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F. E. BUTTON.

RAILWAY BLOCK SIGNAL SYSTEM.

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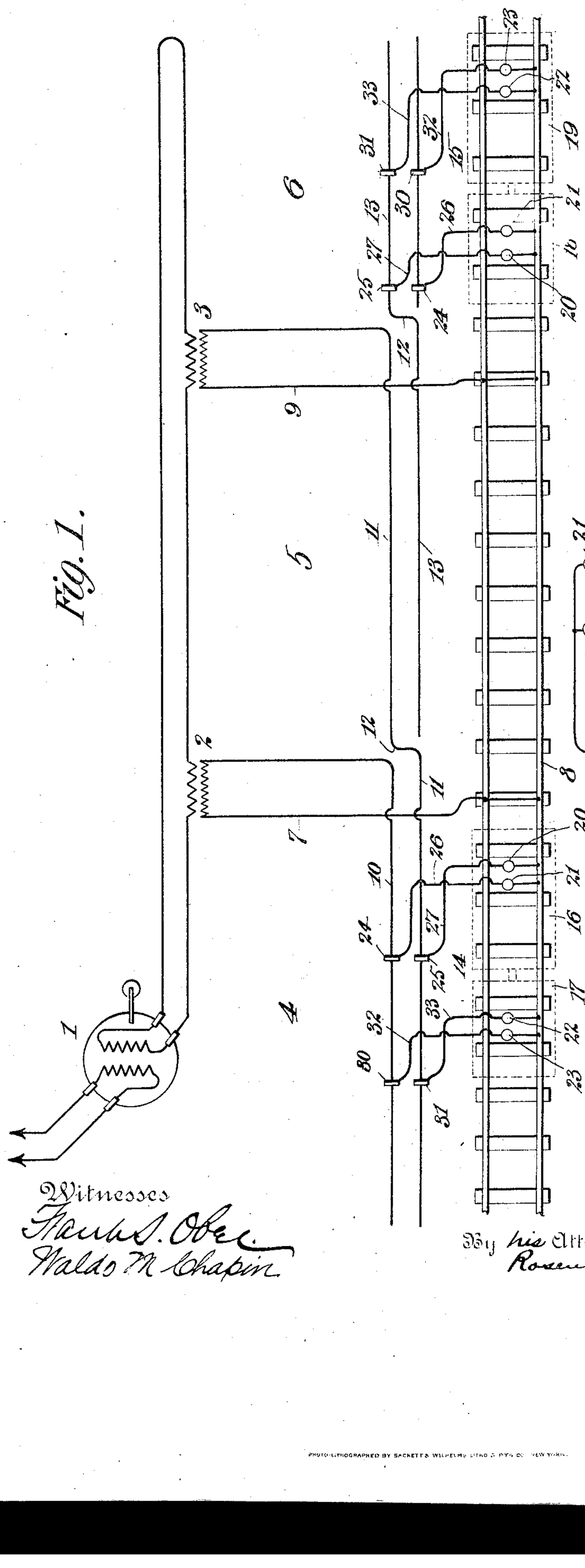

Fig. 1.

