

(No Model.)

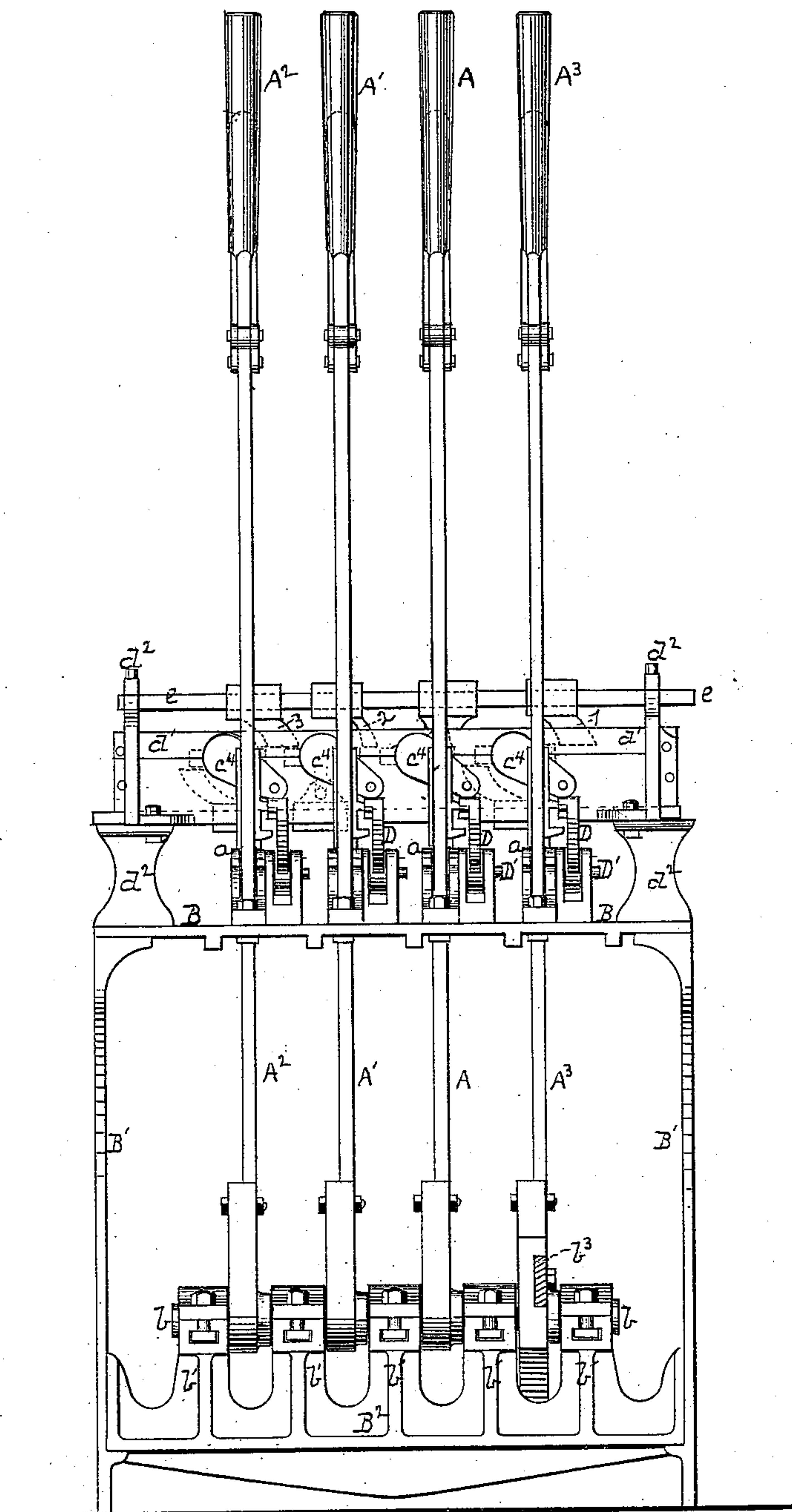
3 Sheets—Sheet 1.

J. SAXBY.

Locking Apparatus for Switches and Signals.

No. 230,200.

Patented July 20, 1880.



