(No Model.) 2 Sheets—Sheet 1.

W. G. WATTSON.

RAILWAY SIGNAL SYSTEM.

No. 475,955. Patented May 31, 1892.

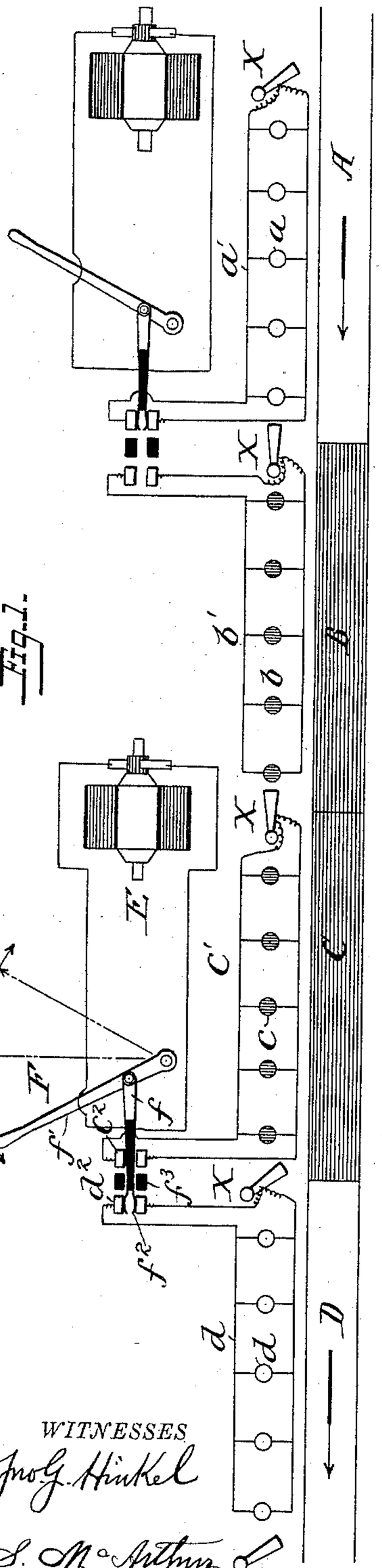

Fig. 1.

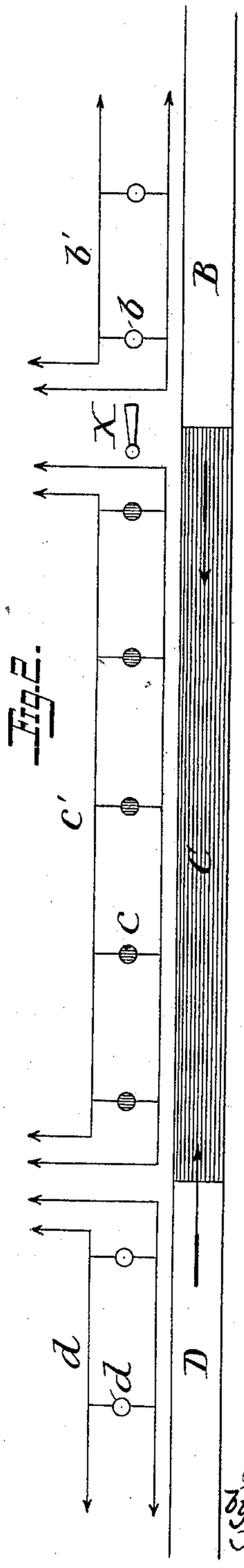

Fig. 2.

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Fig. 3.

