

(No Model.)

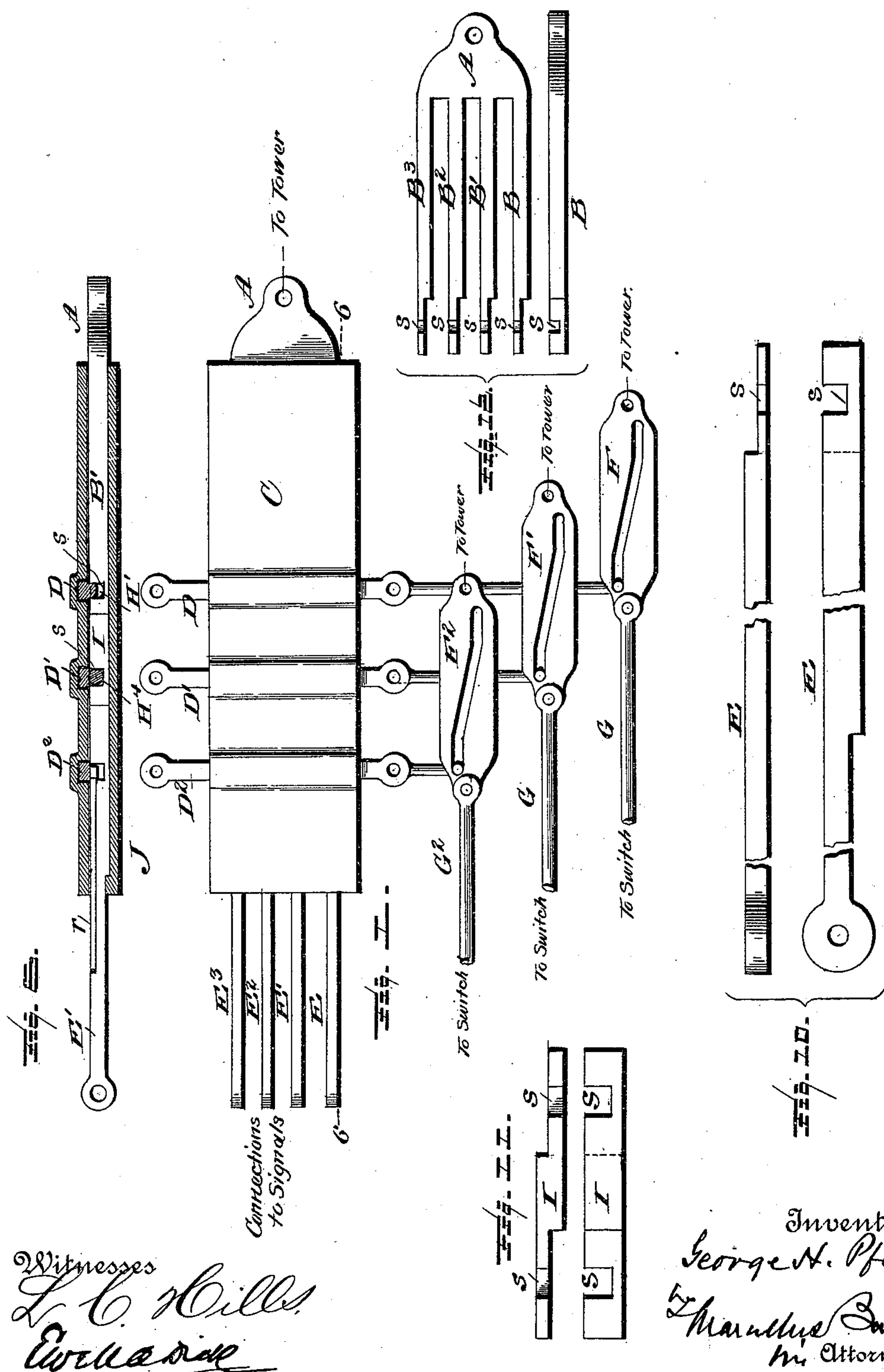
6 Sheets—Sheet 1.

G. H. PFEIL.

## SWITCH AND SIGNAL OPERATING APPARATUS.

No. 470,916.

Patented Mar. 15, 1892.



THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.)