*Witnesses*  
*R. H. Whittlesey*  
*C. L. Parker*

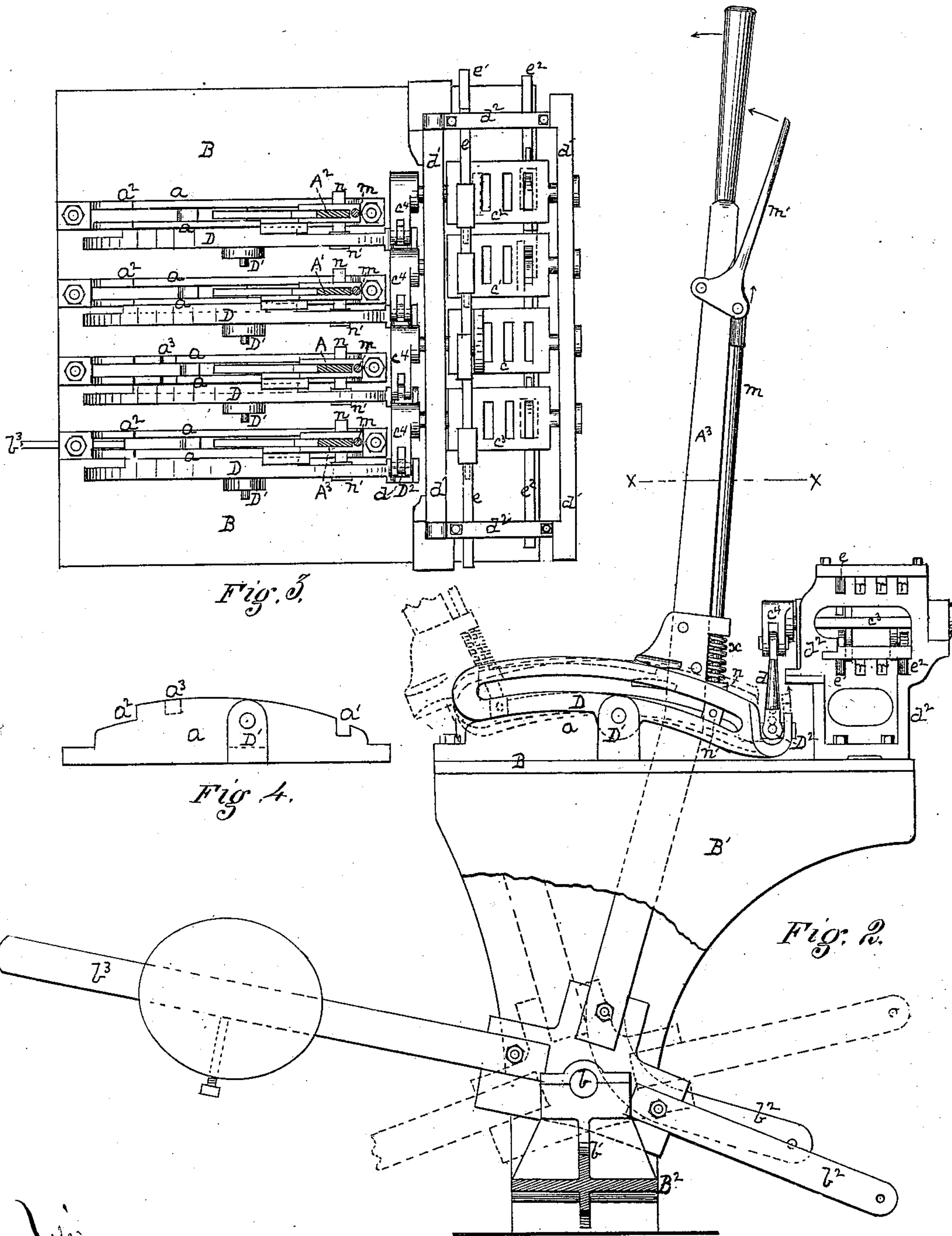
*Fig. 1.*  
*Inventor* *John Saxby*  
*By Attorney* *George H. Christy*

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3 Sheets—Sheet 3.

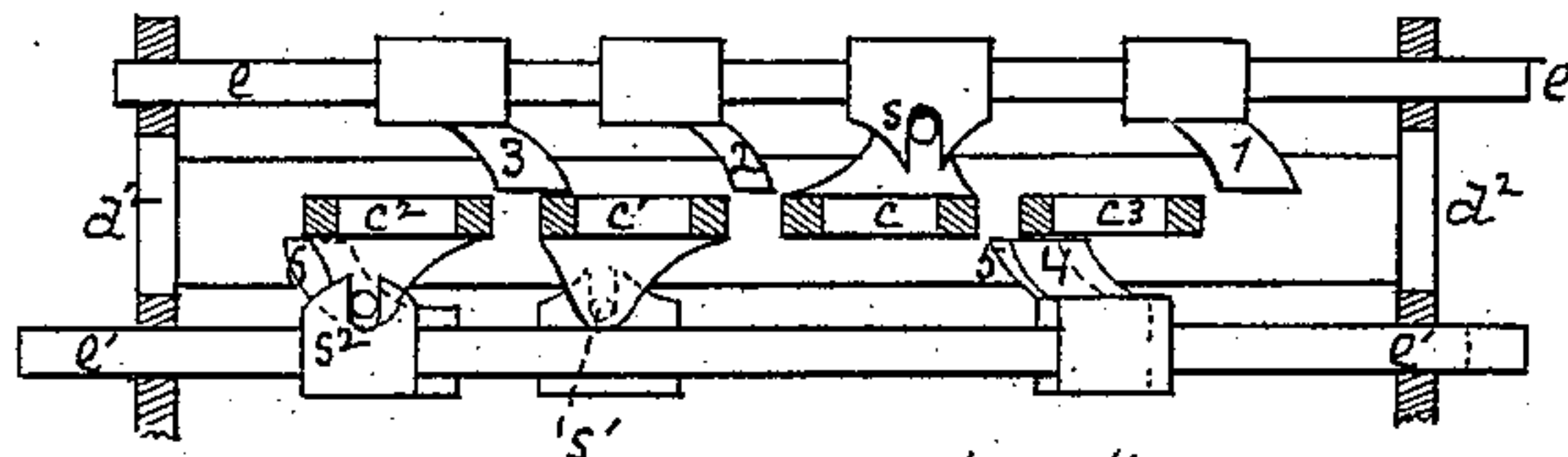


Fig. 5.

