at right angles to the line of switch-rod connection when the toggle-crank is in either fully-thrown position.

8. In an upright automatic switch-stand construction, the combination of the main supporting-column, an upright main shaft, a hand-lever head-block, a revoluble, flexible, spring-retained toggle-crank, a constant high-tension retaining-spring interposed between the head-block and a stop on the column, and an elongated flanged sleeve, all constructed and arranged substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

DAVID H. FOREMAN.

Witnesses:
A. J. O'BRIEN,
NELLIE G. DANIELS.