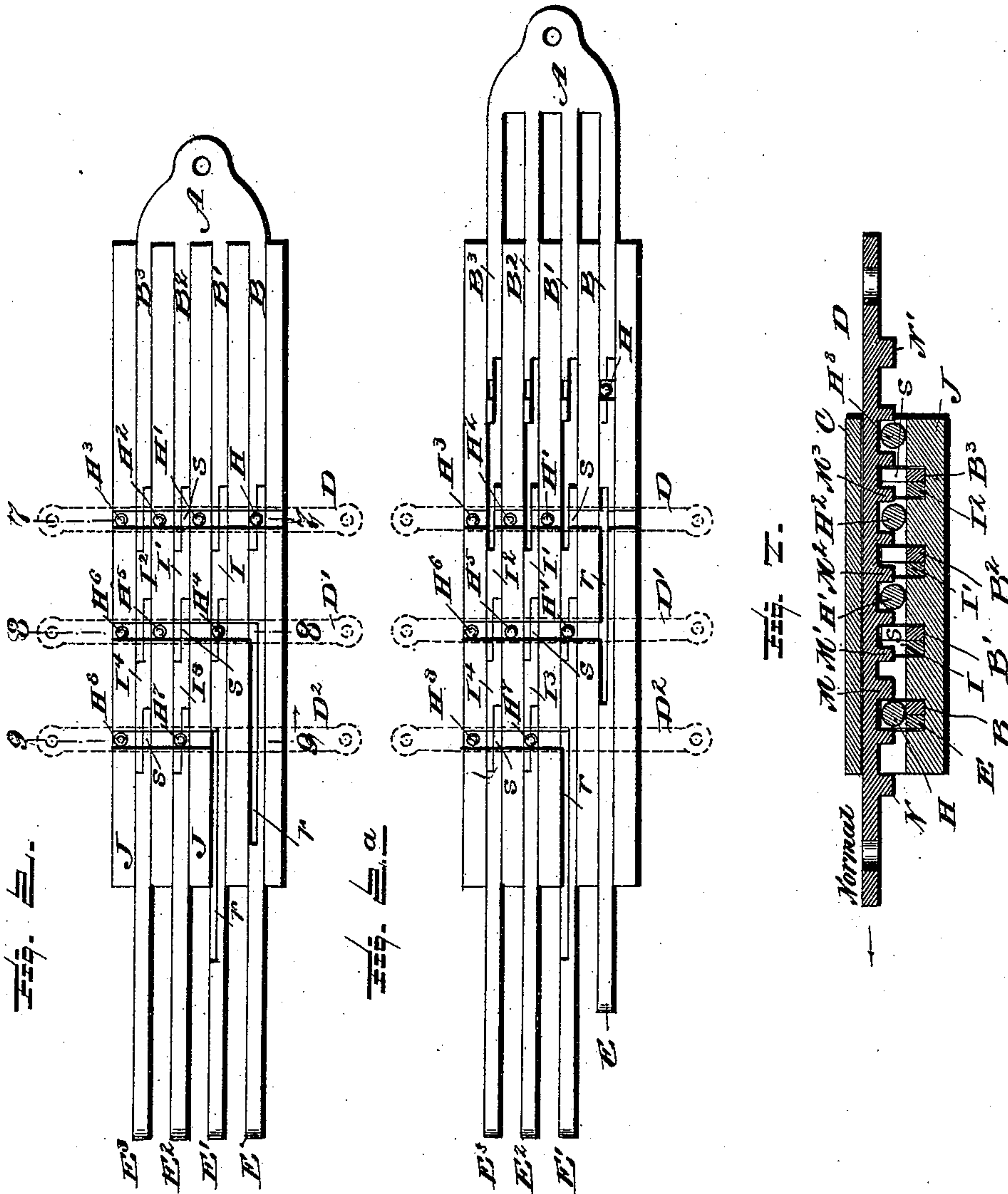
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G. H. PFEIL.

SWITCH AND SIGNAL OPERATING APPARATUS.

No. 470,916.

Patented Mar. 15, 1892.



Witnesses  
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*Edward Dick*

Inventor  
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No Model.)

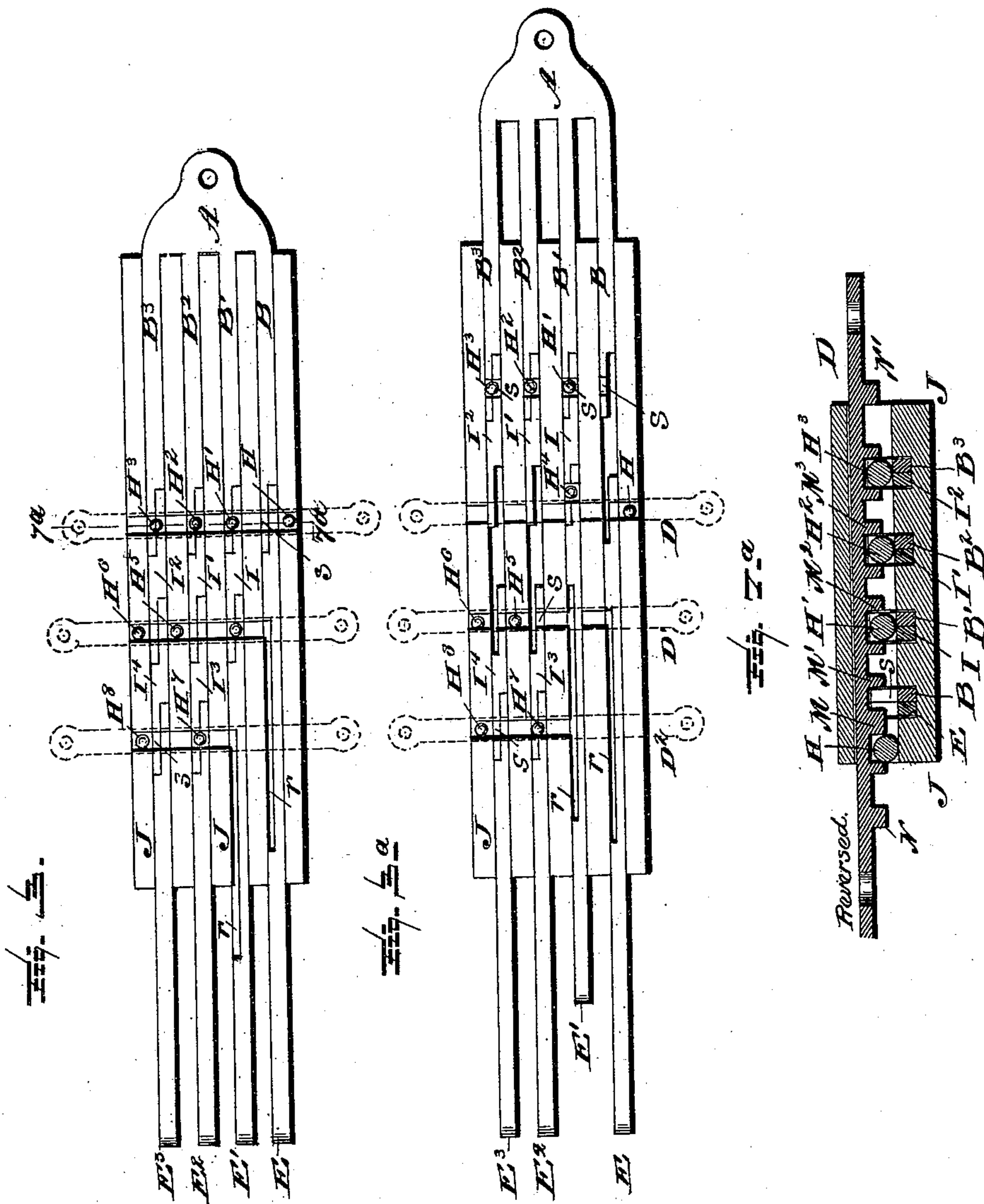
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G. H. PFEIL.