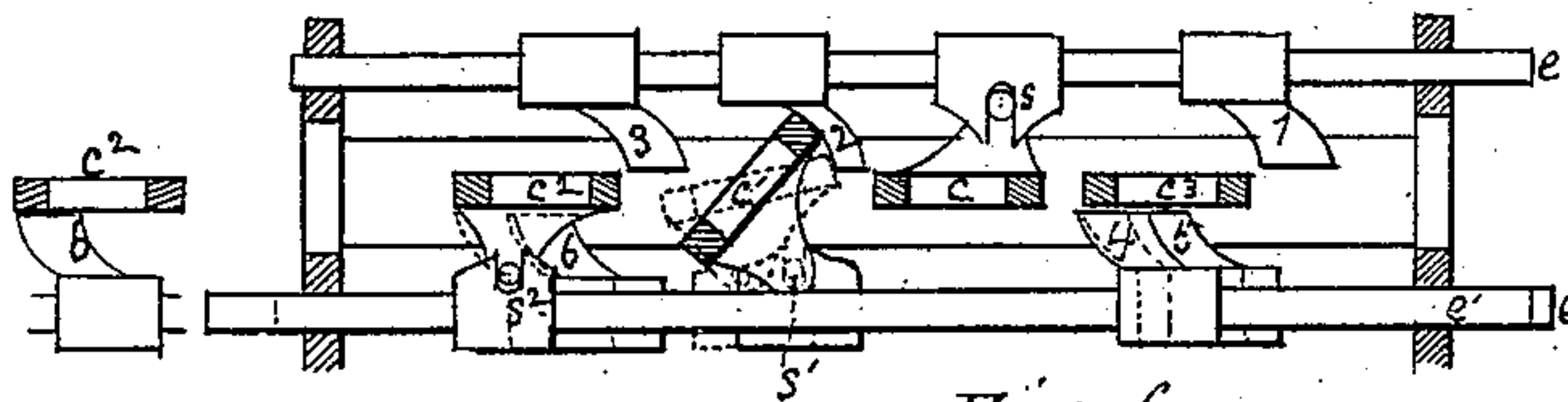


Fig. 6.

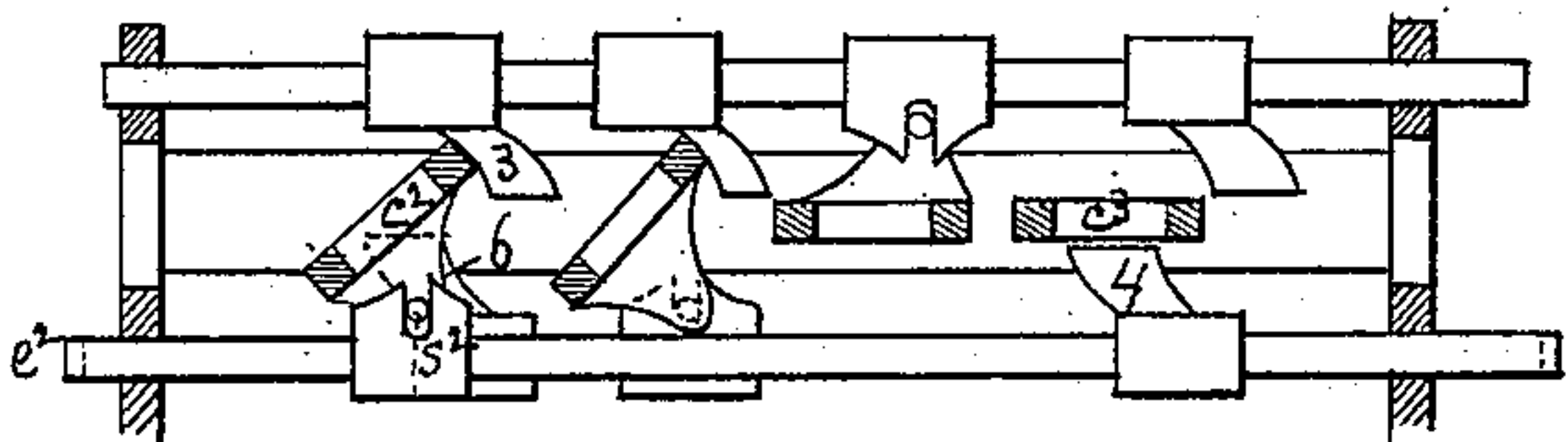


Fig. 7.

