(No Model.)

3 Sheets—Sheet 1.

H. BEZER & A. H. JOHNSON.

SIGNALING SYSTEM.

No. 552,093. Patented Dec. 31, 1895.

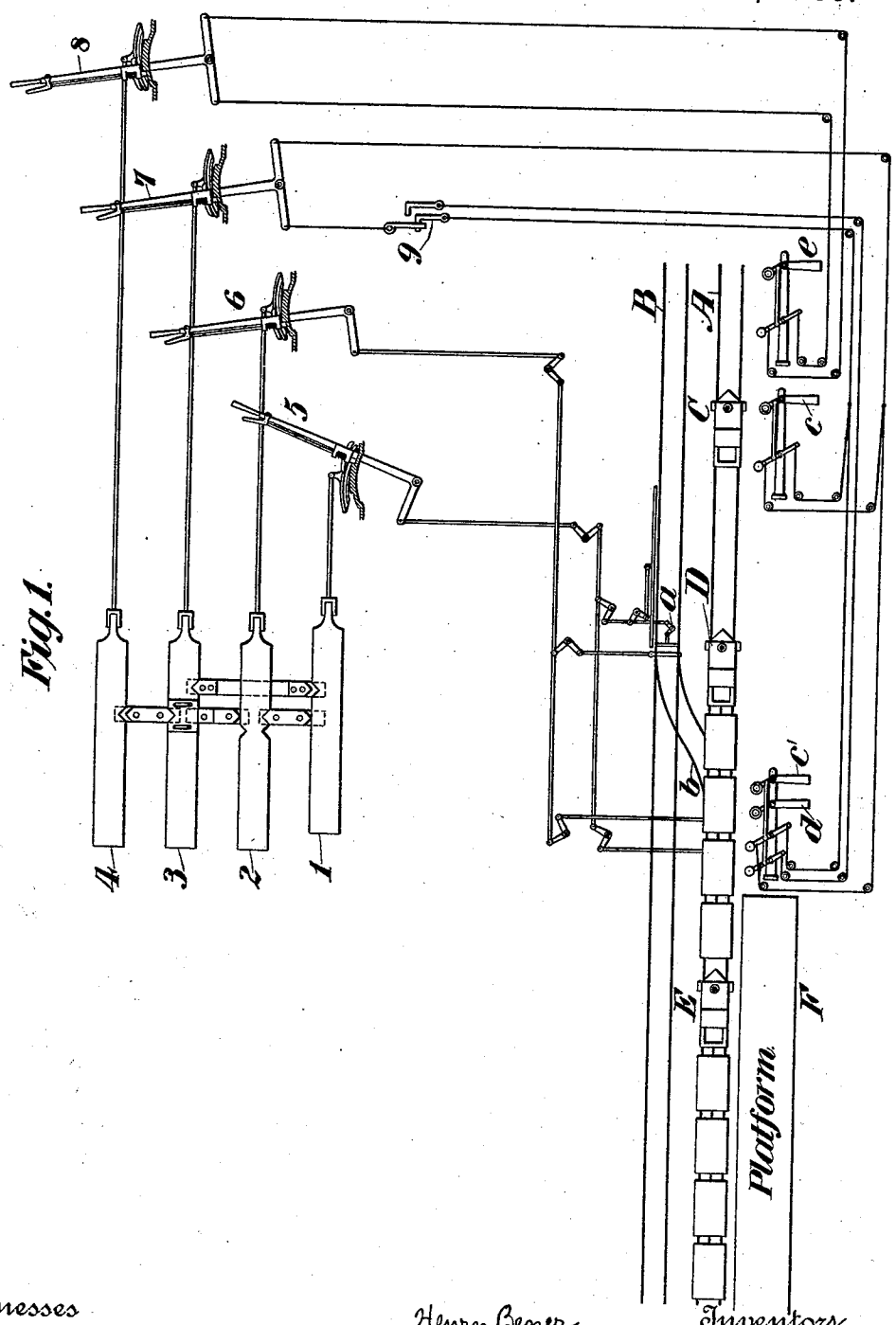

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

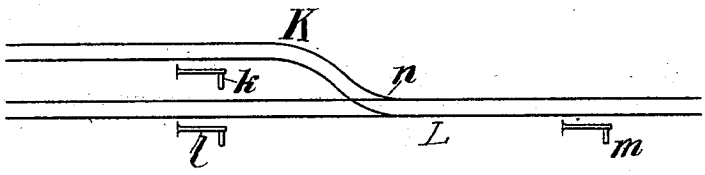

Fig. 3a

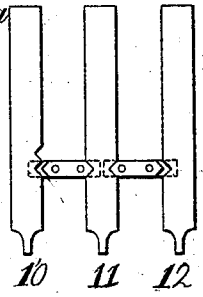

Fig. 2.