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No. 470,916.

Patented Mar. 15, 1892.



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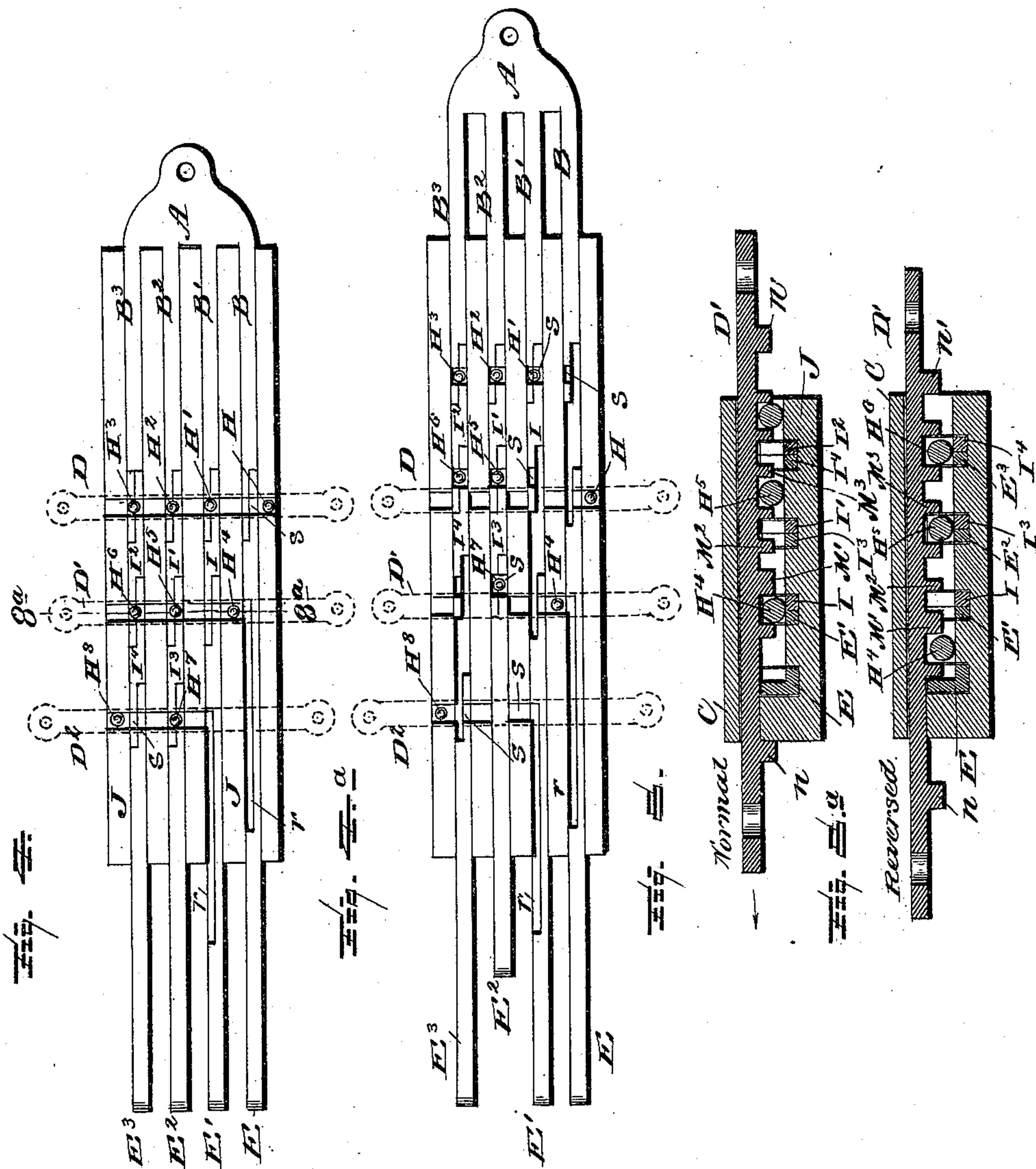
(No Model.)

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G. H. PFEIL.  
SWITCH AND SIGNAL OPERATING APPARATUS.

No. 470,916.

Patented Mar. 15, 1892.