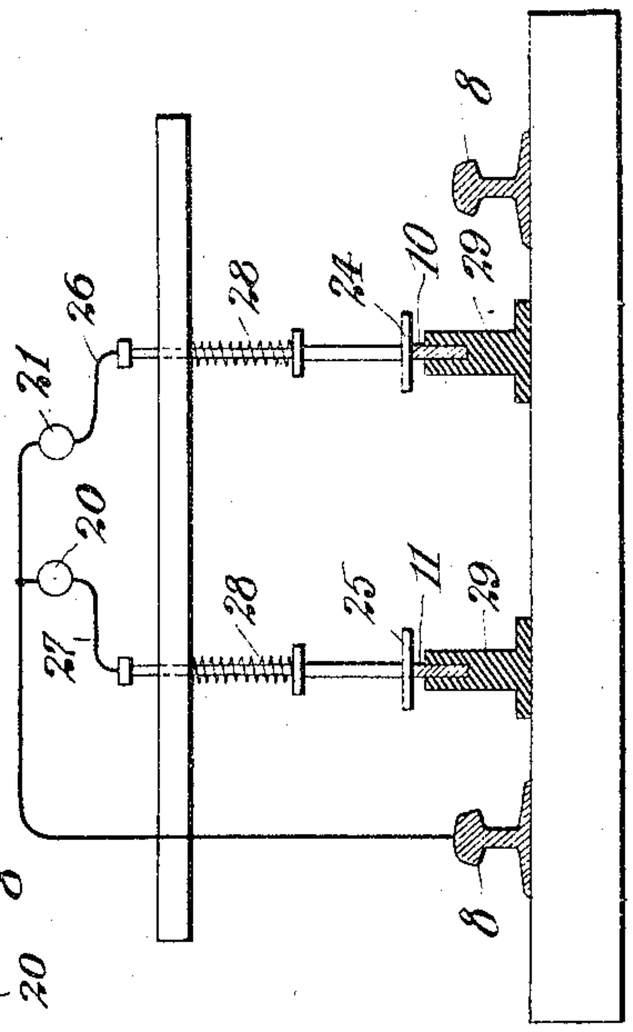

Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANK E. BUTTON, OF NEW YORK, N. Y.

RAILWAY BLOCK-SIGNAL SYSTEM.

SPECIFICATION forming part of Letters Patent No. 791,003, dated May 30, 1905.

Application filed August 12, 1904. Serial No. 220,501.

To all whom it may concern:

Be it known that I, FRANK E. BUTTON, a citizen of the United States, residing in the city of New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Railway Block-Signal Systems, of which the following is a full, clear, and exact description.

My invention relates to block-signal systems for railways, the object of the same being to provide means whereby a signal will be automatically given upon a train or car which will indicate the presence of another train or car in the same block, in the block ahead, or in the block behind, no matter in which direction the train may be moving.

In carrying out my invention I employ a source of constant electric current for each block, a conductor leading from one side of each source of current along and parallel with the trackway for a distance of two blocks in one direction, a plurality of lamps in each train or other moving part, and a plurality of contacts carried by each train which move, respectively, in engagement with the two conductors in each block for drawing current therefrom to light said lamps.

The details of the invention will hereinafter appear and that which I regard as new will be set forth in the claims.

In the drawings forming part of this specification, Figure 1 is a diagrammatic view illustrative of my improved system; and Fig. 2 is a sectional view through the rails and signal-conductors, showing the connections of the lamps carried by the car therewith.

1 indicates a constant-current transformer, and 2 3 series transformers in the secondary circuit thereof. The latter are located at suitable points along the line, one being provided for each block of single trackway. While I prefer to use the transformer 1, it is obvious that for the same I may substitute any other source of alternating-constant-current supply. I may also use in lieu of the transformers 2 3 any other means for the supply of constant current to the different blocks. Three blocks 4, 5, and 6 have been shown, although this number may obviously be increased or decreased. One side of the secondary of the transformer 2 is connected, through the conductor 7, with the track-rails 8, and, similarly, one side of the secondary of the transformer 3 is connected, through the conductor 9, with the track-rails 8. The other side of the secondary circuit of the transformer 2 is extended by way of the insulated conductor 10 along the line of the trackway 8 the length of two blocks in one direction, the said conductor being parallel throughout the greater part of its length with the track-rails. Likewise, the other side of the secondary circuit of the transformer 3 is extended by way of the conductor 11 along the line of the trackway 8 the length of two blocks in the same direction that the conductor 10 leads. This conductor 11 is parallel with the track-rails throughout the greater part of its length. That portion of it in the block 5 is in line with the adjacent portion of the conductor 10, and that portion in the block 4 is parallel to the same portion of said conductor 10. A bend or offset 12 is made in the conductor 11 at the point of intersection of the blocks 4 and 5 for a purpose which will hereinafter appear. The conducter 13 is similar in all respects to the conductors 10 and 11, except that it leads from one side of the secondary of a transformer (not shown) similar to the transformers 2 and 3, but located at the opposite end of the block 6. Said conductor 13 is parallel through the greater portion of its length with the track-rails 8. That portion of it in the block 6 is in line with the adjacent portion of the conductor 11, and that portion in the block 5 is parallel to the same portion of the conductor 11. The conductors 11 12 13, &c., throughout the system are of substantially the same construction and arrangement and may be termed the "signal-conductors."