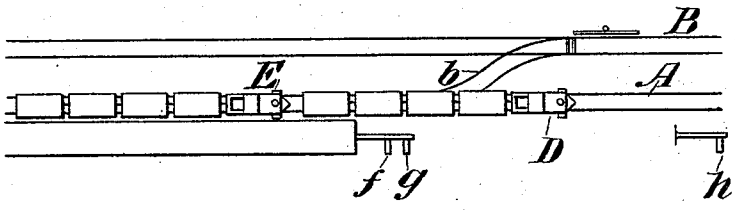

Fig. 2a

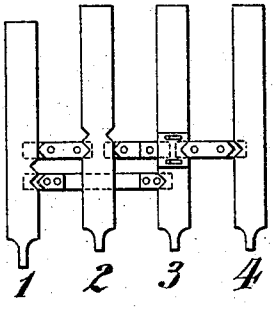

Fig. 4

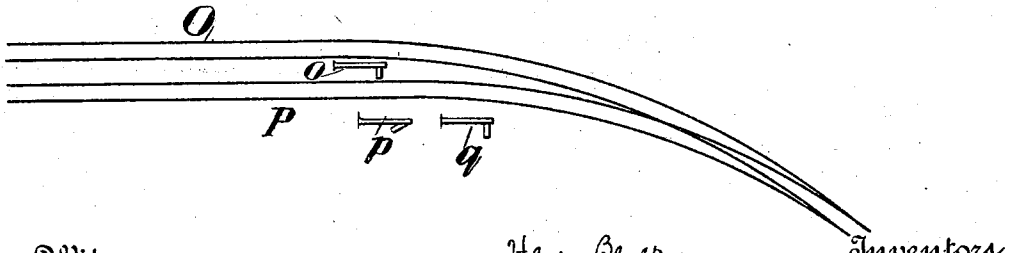

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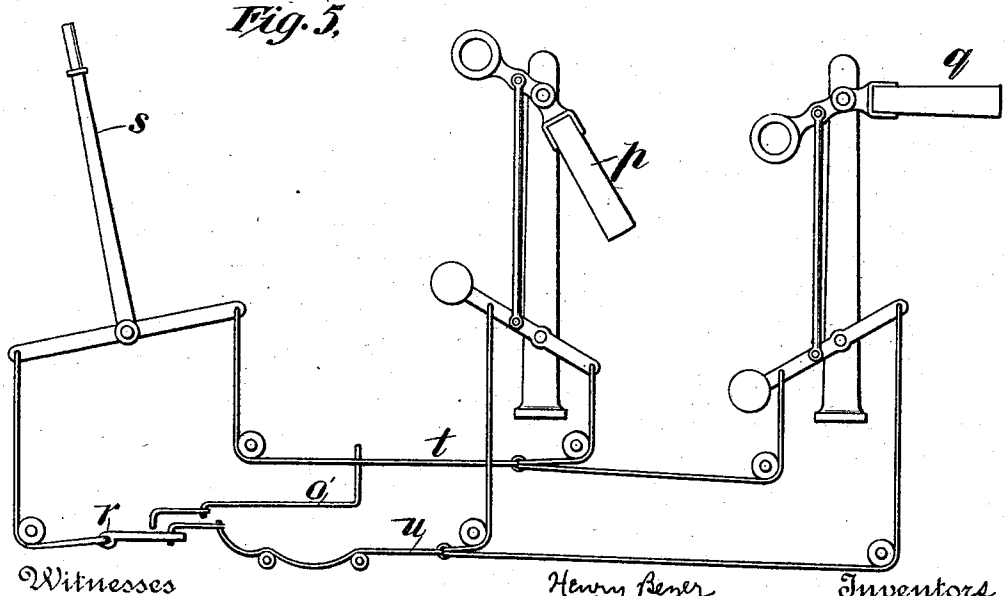
Fig. 5.