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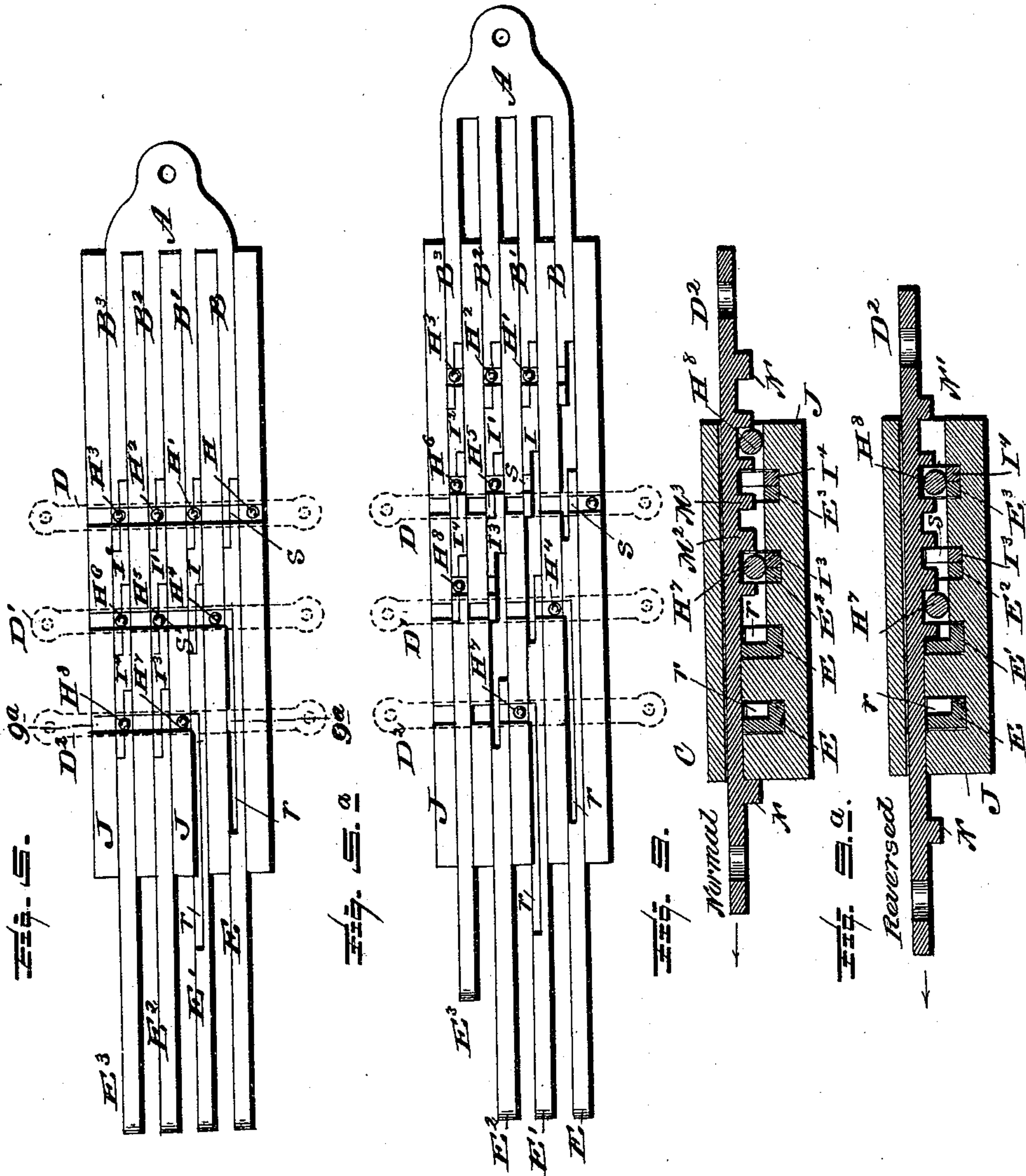
(No Model.)

6 Sheets—Sheet 5.

G. H. PFEIL.  
SWITCH AND SIGNAL OPERATING APPARATUS.

No. 470,916.

Patented Mar. 15, 1892.



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(No Model.)

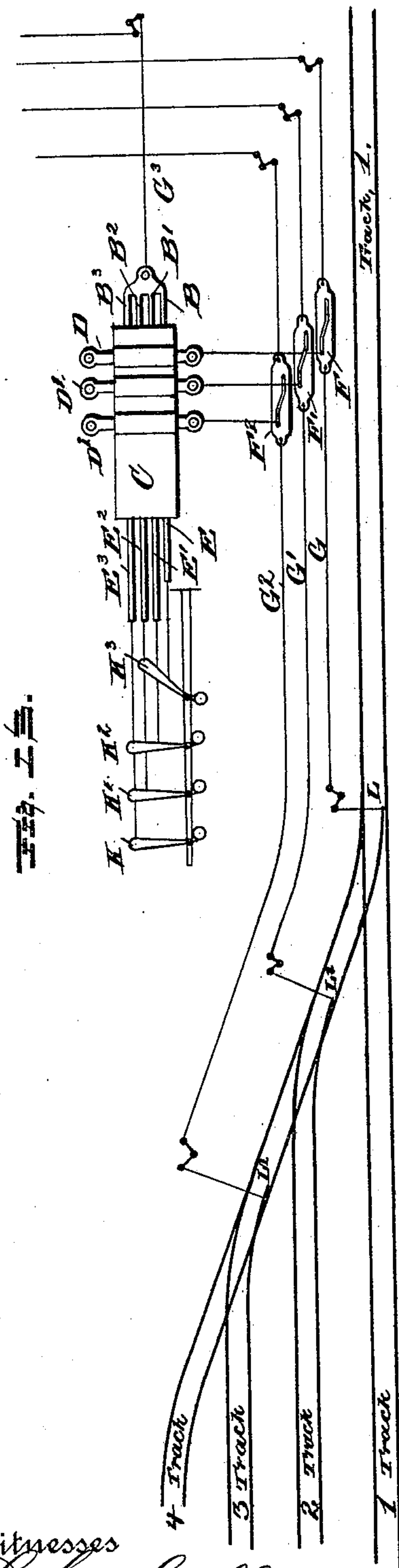
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G. H. PFEIL.