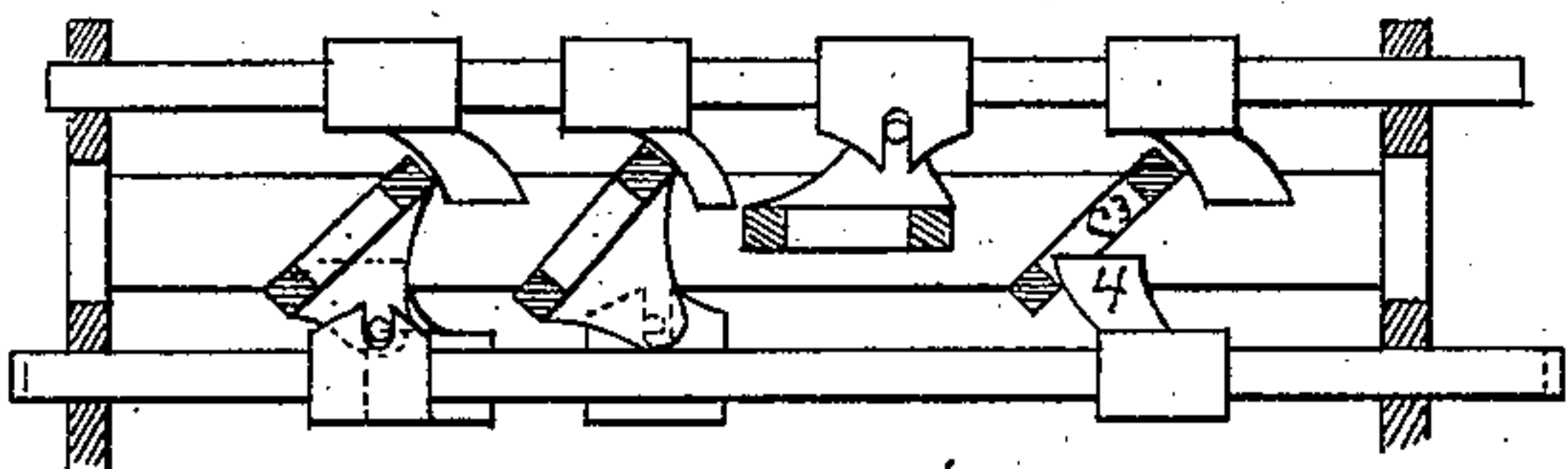


Fig. 8.

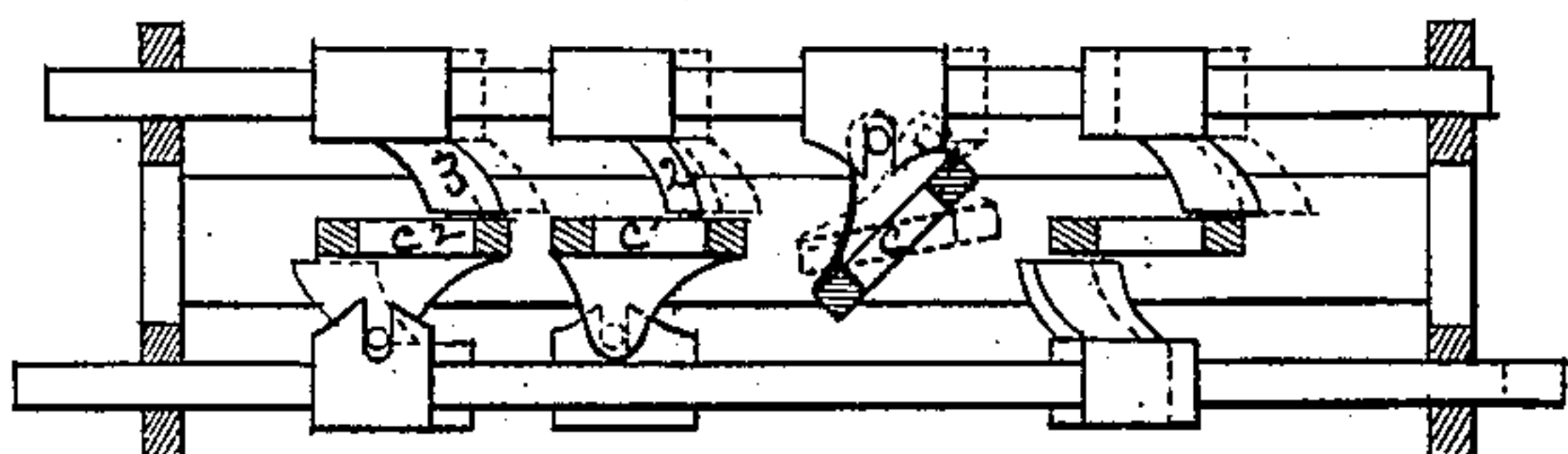


Fig. 9.