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UNITED STATES PATENT OFFICE.

HENRY BEZER, OF NEW ROCHELLE, NEW YORK, AND ARTHUR H. JOHNSON, OF RAHWAY, NEW JERSEY.

SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 552,093, dated December 31, 1895.

Application filed March 8, 1893. Renewed May 15, 1895. Serial No. 549,444. (No model.)

To all whom it may concern:

Be it known that we, HENRY BEZER, residing at New Rochelle, county of Westchester, and State of New York, and ARTHUR H. JOHNSON, residing at Rahway, county of Union, and State of New Jersey, subjects of the Queen of Great Britain, have invented a new and useful Improvement in Signaling Systems, of which the following, taken in connection with the accompanying drawings, is a specification.

Our invention relates to signaling systems employed on railways, and has for its object an arrangement of signals to satisfy certain conditions of traffic whereby a train is prevented from obeying a signal intended for a train immediately in advance.

The invention consists of the devices and their arrangement hereinafter set forth.

There are certain conditions of railway traffic in which it is necessary that two or more trains be permitted to draw up close, one behind another. These conditions frequently occur at various places, among which may be mentioned large passenger-stations where new trains are made up and where it is desirable that these trains be drawn up at the station, one close behind the other, to receive at the same time each its quota of passengers or other freight. Heretofore when the dispatching-signal controlling the outgoing train from such a station was lowered to "clear" there was nothing to indicate to the engineer of the succeeding train whether the clear-signal was intended for his train or for the first train only. The engineer of the succeeding train was therefore often at a loss to know when to advance and when not, and frequently occasioned confusion and delay by advancing in response to a clear-signal intended only for the preceding train. Again confusion was often caused by the operator failing to put his signal back to "danger" for the succeeding train immediately after the preceding train had been cleared. In such a case the engineer of the succeeding train was likely to advance in response to the signal thus improperly left at "clear." Our invention is intended to overcome these defects, and to this end we provide a plurality of signals for the trains so arranged that the chance of delay and confusion or danger will be avoided.

Our invention is applicable not only to the conditions of traffic above referred to, but also to other conditions, some of which will hereinafter appear.

In the drawings we have illustrated diagrammatically four different conditions of railway traffic in connection with which our invention is adapted to be used.

Figures 1, 2, 3 and 4 are diagrammatic representations of tracks and signals, illustrating different applications of our invention, the connections of the signals, &c., with the levers being shown only in Fig. 1. Figs. 2^a and 3^a are diagrammatic details of the locking means employed with the signals shown respectively in Figs. 2 and 3. Fig. 5 is a diagrammatic detail illustration of the signals and their connections as the signals are shown respectively in Fig. 4.

Referring now to Fig. 1, A and B are two tracks connected by a cross-over *b*. C is an engine, and D and E are two trains, all on track A. F is a platform before which the trains D and E are drawn up ready to receive their passengers or other freight. The cross-over *b* is provided at each end with a switch, both operated simultaneously by the lever 6 and its connections, and these switches are provided with well-known facing-point locks operated simultaneously, but separately, from the switches by the lever 5 and its connections. Near the end of the platform are located the detaining-signals *d* and *c'*. About a good train's length in advance is another detaining-signal *c*, and about a good engine's length in advance of the signal *c* is the signal *e*—*i. e.*, the signal which finally dispatches or sends the train into the block which it guards. The lever 7 may be connected in the well-known way through a selector 9 with either the signals *c* and *c'* or with the signal *d*, the signals *c* and *c'* being operated simultaneously by the same lead, and the signal *d* being operated by a different lead, according to the position of the selector. The lever 8 is connected with the signal *e*. These levers 5, 6, 7 and 8 are interlocked in the usual way by means of the tappets 1 2 3 4 and their bolts.