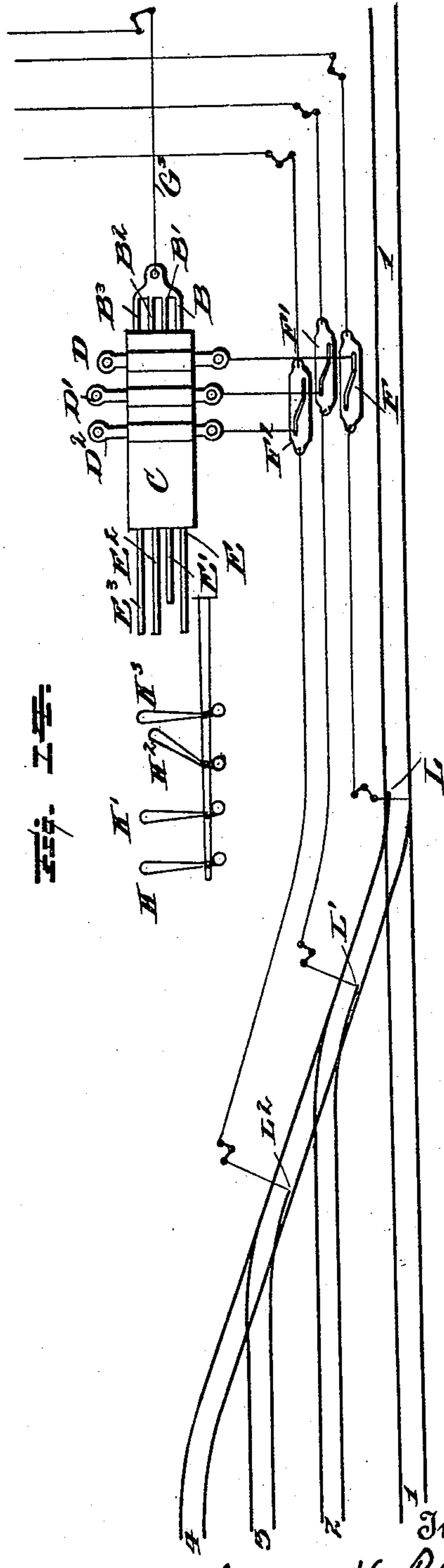
SWITCH AND SIGNAL OPERATING APPARATUS.

No. 470,916.

Patented Mar. 15, 1892.



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# UNITED STATES PATENT OFFICE.

GEORGE H. PFEIL, OF EASTON, PENNSYLVANIA, ASSIGNOR TO THE NATIONAL SWITCH AND SIGNAL COMPANY, OF SAME PLACE.

## SWITCH AND SIGNAL OPERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 470,916, dated March 15, 1892.

Application filed July 20, 1891. Serial No. 400,130. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE H. PFEIL, of Easton, in the State of Pennsylvania, have invented certain new and useful Improvements in Switch and Signal Operating Apparatus, of which the following is a specification.

My invention relates to mechanism for operating railway switches and signals. It has been designed more particularly to meet the needs of that kind of such apparatus known as "interlocking" switch and signal apparatus, and has reference in the main to that portion of said apparatus termed the "selector," which is a mechanism whereby the switch-operating devices when operated are caused to adjust the signal connections in such manner that only the signal appropriate to the route to which the switch or switches have been adjusted can be actuated, the other signal or signals under these conditions usually remaining locked against movement. Such a mechanism, broadly considered, is not new in the art. In Letters Patent No. 216,510, of June 17, 1879, for example, there is shown for this purpose an apparatus comprising two or more signal-rods (each leading to its own signal) capable both of longitudinal movement for operating signals and of lateral movement into and out of engagement with a single longitudinal shifting-bar connected to and operated by the signal-lever in the tower, this lateral movement being occasioned by the same movement which shifts the switch or switches, and a stop being provided to lock such signal rod or rods as may not be engaged with the shifting-bar. In another and subsequent plan shown in Letters Patent No. 342,911, of June 1, 1886, the signal-rods were longitudinally movable, as before; but instead of having lateral movement they were made capable of vertical movement to permit their rear ends to be lifted from or dropped into engagement with the single shifting-bar, this vertical movement downward being by gravity aided by a spring and upward being brought about by lifters, which raised all of the signal-rods from engagement with the shifting-bar except that rod which controlled the selected signal. In this instance the lifters consisted of toes or cams located underneath the signal-rods and fixed on transverse rock-

shafts, which were connected to and actuated by the switch-operating devices. In a still later apparatus shown in Letters Patent No. 415,168, of November 12, 1889, the same general plan as that last above referred to was adopted; but the lifters, instead of being fixed on transverse rock-shafts, were fastened to transverse slide-bars movable crosswise of the signal-rods and connected by slotted motion-plates, elbow-levers, or equivalent intermediaries to the switch-operating devices from which they respectively derived their movement. In all of these plans the engagement of the selected signal-rod is direct with the signal-shifting bar and some movement, either vertical or lateral, of the signal-rod other than the longitudinal movement by which it operates the signal is required in order to engage it with or disengage it from the signal-shifting bar. In still another form of apparatus illustrated in Letters Patent No. 424,485, of April 1, 1890, the arrangement of parts differs materially from the other patented devices hereinbefore referred to in that the signal-rod has no movement other than the longitudinal movement whereby it operates the signal, and the engagement of that rod with the signal-shifting bar is not direct, but indirect and through the intermediary of a clutch provided at its opposite ends with flanges, the one to engage a cross-groove in the signal-rod and the other to engage a cross-groove in the signal-shifting bar, the clutch being movable into and out of engagement with the bar and rod, and when in engaged position moving with them, and its movement for this purpose being effected by means of a transverse slide-bar on which the clutch is held and which is provided with blocks which interpose between the adjoining ends of the rod and bar when the latter are not coupled together.