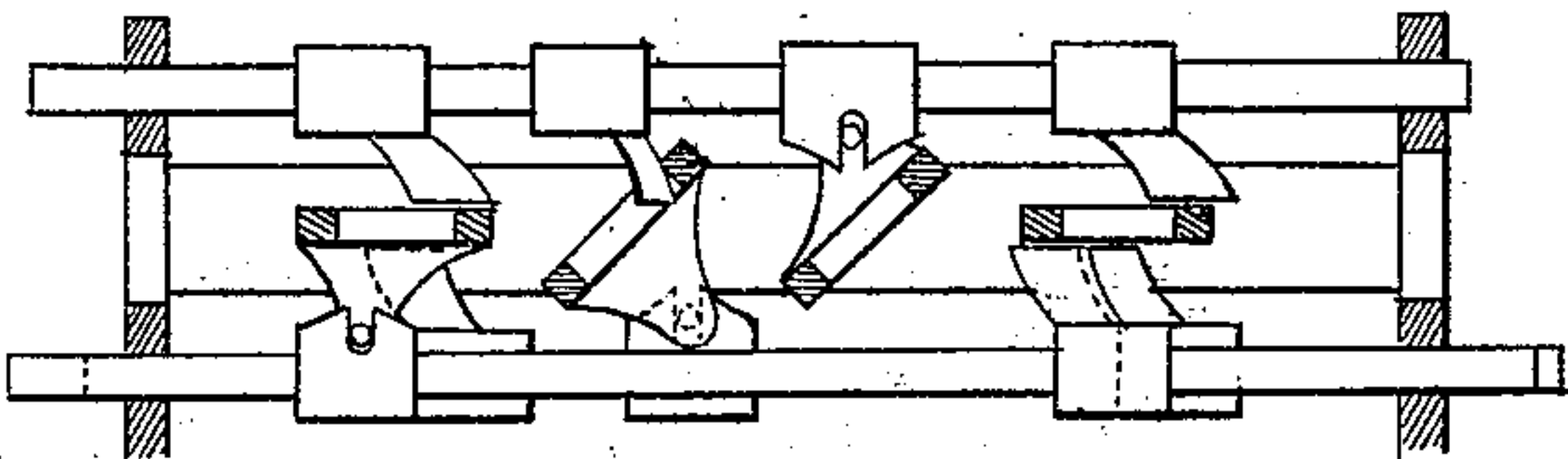
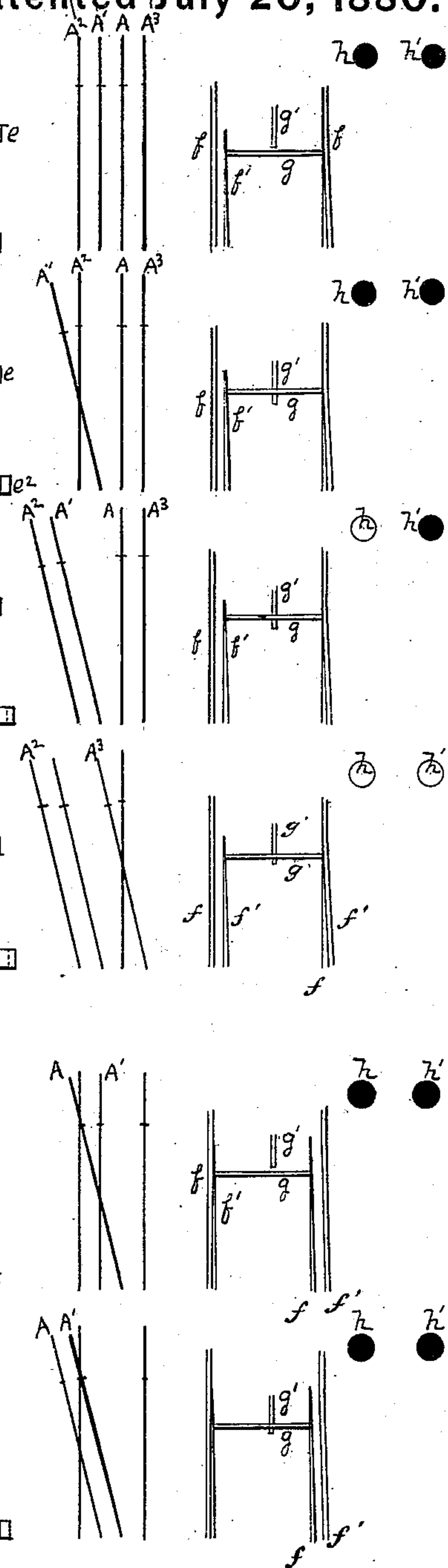


Fig. 10.

home seg. h  
locking  
switch  
dist. seg.



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# UNITED STATES PATENT OFFICE.

JOHN SAXBY, OF KILBURN, ENGLAND, ASSIGNOR TO TOUCEY & BUCHANAN  
INTERLOCKING SWITCH COMPANY, OF HARRISBURG, PA.