The locks, switches, signals, levers and tappets are all shown in their normal positions in Fig. 1 for traffic on track A, the signals being at "danger" and the switches locked against cross-over traffic. It will be seen from an inspection of the tappets and their bolts that the lever 5 of the locks *a* may be operated without disturbing any of the other levers; that the switch-lever 6 cannot be operated to open the switches for cross-over traffic until the lever 5 has opened the locks; that the lever 7 cannot lower the signals *c* and *c'* or the signal *d* to "clear" unless the lever 5 is in its normal locking position and the lever 8 is in its normal position, wherein the signal *e* is at "danger," and that lever 8 can be operated to put signal *e* to "clear" or return it to "danger" only when the signals *c* and *c'* are at "danger." It is especially important to notice that in this arrangement the signals *c* and *c'* can never be put to "clear" for a train to advance until after the signal *e* has been put to "danger," so that a train advancing from the station F on track A in response to a clear-signal will be stopped at signal *e*, and that when the signal *e* is put to "clear" the signals *c* and *c'* are locked at "danger." The signal *e* may be controlled by the operator at the advance-tower by a Sykes lock or any suitable lock and block system, automatic or otherwise. The signal *d* is intended to guard only the cross-over, and trains intending to cross over to track B are guided by this signal and pay no attention to the signal *c'*.

The trains D and E and the engine C having taken the positions shown, the operation is as follows: The operator having received word that the block guarded by the signal *e* is clear or admits of the signal being cleared proceeds to lower this signal, thereby locking the lever 7 in its normal position and holding the signals *c* and *c'* at "danger." The engine C may now enter the block in advance; but the engineers of the trains D and E, although they may see the signal *e* go to "clear," cannot advance, because their signals *c* and *c'* are at "danger." The engine C having now passed by, the operator may desire to lower the signals *c* and *c'* for the trains D and E to advance; but he cannot do so until the signal *e* is returned to "danger." The train D may then take the position formerly occupied by the engine C, with the train E immediately in the rear. When the block guarded by the signal *e* is in condition to receive the train D, the operator lowers the signal *e* to "clear;" but he can only do so after he has put the signals *c* and *c'* to "danger." The train D may now advance into the block; but the train E will be held by the signal *c*. Thus it is clear that no more than one train at a time can ever advance into the block in response to an indication of "clear" from the dispatching-signal *e*. Under the present system when two trains are drawn up one immediately behind the other, the engineer of the second train might take the "clear" indication of the dispatch-signal *e* for the first train to be intended for him also, and would be justified in doing so if the operator did not promptly return the signal *e* to "danger" after the first train has passed on, or should fail altogether to so return it. Under our system such mistakes cannot possibly occur.

If it is desired to send the train E over onto the track B, the engineer of this train pays no attention to the signal *c'*, but watches the signal *d*, which he knows guards the cross-over onto the track B, whither he is to go. The train E therefore remains stationary after the train D has advanced in obedience to an indication of "clear" from the signals *c* and *c'* until the operator has lowered the signal *d* to "clear." Before he does this, however, he operates the lever 5 to open the switch-locks, then opens the switches for cross-over traffic and locks them in this position. He then makes connection with the signal *d* at the selector 9 and lowers the signal to "clear." After the train E has crossed over, the signal *d* is returned to "danger" and the switches and locks may be put back to normal.

The arrangement shown in Fig. 2 is similar to that shown in Fig. 1, except that the signal *e* is omitted, the signal *h* becoming the signal to dispatch trains into the block. The lock, switch, and signal levers and their connections are not shown; but their operation will be readily understood by any one conversant with the art from an inspection of their tappets. (Shown in Fig. 2ª.) The locks *a* are operated by a lever connected to the tappet 1 of Fig. 2ª, and the switches of the cross-over *b* are operated by a lever connected to the tappet 2. The signals *f* and *g* are operated separately through a selector by a third lever connected to the tappet 3, and the signal *h* is operated by another lever connected to the tappet 4. It will be seen that by this arrangement the signal *h* cannot be put to "clear" to dispatch a train unless the signal *g* is at "danger," and that the signal *g* cannot be put to "clear" for a train unless the signal *h* is at "danger." When the signal *h* is therefore cleared for the train D, the train E will be held by the danger indication of the signal *g* if it is to continue on the track A; but the operator can, as previously described in connection with Fig. 1, lower *f* to "clear" when *h* is at "clear."