My invention relates to apparatus of the general form last referred to; and it consists, mainly, in an improved arrangement of parts whereby a clutch of the kind just described is dispensed with and in lieu thereof a coupling-dog is employed, which bodily enters and is contained in a recess or pocket formed by the meeting ends of the bar and rod, which ends overlap one another and have formed in



them notches which when the ends are brought together so as to overlap match or coincide and form the recess or pocket for the reception of the dog. The dog, preferably of ball shape, is carried by a transverse slide-bar provided with ribs between which the dog is held, said ribs being also so formed that they will constitute a lock for such signal-rods as are not coupled to the shifting-bars. Each rib is so shaped and placed that when acting as a lock it will, while entered in the same recess previously occupied by the coupling-dog, come opposite to and engage only the overlapping end of the signal-rod, consequently leaving the signal-shifting bar free to move, while it at the same time positively locks the signal-rod.

In my apparatus if there be a number of signal-rods then, assuming that each signal-rod is to be capable of movement independently of the others, the single shifting-bar should be provided with a corresponding number of prongs or extensions placed each in line with and on the prolongation of its particular signal-rod.

The nature of my improvements and the manner in which the same are or may be carried into effect will be readily understood by reference to the accompanying drawings, in which—

Figure 1 is a plan of the selector complete with the indications thereon of its connections to the switch-lines, the signals, and the signal-lever in the tower. Fig. 2 is a plan of the selector with the parts in normal position and with the cap and transversely-sliding lock-bars removed. In this figure all the signal-rods are locked except the first E. Fig. 2<sup>a</sup> is a plan similar to Fig. 2, excepting that the signal-lever has been reversed and the first signal-rod has been retracted. Fig. 3 is a plan similar to Fig. 2, save that all the signal-rods are locked except the second E'. Fig. 3<sup>a</sup> is like Fig. 3, excepting that rod E' has been retracted. Fig. 4 is a similar plan to Fig. 2, excepting that all the signal-rods are locked except the third E<sup>2</sup>. Fig. 4<sup>a</sup> is the same as Fig. 4, except that the rod E<sup>2</sup> has been retracted. Fig. 5 is a similar plan to Fig. 2, except that all the signal-rods are locked except the fourth E<sup>3</sup>. Fig. 5<sup>a</sup> is the same as Fig. 5, except that the rod E<sup>3</sup> has been retracted. In the plan views, Figs. 2 to 5<sup>a</sup>, inclusive, the positions assumed by the lock-bars are represented by the dotted lines. Fig. 6 is a section on line 6 6, Fig. 1. Fig. 7 is a section on line 7 7, Fig. 2. Fig. 7<sup>a</sup> is a section on line 7<sup>a</sup> 7<sup>a</sup>, Fig. 3. Fig. 8 is a section on line 8 8, Fig. 2. Fig. 8<sup>a</sup> is a section on line 8<sup>a</sup> 8<sup>a</sup>, Fig. 4. Fig. 9 is a section on line 9 9, Fig. 2. Fig. 9<sup>a</sup> is a section on line 9<sup>a</sup> 9<sup>a</sup>, Fig. 5. Fig. 10 is respectively a plan and side elevation of one of the signal-rods, rod E. Fig. 11 is respectively a plan and side elevation of one of the coupling-bars, bar I. Fig. 12 is a plan and side elevation, respectively, of the pronged signal-shifting bar. Fig.

13 is a diagram showing the tracks, switches, signals, and operating apparatus in normal position with signals set for track 1. Fig. 14 is a similar diagram showing signals set from track 1 to track 2.

Similar letters of reference indicate corresponding parts in all the figures.

J is the selector-box, in the bottom of which are formed longitudinal grooves—in this instance four in number—for the reception and guidance of the sliding signal-rods E E' E<sup>2</sup> E<sup>3</sup>, the sliding prongs B B' B<sup>2</sup> B<sup>3</sup> of the signal-shifting bar A, and the sliding coupling-bars I I' I<sup>2</sup> I<sup>3</sup> I<sup>4</sup>, which are interposed between the ends of three of the signal-rods E' E<sup>2</sup> E<sup>3</sup> and their corresponding shifting-prongs B' B<sup>2</sup> B<sup>3</sup>. These coupling-bars at times in effect form part of the prongs, at other times form part of the several signal-rods, and again at other times serve, with the dogs, to couple the signal-rods and prongs together, according to the position of the interlocking dogs, and are introduced in order to conveniently adapt my invention to the needs of a system involving a plurality of signals. There is one coupling-bar I between the signal-rod E' and the prong B', and there is a pair of these bars I' I<sup>3</sup> or I<sup>2</sup> I<sup>4</sup> between each of the signal-rods E<sup>2</sup> or E<sup>3</sup> and its corresponding prong B<sup>2</sup> or B<sup>3</sup>. The meeting ends of all these parts—signal-rods, prongs, and coupling-bars—are laterally cut away or reduced, so that they may overlap and still, where they do overlap, just fill the guideways in the bottom of the selector-box. In their overlapping ends are formed registering slots or notches s to receive and permit the passage of the ribs on the under faces of the lock-bars, hereinafter described, as well as the dogs loosely held between said ribs. The shifting-bar A is suitably connected to the signal-lever in the tower from which all the apparatus is operated. The signal-rods are connected each to its appropriate signal.