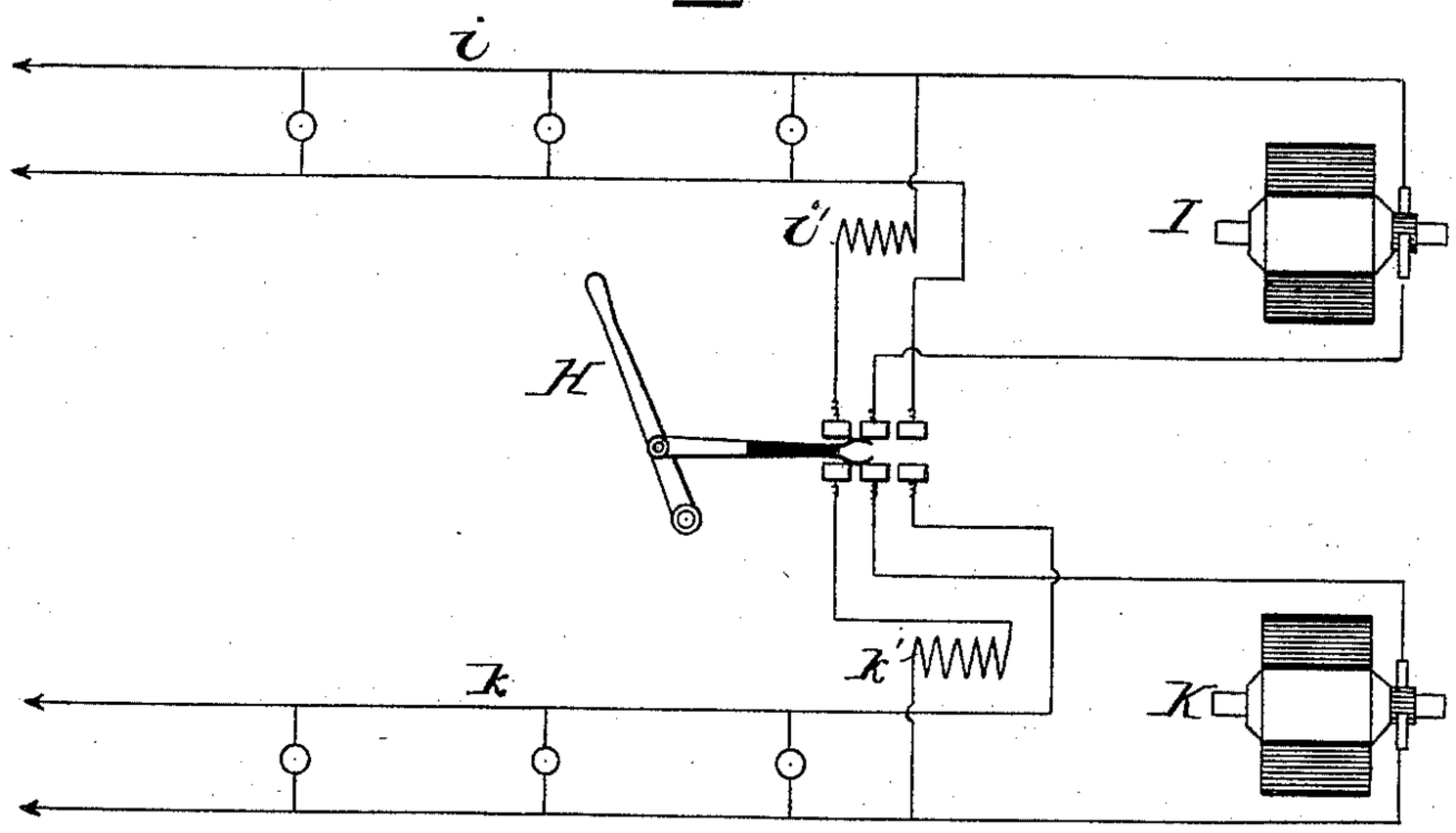
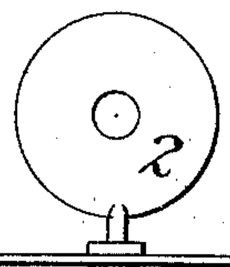


Fig. 4.



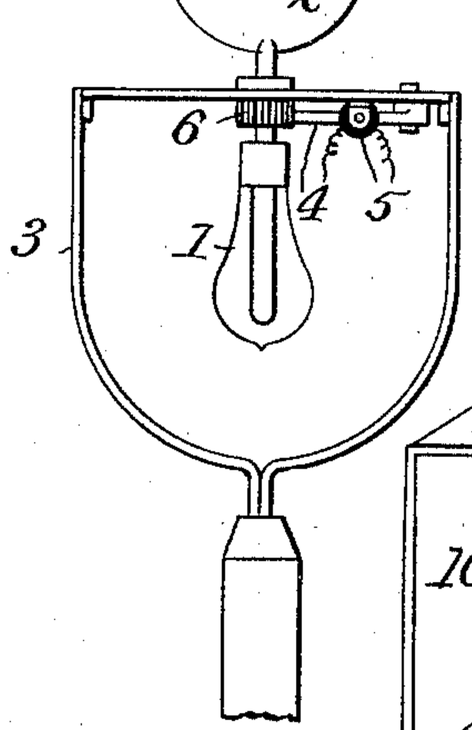


Fig. 5.