In Fig. 3 a track K is shown connected by a switch *n* to the track L. The track K is provided with a signal *k*, which guards the switch *n*, and the track L is provided with the signal *l* and with the dispatching-signal *m*, the latter being located about a train's length, or any desired distance, in advance of the signal *l*. The tappets adapted for the levers used in this arrangement are shown in Fig. 3ª. The switch *n* and its lock may be operated by a lever connected to the tappet 10. The signals *k* and *l* are operated separately through a selector by another lever connected to the tap-

pet 11, and the signal *m* is operated by a third lever connected to the tappet 12. In this case it will be seen that when the signal *m* is lowered to "clear" the signals *k* and *l* will be locked at "danger" and that neither of the signals *k* and *l* can be cleared until the signal *m* has been put to "danger." Thus when a train is dispatched by the signal *m* a second train immediately following, either on the track K or on the track L, will be held by the danger indication of the signal *k* or *l*.

In Fig. 4 are shown two merging tracks O and P. Track P may be used for the storage of light engines or engines waiting to go into an engine-house. In this case it is preferable to arrange the signals *p* and *q* for the track P about an engine's length apart, the signal *p* being normally at "clear" and the signal *q* normally at "danger." The signal *o* guards the track A and is normally at "danger." These signals are operated preferably by a single lever *s*, as shown clearly in Fig. 5. The wire *u*, which runs from the lever to operate the advance-signal *q*, is normally slack, and the wire *t*, which operates the rear signal *p*, is normally taut. *o'*, the wire for operating the signal *o*, is also normally taut. Wires *o'* and *u* may be separately connected with the lever *s* through a selector *r*. An engine on the track P may take up a position between the signals *p* and *q* when it will be normally held by the danger-position signal *q*. When the lever *s* is pulled to lower the signal *q* the signal *p* will be thrown to "danger," and, because of the wire *u* being slack and the wire *t* being taut, the signal *p* will be well on its way to "danger" before the signal *q* has started to "safety." An engine behind signal *p* will, therefore, get its danger-signal from the signal *p* before the engine between the signals has been given its clear-signal from *q*. When connection is made with signal *o* through the selector and *o* is pulled to "clear," signal *p* goes to "danger," but signal *q* remains at "danger." When *o* is put to "danger," then *p* goes back to "clear." The wire *o* is here taut and the signals *o* and *p* would therefore operate simultaneously. It is obvious that the wire *u* may be normally taut if desired, but we pefer to have it slack, as shown.

If desired a signal similar to signal *p* can be arranged for track O behind signal *o*, which could be operated from the lever *s* in conjunction with signal *o* in the same way as signal *p* is operated in conjunction with *q*. These signals may also be interlocked with other signals that might be employed in the ordinary way by means of tappets and bolts, as shown in connection with Figs. 1, 2 and 3. The arrangement for signaling shown in Fig. 4 may be applied to various other traffic conditions besides the one above described.

The signals and switches of our system may be controlled simply by the ordinary and well-known interlocking means, as above described, or in conjunction therewith by further mechanical means or electrical track-circuit controlling means. It is obvious that further mechanical or electromechanical track instruments or track-circuits acting either as locks or as means for informing the operator of the whereabouts of trains, or both, can be added. For example, it might be considered expedient for the better dispatch of traffic under the system shown in Fig. 3 that the operator should be notified by the train of its approach to either signal *k* or *l*, so that he might lower the signal and again be informed by the train when it had passed or was going past the signal, in order that he might place the signal to "danger" and lower signal *m* to "clear" without bringing the train to a stop at either signal. This might occur, especially in the case of signal *m*, if the operator had to visually note that the train passed or partially passed the rear signal *k* or *l*.

The various traffic examples shown are only arranged for the one direction of travel, that being sufficient to illustrate our invention.

We do not limit our invention to the specific traffic conditions shown, as others may require it.

What we claim, and desire to secure by Letters Patent, is—

1. In a signaling system for railways, the combination of a dispatching signal, a detaining signal in the rear thereof and locks connected with said signals for preventing the dispatching signal being put to "safety" until the detaining signal has been put to "danger," substantially as set forth.

2. In a signaling system for railways, the combination of a dispatching signal, two or more detaining signals in the rear thereof and locks connected with said signals for preventing the dispatching signal being put to "safety" until the detaining signals have been put to "danger," substantially as set forth.

3. In a signaling system for railways, the combination of a dispatching signal normally at "danger," a detaining signal in the rear thereof and locks connected with said signals for preventing the dispatching signal being put to "safety" until the detaining signal has been put to "danger," substantially as set forth.