C is the cover of the box J, in the under side of which cover are formed transverse grooves or guideways for three transverse sliding lock-bars D D' D<sup>2</sup>. These lock-bars are in line with the several series of notches or slots s in the overlapping ends of the signal-rods, coupling-bars, and shifting-prongs, and are provided on their under side with cross lugs or ribs, between which are loosely placed the coupling-dogs H to H<sup>8</sup>, inclusive, which is the number made necessary by the particular plan of construction represented in the drawings. These dogs, which may be of any suitable construction, I much prefer to make in the shape of balls, of a diameter to fit snugly but not too tightly the space included between the walls of the registering notches s at the front and rear, the walls of the grooves in the bottom at the sides, and the top of the lock-bars D, &c., above. Each ball is held between a pair of the cross-ribs on the under side of the lock-bar, the distance between these ribs being equal to the width of the guide-groove in the bottom of the selector-box.



Certain of these ribs (lettered M M' M<sup>2</sup> M<sup>3</sup>) on the several bars serve, also, as stops or locks. The others (unlettered) serve simply to compel the ball-dogs to move with the sliding lock-bars. The ribs are of such length that in the transverse sliding movement of the lock-bars they will move easily through the guideway formed by the series of registering slots or notches *s*, in connection with which they operate. It is to be noted, further, that the thickness or width of the several ribs is such that in locking each rib engages only one of the two overlapping meeting ends of the parts in which the notches *s* are located, and that the end thus engaged by the rib is the end of the part in advance of the lock-bar to which the rib pertains—that is to say, each coupling-bar or signal-rod, as the case may be, is locked at its rear end only. This will be manifest upon inspection of Figs. 6 to 9<sup>a</sup>. The lock-bars are connected by a link-and-pin connection each to its own slotted motion-plate, elbow-lever, or equivalent instrumentality F, F', or F<sup>2</sup>, which on the one hand is joined to the switch connections appropriate for the locking-bar, and on the other hand to the connections which lead to the corresponding switch-lever at the operating-tower.

N and N' are stops to limit the throw of the lock-bars.

The foregoing description, in connection with the detail drawings referred to, will suffice to acquaint those skilled in the art with the manner in which the several parts of the selector are constructed and assembled together. The ribs on the under faces of the lock-bars vary in dimensions and position on the several bars, as will be noted by reference to the cross-sections, Figs. 6 to 9<sup>a</sup>, inclusive.

The manner in which the apparatus can be used will be understood by reference to diagram, Figs. 13 and 14. In these figures, No. 1 is the main track. Nos. 2, 3, and 4 are side tracks. K K' K<sup>2</sup> K<sup>3</sup> are signal-blades. L L' L<sup>2</sup> are switches leading to tracks 2 3 4, respectively. In the normal position of parts, which is as shown in Fig. 13, the main track, or track No. 1, is clear, switch L' is set for track No. 2, and switch L<sup>2</sup> is set for track No. 3, and the selector before the signal K<sup>3</sup> is dropped stands in the position indicated in Figs. 1 and 2.

By reference to Figs. 2 and 7 it will be seen that the ball-dog H is in the pocket formed by the registering slots *s* in the overlapping ends of prong B and signal-rod E, thereby connecting the rod with the prong, while the ball-dogs H' H<sup>2</sup> H<sup>3</sup> are removed from the pockets formed by the slots or notches in the overlapping ends of I and B', I' and B<sup>2</sup>, I<sup>2</sup> and B<sup>3</sup>, respectively. Thus I I' I<sup>2</sup> are for the time being entirely disconnected from prongs B' B<sup>2</sup> B<sup>3</sup>, and as a consequence the signal-rods E' E<sup>2</sup> E<sup>3</sup>, to which these coupling-bars pertain, have no connection with the shifting-prongs and the signal-rod E only can be moved by the shifting-bar A. Not only are

the signal-rods E' E<sup>2</sup> E<sup>3</sup> disconnected, as just described, but they are also locked indirectly by resting against their coupling-bars I' I<sup>2</sup> I<sup>3</sup>, the latter being locked directly by the ribs M' M<sup>2</sup> M<sup>3</sup> of the locking-bar D, as seen in Fig. 7. In this statement no account is taken of the coupling-bars I<sup>3</sup> I<sup>4</sup>. They may be considered in this connection simply as intermediate filling-pieces. Thus all the signal-rods will be locked except rod E, which, as above described, is coupled with prong B and is free to move. Consequently when the signal-lever through the connection G<sup>3</sup> pulls on the shifting-bar A the latter will be pulled back and in so doing will retract the bar E and cause the lowering of signal K<sup>3</sup>. The parts in this position are represented in Figs. 13 and 2<sup>a</sup>. Before making any other move the shifting-bar must be returned to its normal position.

To signal a route clear from track No. 1 to track No. 2, the operation is as follows: Switch L first of all must be reversed to make a continuous track as far as switch L', (the latter, as above stated, being normally set for track No. 2.) The track is thus continuous from track No. 1 to track No. 2. This operation has affected the selector as follows: The motion of motion-plate F due to the operating mechanism of switch L has moved its locking-bar D so that the selector will stand in the position shown in Figs. 3 and 7<sup>a</sup>. By reference to these figures it will be seen that the position of all the ball-dogs is such that while signal-rod E' is connected to its prong B' of the shifting-bars all the other signal-rods are disconnected from their prongs B B<sup>2</sup> B<sup>3</sup>, and not only are disconnected, but also are locked, E being locked by the rib M on lock-bar D, as seen in Fig. 7<sup>a</sup>, and E<sup>2</sup> and E<sup>3</sup> being locked indirectly by resting or bearing against coupling-bars I<sup>3</sup> and I<sup>4</sup>, the latter being locked by ribs M<sup>2</sup> and M<sup>3</sup> on lock-bar D', Fig. 8. Thus all the signal-rods are locked except rod E', which can be retracted with shifting-bar A to cause the lowering of signal K<sup>2</sup>. The parts in this position are shown in Figs. 14, 3<sup>a</sup>, and 7<sup>a</sup>.