The conductors 10, 11, and 13 may be in the form of rails located between the track-rails 8, as shown in Fig. 2 of the drawings, or they may be of other form and disposition, as desired. Upon an ordinary third-rail electric-railway system the same could be mounted on insulated supports carried by the third rail and contact-shoes therefor provided on the cars similar to those now in use.

Coöperating with the above parts are the

signaling devices carried by the cars or the cabs of the locomotives. In Fig. 1 of the drawings I have represented diagrammatically two trains 14 and 15, the train 14 being located in block 4 and supposed to be running from left to right and the train 15 being located in block 6 and supposed to be running from right to left. 16 indicates the locomotive-cab of train 14, and 17 the caboose of the same train, whereas 18 represents the locomotive-cab of train 15, and 19 the caboose thereof. Carried by the cab of each train are the signaling devices, shown in the form of lamps 20 21, the lamp 20 being preferably located in front of the lamp 21 and designed to indicate the condition of the block ahead of that in which the train is for the time being located and the lamp 21 being designed to indicate the condition of the block behind, both lamps acting together to indicate the condition of the block in which the train is located. Both of said lamps are connected, through the locomotive-wheels or otherwise, with the rails 8. The lamps 22 and 23, carried by the caboose of each train, are duplicates in all respects of the lamps 20 21, respectively, the same being provided in order that the signal may be given at both ends of the train and in order that either section of the train may hold the block in the event that the train becomes broken in two. Also carried by the cab 16 is a pair of contact-shoes 24 25, the shoe 24 being connected, through the wire 26, with the lamp 21 and the shoe 25 being connected, through the wire 27, with the lamp 20. These shoes may be of any suitable form of construction and are adapted to engage the signal-conductors 10 11 13, &c., which extend along the trackway. They are both normally urged into engagement with the said conductors by the springs 28, and said conductors may themselves be mounted upon insulating-supports 29, as shown in Fig. 2 of the drawings. Contact-shoes 30 and 31, similar in all respects to the contact-shoes 24 and 25, are carried by the caboose and are connected, respectively, through the wires 32 and 33, with the lamps 23 and 22 on said caboose.

It will be readily understood from the foregoing description that the lamps 20, 21, 22, and 23 receive current from the signal-conductors 10 11 13, &c., along the line of the trackway when the contact-shoes 24, 25, 30, and 31 are in engagement therewith. It will also be understood that the lamps 20 and 22 receive current from the transformer for the next block ahead and that the lamps 21 and 23 receive current from the transformer for the same block in which the train is located. The transformers 2 3, &c., supply a constant current at just sufficient voltage to light one set of lamps on one train at approximately normal brilliancy when they receive all of said current. When the train 14 is in block 4 in the position in which it is shown in Fig. 1 of the drawings, the lamps 20, 21, 22, and 23 will all be burning brightly if there be no other train or car in the same block, in the block ahead, or in the block behind. The circuit will be closed through the lamp 20 over the following path: conductor 11, contact-shoe 25, wire 27, track-rails 8, and wire 9, which circuit includes the secondary of the constant-current transformer 3, located at the forward end of the block 5. The lamp 20 is located in front of the lamp 21 in the cab 16, and consequently when the same is burning at its full candle-power it will indicate to the engineer or operator on the train that the block ahead—that is, the block 5—is clear. The circuit through the lamp 21 is closed over the following path: conductor 10, contact-shoe 24, wire 26, track-rails 8, and wire 7, which circuit includes the secondary of the constant-current transformer 2, located at the forward end of the block 4, in which the train 14 is at the time located. As the conductor 10, however, leads back to and through the block behind block 4, it will be obvious that if the lamp 21 be burning brightly it will indicate that the block behind that in which the train 14 is located is clear. The circuit through lamp 22 on the caboose of the train 14 will be closed over the following path: conductor 11, contact-shoe 31, wire 33, track-rails 8, and wire 9, which circuit includes the secondary of the transformer 3, and the circuit through the lamp 23 will be closed over the following path: conductor 10, contact-shoe 30, wire 32, track-rails 8, and wire 7, which circuit includes the secondary of the transformer 2. It will thus be seen that the lamps 22 and 23 and the parts which coöperate therewith are exact duplicates of the lamps 20 and 21, with their coöperating parts, and consequently the same signals will be given in the caboose of the train as in the cab or locomotive when the train has completely entered one of the blocks. If when the train 14 is in block 4 in the position shown there should also be a train in block 5, an indication of this fact would be given by the reduced candle-power of the lamps 20 and 22—that is to say, the flow of current from the conductor 11, which extends throughout the length of both blocks 4 and 5, would be divided over four lamps instead of over two. The operator would know at once then by merely glancing at the front lamp 20 that there was an obstruction in the block ahead and that he should proceed with caution. If according to the rules of the road two trains were not allowed to be in one block at the same time, it would be necessary for the engineer of train 14 to stop his train before entering block 5 until the lamp 20 began to burn again at its full candle-power, which would indicate that said lamp was the only one receiving current from the secondary of the transformer 3 and that the train which was formerly in block 5 had left the