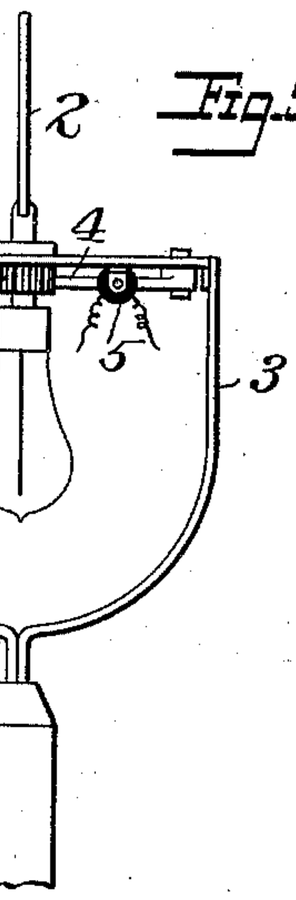


Fig. 7.

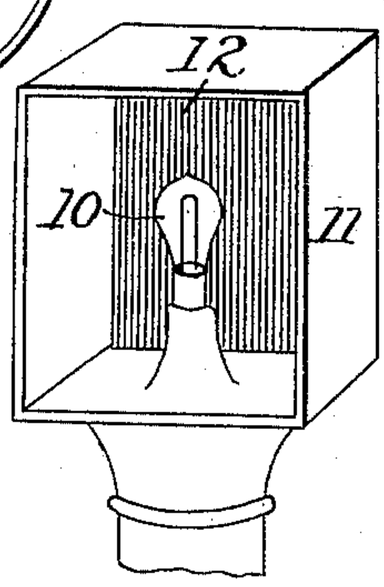
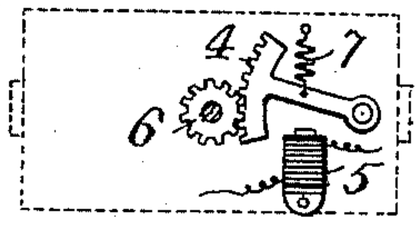


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM G. WATTSON, OF TAPPAN, ASSIGNOR OF ONE-HALF TO JOSEPH B. STEWART, OF HAVERSTRAW, NEW YORK.

RAILWAY SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 475,955, dated May 31, 1892.

Application filed June 17, 1891. Serial No. 396,595. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM G. WATTSON, a citizen of the United States, residing at Tappan, Rockland county, State of New York, have invented certain new and useful Improvements in Railway Signal Systems, of which the following is a specification.

My invention relates to railroad signaling systems; and it consists in an improved apparatus for running and protecting railroad-trains.

In the accompanying drawings, in which like reference-signs refer to like parts throughout the several views, Figure 1 is a diagram showing the arrangement of signals and operating devices upon the track on which the travel is in one direction or as in double-track systems. Fig. 2 is a diagram showing my improved system applied to a single-track road. Fig. 3 shows the signals arranged in duplicate, and Figs. 4, 5, and 6 are details of a form of signal. Fig. 7 is a perspective view of another form of signal.

My invention consists in an apparatus substantially as hereinafter described for dividing the track to be protected into blocks or sections and distributing signals throughout the length of each block, the series of signals for each block being connected together either mechanically or electrically, so that they may be operated simultaneously. The chief advantage of such a system is that a train may be controlled not only at the initial point of the block, as heretofore, but at any part throughout its length.

Another important feature of the present invention is the employment of lamps at each signal along the track for the purpose of indicating the condition of the block at night. By the employment of lamps in connection with my system of signaling the operation of trains in tunnels is rendered quite as safe and easy of manipulation as upon other portions.

Another feature of the invention consists in arranging the blocks in pairs with a single controller for manipulating the signals in each other block of the pair, the controller being so arranged that the signals in either or both blocks may be set at "danger," and in either block the signals may be set to indicate "clear track," it being, however, rendered impossible to indicate "clear track" at the same time upon both blocks.