## LOCKING APPARATUS FOR SWITCHES AND SIGNALS.

SPECIFICATION forming part of Letters Patent No. 230,200, dated July 20, 1880.

Application filed March 29, 1880. (No model.) Patented in England January 23, 1874.

*To all whom it may concern:*

Be it known that I, JOHN SAXBY, of Canterbury Road, Kilburn, in the county of Middlesex, England, railway-signal engineer, have  
5 invented or discovered a new and useful Improvement in Locking Apparatus for Switches and Signals; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the  
10 accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1, Sheet 1, is a front elevation of so much of my improved apparatus as is necessary to illustrate the present invention. Fig.  
15 2, Sheet 2, is an elevation of the same. Fig. 3 is a top or plan view, with so much of the apparatus removed as lies above the plane of the line  $x x$  of Fig. 2. Fig. 4 is a detached  
20 side view of one of the notched or recessed quadrants which I employ, and Figs. 5 to 10, Sheet 3, illustrate at the right hand, by outline diagrams, the different positions of levers, signals, and switches, and at the left, by section and elevation, the positions of the interlocking dogs and flops or rockers corresponding thereto, the flops or rockers being shown  
25 in transverse section, and the dogs and dog-bars in elevation.

My present invention relates to a system of interlocking switch and signal apparatus in which two or more switch and signal connections are operated by one operator from a single standpoint, as in a cabin conveniently situated, and in which every signal and switch  
35 may be locked, so far as may be necessary for purposes of safety, when once they are properly set for the passage of a train in any desired direction, or on any one of two or more  
40 tracks or connections, and for stopping all other trains, and can be conveniently unlocked for any desired change of switch or track connections, and for a corresponding change of signals, and after this is effected can be again  
45 locked. It is also generally a characteristic feature of this system that the setting of the proper signal or signals at "safety" for the movement of a train can be effected when, and only when, the switches or track-connections  
50 are properly adjusted for such movement, and

also when all signals which ought to be at "danger" are so set. Then the shifting of the signals for the movement of the train effects the locking of the switch, and the latter cannot be unlocked preparatory to the making of another  
55 line of track-connection until such signal has been set at "danger," so as properly to guard the track. Hence this system includes one or more switch-levers and connections from the position of the operator to the switch or switches;  
60 also one or more signal-levers with connections to the signal or signals; and in some combinations, or for some purposes, one or more locking-levers are to be added. But, for the purposes of the present invention I have deemed  
65 it necessary to show only a four-lever machine, one lever, A, being a switch-lever, one lever, A', being a locking-lever, one lever, A<sup>2</sup>, being a signal-lever for actuating a home-signal, by which I mean a signal comparatively near to,  
70 but at the usual distance from the switch which it is more immediately designed to guard, and a fourth lever, A<sup>3</sup>, being designed to actuate a distant signal on the main track, whereby to guard the entire system of switches and moving  
75 trains thereon or near thereto, as against danger from an approaching train moving at a high speed; and under the term "train" as used herein, I include detached locomotives, cars, switching-engines, and moving parts of  
80 trains.

The present invention is directed to certain improvements in the construction of such apparatus, and in the combinations of devices by means of which such apparatus is the better adapted for doing its work.

The apparatus is mounted on any suitable frame-work, which, for convenience, is here represented as consisting of a table, B, standards B', a lower cross-bar, B<sup>2</sup>, the latter having  
90 raised plumber-blocks b', on which to support in suitable boxes the axial or fulcrum bearings b of the levers A to A<sup>3</sup>. Each lever has an arm, b<sup>2</sup>, by means of which connection is made, by bell-crank levers, gas-pipe, or in other  
95 suitable way, with the switch, signal, or locking-bolt, as the case may be, which is to be operated thereby, and in cases where, as in distant signals, a considerable force may be required to move the lever in one direction, I  
100



sometimes provide for counterbalancing the resistance by the use of a weighted arm,  $b^3$ , as shown in Fig. 2. The levers project up through slits in the table B, to a height convenient for their manipulation by an operator, who stands in front, (by which I mean to the left of Fig. 2,) and each lever terminates in the usual handle.

On one or both sides of each slit in the table is a notched or recessed quadrant,  $a$ , the upper edge of which has a radius of curvature measured from the fulcrum-point  $b$ . At the proper points for the ends of the forward and back strokes or motions of the levers I make in each quadrant notches or recesses  $a' a^2$ , which ordinarily are in the same position in all the quadrants, except in the switch-lever quadrant, where I find that a shorter range or length of motion will do. Hence in such quadrant I make the front recess a little nearer the center—say at  $a^3$ . On one side of each quadrant, whether single or double, and at a point,  $D'$ , at or about midway between the extreme points of the throw of the levers, I pivot a slotted link,  $D$ , and to the back end of such link, by any suitable swinging joint,  $D^2$ , I attach the end of a connecting-rod,  $d$ , which latter, at its other end, is similarly connected to the crank-arm  $c^4$  of one of a series of flops or rockers,  $c c' c^2 c^3$ . These flops are journaled in suitable bearings in bars  $d'$ , which latter are supported in end frames,  $d^2$ , resting on and firmly secured to the table B. In boxes or closed recesses  $r$ , made in such end frames, I arrange a series of two or more longitudinally-moving dog-bars,  $e e' e^2$ .