same and passed into block 6. If the permissive system of allowing a train to enter a block already occupied were in force, the dim burning of the lamp 20 would merely indicate "danger" and that the engineer should have his train under control in proceeding into and along block 5. If a train were located in block 6, an indication of this fact would be immediately given to the engineer of train 14 by the dim burning of its lamp 20 as soon as his train passed into block 5 and contact took place between the shoe 25 and the conductor 13 for the same reason as above stated—that the supply of current from the conductor 13 would be divided between the lamps carried by the train in block 6 and the lamp 20 in the cab of train 14 in block 5.

As heretofore indicated, the lamp 21 in the cab 16 is preferably located behind the lamp 20, and the lamp 23 in the caboose 17 is preferably located behind the lamp 22. These lamps 21 and 23 are provided for the purpose of indicating to the engineer or other operator of the train the presence or absence of another train in the block behind. If, for example, the train 14 be located in block 5, the lamp 21 will receive current from the conductor 11, leading from the secondary of the transformer 3 through the contact-shoe 24 and wire 26, and the lamp 23 will also receive current from the same conductor through the contact-shoe 30 and the wire 31. If there be no other train in block 5 or in block 4, which is the next one to the rear, the lamps 21 and 23 will burn brightly and indicate to the operator that all is clear on the same block and in the block behind. If, however, there be a train in the same block or in the block behind, the current from the conductor 11 will be divided between the lamps on the two trains. The lamps 21 and 23 in both trains will therefore burn either very dimly or be completely extinguished. This will indicate to the operator of train 14 in block 5 the presence of a train in the same block or in the block to the rear and, as heretofore described, will indicate to the operator of the rear train the presence of the train 14 in the same block or in the block ahead. These same results may be obtained in whichever direction the train may be running. The train 15, shown in Fig. 1 of the drawings as being located in block 6, is supposed to be running in a direction opposite to that of the train 14 shown in block 4—that is to say, from right to left. In this position the contact-shoes 25 and 31 move in engagement with the conductor 13, which extends throughout the length of block 6 and block 5. Through this conductor 13 and said contact-shoes current is supplied to the lamps 20 and 22 of the cab 18 and caboose 19, respectively. The said lamps 20 and 22 are the forward lamps of each pair, and consequently in either direction that a train may be running the condition of the forward lamp will indicate the presence or absence of another train in the same block or in the block ahead. Of course it will be understood that if there is another train in the same block both the forward and rear lamps of the cab will burn dimly or be extinguished, whereas if the other train is in the block ahead the forward lamps only of each set will burn dimly, and if the other train is in the block behind the rear lamp only of each set will burn dimly. There is therefore no danger of confusion.

As each train or car is supplied with identically the same apparatus in the way of lamps and in the way of contact-shoes which move in engagement with the signal-conductors, it is necessary when the trains run in both directions on the same track that means be provided for maintaining the connections to the signal-lamps in such a way that the front lamp or one particular lamp will always indicate the presence or absence of another train in the block ahead and that the other lamp will always indicate the presence or absence of a train in the block behind. The means whereby I effect this result is by forming in the signal-conductors 10 11 13, &c., the offset portions 12, heretofore described. These offset portions occur at or about the points of intersection of each two adjacent blocks, as clearly shown in Fig. 1 of the drawings. Unless some such arrangement as this were provided, although a signal would be given by one or the other of the lamps carried by the cab or caboose of the presence or absence of a train in the adjoining block, there would be no way by which the engineer or other operator could tell whether it was the block ahead or the block behind which was occupied or free from obstruction.