My invention furnishes an absolute block-signal system which provides for a space of track at least the length of one block between all trains moving in the same direction upon which a continuous series of signals indicates "danger." By means of this system it is practicable to make the blocks quite short, if desired, and run trains at high speed and at very short intervals with absolute safety. The length of the sections or blocks will be dependent upon the distance or time that it is desired to keep the trains apart or, in other words, upon the volume of the traffic.

It often happens with the ordinary system of block-signals in which but one signal is used for each block that an engineer will fail to observe the true condition of the signal in passing, either on account of carelessness or color-blindness or through a defect in the signal or on account of the condition of the atmosphere. Under my system the signals are continuously visible, and it is almost impossible for a mistake of this kind to occur, particularly at night when a clear track is indicated by a row of lights throughout the entire section and an obstructed track indicated by the absence of light. The contrast between these conditions is so glaring that should both the engineer and fireman be stricken down the other trainmen and passengers acquainted with the system of signaling would immediately notice that the train was in danger if the lights were out and stop it. Thus in tunnels and when running through the night the simple rule would be "run when lights are burning" and "stop immediately when lights are out."

If by any possibility two trains should accidentally get onto the same block, it is possible by this system to stop them both in any part of the block if the error be noticed in time. Such an occurrence of course would be impossible with trains running on the main line when my system of signaling is in use; but it might happen that a train coming from a siding or branch line would take the main track when the block was occupied by a main-line train.

As above stated, the blocks are preferably operated in pairs; but it will be obvious that any section or block may be operated independently or that any number of blocks may be controlled from a central station.

By the term "lamp" as used in this specification it is intended to cover any form of light-producing device, such as electric, gas, or oil lights, said lights being of any desired color. In this specification electric lamps and electrically-operated signals will be described to illustrate my invention, as in practice they are more easily controlled than other forms of devices.

In Fig. 1 is illustrated by diagram a section of a track in which the travel is all in one direction, as indicated by the arrows. The letters A B C D indicate blocks, and *a b c d* indicate the signals, arranged along the different blocks, respectively. The blocks A and B form one pair and the blocks C and D another. As shown, the signals are connected by electric circuits *a' b' c' d'*, and the power is furnished by dynamos E or other suitable sources of electricity. For each pair of blocks there is a single signal-controller F, consisting of a device for making and breaking the circuits. This device is shown in the form of a plunger *f*, operated by lever *f'*, the said plunger carrying spring-contacts f^2, connected, respectively, to the poles of the dynamos. These contacts slide in a box containing the terminals c^2 d^2 of the circuits. Midway between the terminals c^2 d^2 are a pair of non-conducting blocks f^3. At the initial point of each block a large signal X may be employed, similar to those now in use, this signal being also included in the electric circuit of each block, if desired. As shown, these signals X consist of semaphore-arms which normally indicate "danger;" but when the circuit for the block is complete the signal X, simultaneously with all the other signals, is made to indicate that the track is clear, the movement of the semaphore-arm being controlled by a magnet in the circuit. The small signals *a b c d* may be of any suitable construction, there being always a lamp for a night-signal. In tunnels, of course, the lamp alone should be used. In Figs. 4, 5, and 6 a form of signal is illustrated in detail which is useful either as a day or night signal. In these figures, 1 indicates an electric lamp, and 2 a target supported upon a frame 3. The target 2 is revoluble and is turned by means of a segmental gear 4, which is operated by a magnet 5, in circuit with the lamp, and meshes with a pinion 6 upon the target-spindle. A spring 7 serves to hold the target normally to indicate "danger;" but when the circuit is completed the magnet attracts the segmental gear, which turns the pinion and causes the target to indicate that the block is clear.

The operation of the system as thus far described is as follows: In Fig. 1 section A is shown as clear and section B blocked, section A being the one first reached when the travel is in the direction of the arrow. This is the normal condition of each pair of sections when no train is on either section, and to permit a train to enter the block A freely. When the train reaches the end of the block A, the operator breaks the circuit *a'* and closes the circuit *b'*, which immediately sets all the signals *a* to "danger" and all the signals *b* to indicate that the block B is clear, and the train is thus permitted to proceed, being protected as long as it remains in the section B by the entire series of signals *a* or the absence of signal-lights on section A. If no train is upon the section D, the section C will be found clear, and the train may proceed; but if the section D be occupied the series of danger-signals *c* will be encountered upon the section C. As it is obvious that a train can under this system be stopped anywhere in the section, it is unnecessary to have "distance" or "overlapping" signals. It will be understood that the movements of the trains are communicated to the operators who control the circuits either by persons stationed along the line between the pairs of sections or automatically—as, for instance, by tappets upon the rear ends of the trains making or breaking electric circuits by means of track-instruments arranged at the junctions of the blocks or by electrical track connections.