In the four-lever machine shown and described only three such dog-bars are necessary, and the additional boxes are shown simply as places where additional bars may be added in larger machines. Each dog-bar has affixed thereon, by a riveted socket, as shown, or in other suitable way, one or more dogs, 1 2 3, &c.

The flops  $c-c^3$  are slotted or recessed, as shown in Fig. 3 and Figs. 5-10, and the dogs of each bar come, by preference, in the vertical plane of a line, row, or series of the slots, and the dogs and flops are so shaped and proportioned that the flops may be held horizontally, as shown in Fig. 5, and prevented from rotating or flopping into inclined positions, as shown in Figs. 6 to 10, by the engagement of the foot or end of the dog with a longitudinal side bar of a flop, when the dogs are in proper position for that purpose; or the dogs being shifted one way by a longitudinal movement of a bar or bars, the flops may be rotated up under the dogs, as shown in Figs. 6 to 8; or, again, the dogs being shifted in the other direction, the flops may be turned up over the dogs, the dogs for that purpose entering the slits or recesses in the flops, as shown in Figs. 8 and 10; or some flops may pass over one dog and under another, when one dog is above and another below. The described movement of the

dog-bars is effected by the same motion which rotates the flops, some one of the flops being connected with each bar by a universal or other suitable joint, as shown at  $s s' s^2$ .

Returning, now, to the movements of the levers, the drawings illustrate what has been known as "preliminary interlocking," by which is meant a shifting of a certain part of the interlocking devices, or a partial shifting of the interlocking devices, by the attachments of one lever, and before said lever begins its stroke, whereby one or more of the other levers are sufficiently locked to prevent their being shifted, the completion of the interlocking motion being effected at the end of the motion or throw of the first lever. For this purpose a spring catch-rod,  $m$ , is added to each lever, with its handle  $m'$  pivoted to the lever in such position that the switchman may grasp both handles at the same time.

The lower end of each catch-rod carries a catch,  $n$ , of proper size and form to fill neatly the recesses  $a' a^2$  of the quadrant  $a$ , and a wrist,  $n'$ , projects from the side of the catch-rod, and plays neatly and closely in the slot of the link.

The catch-rod has a sufficient range of motion in the direction of its length whereby to raise the back end of the link  $D$  through about one-half of its proper motion, more or less, the link  $D$  turning on its pivot. This works the connecting-rod  $d$  and crank  $c^4$ , and partially rotates the corresponding flop and gives an initial motion to the dog-bar connected therewith, so as to effect what is called "preliminary interlocking;" but, passing this for the present, the switchman, having raised the catch  $n$  out of its recess in the quadrant, draws the lever over until the catch  $n$  comes opposite the proper recess in the other end of the quadrant, and the spring  $x$  then forces the catch down into the recess, and in doing so, acting through the wrist  $n'$ , completes the stroke of the link, and gives to the corresponding flop and dog-bar their full motion.

In Fig. 2 I have shown in full lines one position of the link at the end of a lever-stroke, and by outside dotted lines its position at the other end of the lever-stroke, and also, by intermediate dotted lines, its position in preliminary interlocking.

The operation of the devices thus described will be understood on reference to Sheet 3. In the outline or diagram figures shown on this sheet the lines indicating levers are lettered as already described. A main line of track is represented at  $f$ , a switch at  $f'$ , a cross-bar connecting the switch-rails at  $g$ , the same having a hole or holes in it, so that it may be locked or unlocked by the use of an endwise-moving bolt,  $g'$ . A home-signal is represented by the disk  $h$ , and a distant signal by  $h'$ . The presence of the usual connections is assumed.

Starting with the devices in the position shown in Fig. 5, (all levers being back,) the switch-bolt  $g$  withdrawn, and both signals at