It will be noted that a ground or a short circuit would act as a danger-signal, as either would have the effect of depriving the signal-lamps of a sufficient portion of the constant current to enable them to burn brightly. An open circuit would have the same effect, and all switches should be so connected as to open or short-circuit the line in case of misplacement.

Having described my invention, I claim—

1. In a railway block-signal system, a source of constant electric current for each block, a conductor leading from one side of each source of current, along and parallel with the trackway, for a distance greater than the length of one block, whereby in each block there are two such conductors leading from different sources of current, a plurality of signaling devices on each train or other moving part, and a plurality of contacts carried by each train moving respectively in engagement with the two conductors in each block for drawing current therefrom to actuate said signaling devices.

2. In a railway block-signal system, a source of constant electric current for each block, a

conductor leading from one side of each source of current, along and parallel with the trackway, for a distance greater than the length of one block, whereby in each block there are two such conductors leading from different sources of current, a plurality of electric lamps on each train or other moving part, and a plurality of contacts carried by each train moving respectively in engagement with the two conductors in each block for drawing current therefrom to light said lamps.

3. In a railway block-signal system, a source of constant electric current for each block, one side of each of which is connected to the rails, an insulated conductor leading from the other side of each source of current, along the trackway, for a distance greater than the length of one block, whereby there are two of such conductors in each block leading from different sources of current, a plurality of electric lamps on each train or other moving part connected on one side with the track-rails, and contacts carried by the train moving in engagement with the two conductors in each block and connected respectively with said lamps, as and for the purpose set forth.

4. In a railway block-signal system, a source of constant electric current for each block, one side of each of which is connected to the rails, an insulated conductor leading from the other side of each source of current, along the trackway, for a distance greater than the length of one block, each conductor having an offset therein at the meeting-point of the two blocks which it traverses, part of each conductor being parallel with the part of the other conductor in the same block and in line with the other part of the other conductor in the adjacent block, a plurality of electric lamps on each train or other moving part connected on one side with the track-rails, and contacts carried by the train moving in engagement with the two conductors in each block and connected respectively with said lamps, as and for the purpose set forth.

5. In a railway block-signal system, a source of constant electric current for each block, one side of each of which is connected to the rails, an insulated conductor leading from the other side of each source of current, along the trackway, for a distance greater than the length of one block, each conductor having an offset therein at the meeting-point of the two blocks which it traverses, part of each conductor being parallel with the part of the other conductor in the same block and in line with the other part of the other conductor in the adjacent block, a plurality of electric lamps on each train or other moving part connected on one side with the track-rails, and located one in advance of the other, and contacts carried by the train moving in engagement with the two conductors in each block and connected respectively with said lamps, whereby the forward of said lamps will serve to indicate the condition of the block ahead and the other will serve to indicate the condition of the block behind, in whichever direction the train may be moving.

6. In a railway block-signal system, a source of alternating constant current, transformers, one for each block, whose primaries are connected in series with said source, and whose secondaries are connected on one side with the track-rails, an insulated conductor leading from the other side of the secondary of each of said transformers, along the trackway, for the distance of two blocks, whereby there are two of such conductors in each block leading from different transformers, a plurality of electric lamps on each train or other moving part connected on one side with the track-rails, and contacts carried by the train moving in engagement with the two conducters in each block and connected respectively with said lamps, as and for the purpose set forth.

7. In a railway block-signal system, a source of alternating constant current, transformers, one for each block, whose primaries are connected in series with said source, and whose secondaries are connected on one side with the track-rails, an insulated conductor leading from the other side of the secondary of each of said transformers, along the trackway, for the distance of two blocks, each conductor having an offset at the meeting-point of the two blocks which it traverses, a part of each conductor being parallel with the part of the other conductor in the same block and in line with the other part of the other conductor in the adjacent block, a plurality of electric lamps on each train or other moving part connected on one side with the track-rails, and contacts carried by the train moving in engagement with the two conductors in each block and connected respectively with said lamps, as and for the purpose set forth.

In witness whereof I subscribe my signature in the presence of two witnesses.

FRANK E. BUTTON.

Witnesses:
WM. M. STOCKBRIDGE,
FRANK S. OBER.