To signal a route clear from track No. 1 to track No. 3, the operation is as follows: Before any further move than that just described can be had the shifting-bar A must first be returned to its normal position. Then, leaving switch L and its connections in the position represented in Fig. 14, the switch L' by its connection G' must be reversed in order to make a continuous track as far as switch L<sup>2</sup>, and the latter being normally set for track No. 3, the track is thus continuous from track No. 1 to track No. 3. These operations have affected the selector as follows: The motion-plate F' of the operating mechanism of switch L' has moved lock-bar D' so that the selector now stands as shown in Fig. 4 and in the cross-sections appropriate to that figure. By reference to these figures it will be seen that the position of all the ball-dogs is now such that



signal-rods  $E E' E^3$  are disconnected from their prongs of the shifting-bar  $A$  and also are locked, rod  $E$  by rib  $M$  on lock-bar  $D$ , Fig. 7<sup>a</sup>, rod  $E'$  by rib  $M'$  on lock-bar  $D'$ , Fig. 8<sup>a</sup>, and rod  $E^3$  indirectly by resting against coupling-bar  $I^4$ , the latter being locked by rib  $M^3$  on lock-bar  $D^3$ , Fig. 9. Only the signal-rod  $E^2$  is unlocked and connected up to its prong  $B^2$  of the shifting-bar. Therefore when the shifting-bar is drawn back it will retract with it the signal-rod  $E^2$ , with the effect of lowering the signal-blade  $K'$ , with which said rod is connected, thus indicating a clear track from track No. 1 to track No. 3. The selector in this position will appear as in Fig. 4<sup>a</sup>. Before making any other move the signal-shifting bar  $A$  must of course be returned to normal position.

To signal a clear track from track No. 1 to track No. 4, we must superadd to the foregoing series of operations the reversal of the switch  $L^2$ , whose operating mechanism is connected to the lock-bar  $D^2$  of the selector. The effect of this will be to disconnect and lock all of the signal-rods except rod  $E^3$ , as indicated in Fig. 5. The signal-rod is then retracted to operate its signal  $K$ , and in this position the parts of the selector are seen in Fig. 5<sup>a</sup>.

The foregoing is sufficient to indicate the capabilities and mode of operation of the apparatus.

It may be here remarked that while I have shown the ball-dog as applied to couple the notched meeting ends of a signal-shifting bar and signal-rod, yet the same coupling device can be used for coupling together the meeting ends of bars or rods for other purposes, and I wish to be understood as intending to embrace such use or application in my claims.

In conclusion I would say that I do not desire to be understood as restricting myself to the particular details herein described in illustration of my invention, for manifestly the same can be considerably varied in sundry particulars without departure from the invention; but,

Having described my improvements and the best way now known to me of carrying the same into effect, what I consider herein to be new and of my own invention is—

1. In interlocking switch and signal mechanism, the combination, with a longitudinally-movable signal-shifting bar and a longitudinally-movable signal-rod provided with overlapping notched meeting ends, of a coupling-dog movable into and out of the recess or pocket formed by the matching notches of the said overlapping ends, substantially as and for the purpose hereinbefore set forth.

2. The combination, with a signal-shifting bar, a signal-rod, and one or more intermediate coupling-bars, all having overlapping notched meeting ends, of coupling-dogs movable into and out of the recesses or pockets formed by the matching notches of the said overlapping ends for the purpose of connecting and disconnecting the said signal-shifting bar, coupling bar or bars, and signal-rod, substantially as hereinbefore set forth.

3. The combination, with a longitudinally-movable signal-shifting bar and a longitudinally-movable signal-rod provided with overlapping notched meeting ends, of a coupling-dog movable into and out of the recess or pocket formed by the matching notches of said overlapping ends, a transverse slide-bar carrying said dog, and a locking-rib on said slide-bar, which when the coupling-dog is out of coupling position enters the recess or pocket formerly occupied by the dog and engages the signal-rod only, substantially as and for the purposes hereinbefore set forth.

4. The combination, with the series of independently-movable signal-rods, the single shifting-bar provided with prongs in number corresponding to the signal-rods, and the intermediate coupling-bars, said shifting-prongs, coupling-bars, and signal-rods having overlapping notched meeting ends, of coupling-dogs movable into and out of the recesses or pockets formed by the matching-notches of said meeting ends, the series of transverse sliding bars whereby the dogs are moved into and out of coupling position, and locking-ribs on said slide-bars, arranged and adapted to enter such recesses or pockets as are unoccupied by the coupling-dogs and to engage the overlapping ends of those parts only which are in advance, substantially as hereinbefore set forth.

5. The combination of a longitudinally-movable shifting-bar, an independent longitudinally-movable rod to be operated thereby, said bar and rod having overlapping notched meeting ends, the ball-dog for coupling together said parts by entering the registering notches of their meeting ends, and means for moving said ball-dog into and out of coupling position, substantially as and for the purposes hereinbefore set forth.

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

GEO. H. PFEIL.

Witnesses:

T. E. STEEKLE,  
J. W. LATTIG.