4. In a signaling system for railways, the combination of a dispatching signal normally at "danger," two or more detaining signals in the rear thereof and locks connected with said signals for preventing the dispatching signal being put to "safety" until the detaining signals have been put to "danger," substantially as set forth.

5. In a signaling system for railways, the combination of a dispatching signal normally at "danger," two or more detaining signals normally at "danger" in the rear thereof and locks connected with said signals for preventing the dispatching signal being put to "safety" until the detaining signals have been put to "danger," substantially as set forth.

6. In a signaling system for railways, the combination of a dispatching signal and means for operating it, two or more detaining signals and means for operating them, including a selector and mechanism to prevent the dispatching signal being put to "safety" until a detaining signal has been put to "danger," substantially as set forth.

7. In a signaling system for railways, the combination of a dispatching signal normally at "danger" and means for operating it, two or more detaining signals and means for operating them, including a selector and mechanism to prevent the dispatching signal being put to "safety" until a detaining signal has been put to "danger," substantially as set forth.

8. In a signaling system for railways, the combination of a dispatching signal normally at "danger" and means for operating it, two or more detaining signals normally at "danger" and means for operating them, including a selector and mechanism to prevent the dispatching signal being put to "safety" until a detaining signal has been put to "danger," substantially as set forth.

9. In a signaling system for railways, the combination of a dispatching signal, a detaining signal located about an engine's length in the rear thereof, a second detaining signal located about a train's length in the rear of the first mentioned detaining signal, and locks to prevent either of the detaining signals being put to "clear" when the dispatching signal is at "clear," substantially as set forth.

10. In a signaling system for railways, the combination of a dispatching signal normally at "danger," a detaining signal located about an engine's length in the rear thereof, a second detaining signal located about a train's length in the rear of the first mentioned detaining signal, and locks to prevent either of the detaining signals being put to "clear" when the dispatching signal is at "clear," substantially as set forth.

11. In a signaling system for railways, the combination of a dispatching signal normally at "danger," a detaining signal located about an engine's length in the rear thereof, a second detaining signal normally at "danger" located about a train's length in the rear of the first mentioned detaining signal, and locks to prevent either of the detaining signals being put to "clear" when the dispatching signal is at "clear," substantially as set forth.

12. In a signaling system for railways, the combination of a dispatching signal, a pair of detaining signals, the first of which is located about an engine's length in the rear of the dispatching signal and the second of which is located about a train's length in the rear of the first detaining signal, a third detaining signal located near the second of the said pair of detaining signals, two tracks along which all of said signals are arranged, connected by a cross-over provided with switches; locks adapted to prevent either of the pair of detaining signals being put to "clear," when the dispatching signal is at "clear," and locks adapted to prevent the third detaining signal being put to "clear" when the cross-over is not switched for cross-over traffic, substantially as set forth.

13. In a signaling system for railways, the combination of a dispatching signal, a pair of detaining signals, the first of which is located about an engine's length in the rear of the dispatching signal and the second of which is located about a train's length in the rear of the first detaining signal, a third detaining signal located near the second of the said pair of detaining signals, all of said signals being normally at "danger," two tracks along which all of said signals are arranged, connected by a cross-over provided with switches, locks adapted to prevent either of the pair of detaining signals being put to "clear" when the dispatching signal is at "clear," and locks adapted to prevent the third detaining signal being put to "clear" when the cross-over is not switched for cross-over traffic, substantially as set forth.

14. In a signaling system for railways, the combination of a dispatching signal, a pair of detaining signals, the first of which is located about an engine's length in the rear of the dispatching signal and the second of which is located about a train's length in the rear of the first detaining signal, a third detaining signal located near the second of the said pair of detaining signals, all of said signals being normally at "danger," two tracks along which said signals are arranged, connected by a cross-over provided with switches, an operating lever for the dispatching signal, a second operating lever for the detaining signals, said pair of detaining signals being connected to the same lead from the lever, and the said third detaining signal being connected to an independent lead through a selector, locks adapted to prevent either of the said pair of detaining signals being put to "clear" when the dispatching signal is at "clear," and locks adapted to prevent the said third detaining signal being put to "clear" when the cross-over is not switched for cross-over traffic, substantially as set forth.

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