In Fig. 2 my system is illustrated as applied to a single-track road. With the system of block-signaling now in use it sometimes happens that a train passes a station where it should have been held for orders or where it should have taken a siding, and thus accidentally gets beyond the control of the operator at the station and the train-dispatcher, while at the same time another train which has the right of track is ahead of it and also between it and the next telegraph-station. Under these circumstances at present a collision is almost inevitable, and to this cause a large amount of accidents may be attributed. With my approved apparatus for signaling the train-dispatcher and the operators at the stations on either side of the two trains have complete control of every portion of the track, and by setting all of the signals at said stations at "danger" both trains may be immediately stopped and an accident prevented. In many other ways my improved system will be found valuable upon single-track roads.

In Fig. 3 I have shown a single section or block of track with two series of signals controlled by independent circuits. This arrangement may be adopted where extra precautions are desired to be taken to prevent accidents, as in tunnels and near large cities where the traffic is heavy. These circuits are supplied with current from distinct sources, so that a defect in either circuit will not affect the other. They are, however, operated by a single controller. In said figure, H represents the controller, which is quite

similar to that heretofore described, and need not be taken up in detail. I and K indicate the dynamos, and *i* and *k* the circuits. *i'* and *k'* are resistances placed in shunt-circuits and come into use when the main circuits are cut out by the controller H.

The present invention is peculiarly valuable as a means for signaling in tunnels and at night, in which cases the lamps serve the double purpose of indicating that there is no train occupying the track and also lighting up the roadway, so that other obstacles are rendered visible. By this means many accidents which occur from the track being blocked by rocks, trees, or other débris from hillsides may be prevented.

It will be obvious that the broad features of my invention may be carried out by many varieties of apparatus, and I therefore do not intend to limit myself to the precise construction and arrangement of parts herein illustrated and described.

In Fig. 7 I have shown a lamp 10, with an open-sided casing 11, the back 12 of which is painted dead black on the inside, so as to provide a dark background for the lamp. This form of signal is suitable for either day or night work, the lamp being distinctly visible in the day-time, even in the strongest sunlight against the black background.

What I claim is—

1. In a block-signal system, the blocks each provided with a series of signals distributed throughout its length, said blocks being arranged in pairs, and a switching device for each pair, said device being constructed to set at "safety" the signals of one block at a time, the signals of the remaining block being simultaneously at "danger," substantially as described.

2. In a block-signal system, the blocks arranged in pairs and each provided with a series of electrically-operated signals distributed throughout its length, a separate electric circuit for the signals of each block, and a switch common to the circuits of each pair of blocks, said switch being arranged to make and break said circuits alternately, substantially as described.

3. In a block-signal system, the blocks arranged in pairs and each provided with a series of electrically-operated signals distributed throughout its length, an electric circuit connecting the signals of each series, an electric generator for each pair of blocks, and a switch arranged to throw the current from the generator into the circuit of either block, substantially as described.

4. In a block-signal system, a pair of contiguous blocks, each having a series of electrically-operated signals distributed throughout its length and a circuit for said signals, an electric generator for said circuits, and a switch consisting of the terminals d^2 c^2 of the block-circuits, intermediate non-conductors f^3, movable spring-terminals upon the generator-circuit, and means for shifting said terminals to contact with the terminals of either block-circuit or the intermediate non-conductors, substantially as described.

5. In a block-signal system, the blocks arranged in pairs and each provided with a separate electric circuit, a switch common to each pair of circuits, and combined day and night signals distributed throughout the length of each block, said signals each consisting of a target operated by a magnet in the circuit, and an electric lamp also in the circuit, whereby they are operated simultaneously, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM G. WATTSON.

Witnesses:
JOS. B. STEWART,
WM. H. MEEKS.