"danger," I will suppose that it be desired to pass a train over the main line. The switchman first pulls forward the locking-lever A', which throws the bolt  $g'$  and locks the switch in position, as shown in Fig. 6. In doing this he turns the flop  $c'$  up behind the dog 2, and as this dog 2 is on the dog-bar  $e$ , and as this bar receives its motion from the switch-lever A, through its universal-joint connection  $s$  with the flop  $c$ , it necessarily follows that the switch-lever A is thereby locked in position. Also, the movement of the flop  $c'$ , through its joint-connection  $s'$ , with the dog-bar  $e^2$ , shifts the dogs 5 and 6, which are on the bar  $e^2$ , to a position opposite slots in the corresponding flops, so that thereby the flop  $c^2$  and its lever A<sup>2</sup> and the home-signal  $h$  are entirely unlocked, and the flop  $c^3$  and its lever A<sup>3</sup> are partly so; but both the latter remain locked, as also the distant signal  $h'$ , by means of the dog 4 on the dog-bar  $e'$ , the latter being connected by a universal joint, as shown at  $s^2$ , with the flop  $c^2$ , which receives its motion from the home-signal lever A<sup>2</sup>. The switchman then draws forward the home-signal lever A<sup>2</sup> and exposes a home safety-signal,  $h$ , and brings the devices to the position shown in Fig. 7. In so doing he rotates the flop  $c^2$  up behind the dog 3 and down over a dog, 6, which is on the farther dog-bar  $e^2$ . This motion still further locks the dog-bar  $e$ , but, acting through the universal joint  $s^2$ , shifts the dog-bar  $e'$  to the right sufficiently far to bring the dog 4, which is thereon, opposite to one of the slots of the flop  $c^3$ . The flop  $c^3$  is thus unlocked, and with it the distant-signal lever A<sup>3</sup>. The switchman then pulls the latter forward, which has the effect to rotate the flop  $c^3$  to the position shown in Fig. 8, and so as to engage the dog 4, and by doing so lock the home-signal lever A<sup>2</sup>, and also to display a distant safety-signal,  $h'$ . The main line is then open, and switches and signals are all locked except the distant signal  $h'$ , and the first step in making any change of any kind is by going backward on the same movements to change the distant signal  $h'$  to "danger," which guards the switch and unlocks the home-signal. Pushing back the lever A<sup>2</sup> reverses the home-signal  $h$ , sets it at "danger," locks the distant signal at "danger," and unlocks the locking-lever A'. Reversing this withdraws the bolt  $g'$  and unlocks the switch and switch-lever. Then, by pulling the switch-lever A forward, the devices are brought to the position shown in Fig. 9, in which the switch is set to the siding, and the flop  $c$  being rotated, the dog 2 is shifted to a position opposite one of the slots of the flop  $c'$ , and the dog 3 is brought over the side bar of the flop  $c^2$ , as a result of which the locking-lever A', which, before any operation of the lever A or its catch-rod, was unlocked, but was locked by the first movement of said catch during the throw of said lever, is by the final movement of said catch unlocked and the home-signal lever is locked. Drawing the

locking-lever A' forward then results in throwing the bolt  $g'$  so as to lock the switch, as in Fig. 10, and at the same time leaves the home and distant signals locked at "danger," so that a train which, coming in, is to take the switch, will be brought in by special signals, or the lantern-signals usually employed.

With this description of the construction and operation of the devices shown the mechanic skilled in the art will readily understand how to adapt the same elements of invention as are herein claimed to other and larger or smaller machines by properly varying, as the work to be done may require, the number and arrangement of the levers, flops, dogs, dog-bars, and connections, increasing the length of the dog-bars, if necessary. In these respects I do not limit myself in my present invention, but include herein the features of invention herein claimed, whether applied to a large or to a small machine; but it should be stated that the peculiar switch-lock described by lever A', sliding bolt  $g'$ , and cross-bar  $g$ , forms of itself no part of the present invention, that being the invention of another.

The preliminary locking above referred to differs from the complete locking described, chiefly in the fact that it is performed before the lever begins its stroke, so that, even if through carelessness or haste the proper stroke of the lever is not completed, no other lever except the proper one can be shifted, and in most cases the proper lever to be moved next cannot be shifted, as the dogs are, by preference, so made and arranged that, though the half or partial motion given in preliminary locking will lock all levers that ought to be locked, it will not fully unlock the lever next to be moved; so that for this latter purpose a full stroke of the unlocking lever will be requisite. This I have illustrated in Fig. 6, where the flop  $c'$  is shown by dotted lines in the preliminary locking position, or at about half-stroke; but in coming to this position it, by its joint  $s'$ , shifted the dog-bar  $e^2$  through but a part of its entire motion, and has not carried the dog 6 clear of the side bar of the flop  $c^2$ , the position of the latter relative to its flop, in this preliminary locking, being shown in the small detached view to the left of Fig. 6. A like feature of operation is also illustrated by dotted lines in Fig. 9.

From this and the previous description the positions and functions of the other flops and dogs will be readily made out by those skilled in the art.

I claim herein as my invention—

1. In an interlocking switch and signal apparatus, the combination of a series of slotted flops, a series of dogs with or on which to interlock the flops, and a preliminary shifting catch-rod and pivoted link, D, by which to give to the slotted flops a partial rotary motion in advance of the motion of the levers, substantially as set forth.

2. In combination with the pivoted link D



and connections, thence to the operating-lever, whereby the link shall be partially shifted in advance of the motion of the lever, a slot-  
5 ted flop adapted to receive a partial and a separate final throw from said link, and adapted to pass under or over or stand clear of the engaging-dogs, substantially as set forth.

3. The combination of lever, catch-rod, and pivoted link D with the flop and dog-bar by  
10 means of a single connection, whereby both

the flop and dog-bar shall be simultaneously moved by the catch-rod or lever, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JOHN SAXBY.

Witnesses:

CHARLES DENTON ABEL,  
OLIVER IMRAY.