No. 861,015. PATENTED JULY 23, 1907.

E. F. BLISS.

BLOCK SIGNAL SYSTEM.

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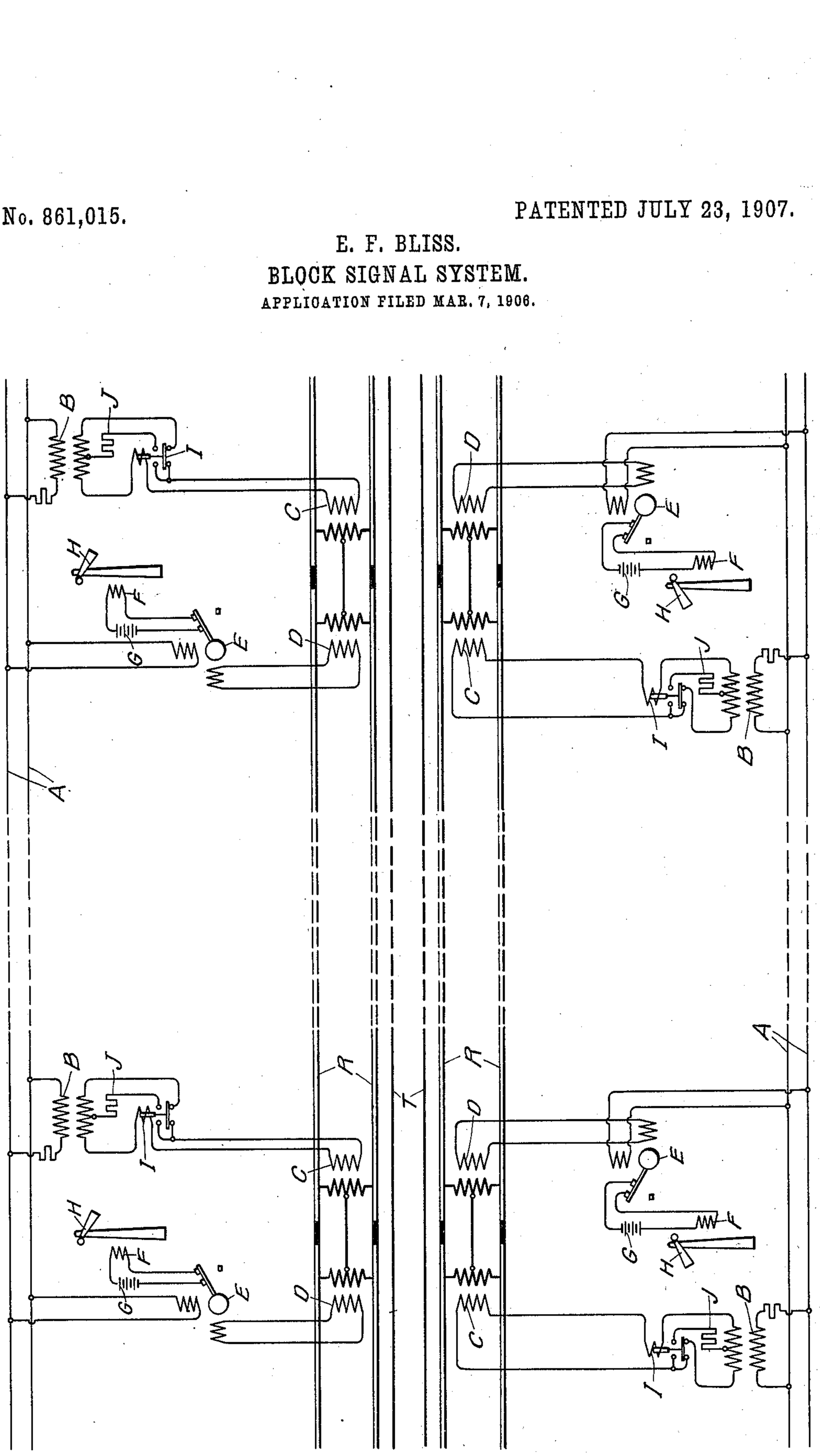


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# UNITED STATES PATENT OFFICE.

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## BLOCK-SIGNAL SYSTEM.

No. 861,015. Specification of Letters Patent. Patented July 23, 1907.

Application filed March 7, 1906. Serial No. 304,649.

*To all whom it may concern:*

Be it known that I, ELMER F. BLISS, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Block-Signal Systems, of which the following is a specification.

My invention relates to block signal systems, and its object is to provide simple and efficient means for protecting the source of current connected to the track circuit from an abnormal flow of current when short-circuited by a train.

It has been proposed heretofore to protect the source by means of a resistance inserted when the current rises above a predetermined amount.

My invention consists in cutting a portion of the source out of circuit upon an abnormal flow of current. By means of this arrangement the protective resistance may be greatly reduced in amount, or even omitted entirely, so that the loss of power is reduced and the efficiency of the system increased.

While my invention in its broadest aspect is not limited to a signal system employing any particular form of current, it is particularly advantageous for use in alternating-current signal systems in which the track circuits are supplied from transformers. In a direct-current signal system in which the track circuits are supplied from batteries the internal resistance of the battery is ordinarily high enough to prevent a flow of current large enough to injure the battery when short-circuited by a train on the block, but when a transformer is the source of supply, the internal resistance is small. I shall, accordingly, describe my invention as applied to an alternating signal system, but it will be understood that it is equally applicable to a direct-current signal system, if it is desired to protect the direct-current source against an abnormal flow.

My invention will best be understood by reference to the accompanying drawing, which shows diagrammatically a block signal system provided with protective devices arranged in accordance with my invention.

In the drawing R, R, represent the track-rails of a road which, in the present case, is assumed to be an electrically operated road, the supply conductors for the power-current being indicated at T.

A, A, represent line-wires carrying alternating-current at high tension, which is supplied to the track circuit through the step-down transformers B, B.

C, C, represent transformers having their primaries supplied from the step-down transformers B, B, and their secondaries connected to the track circuit.

D, D, represent transformers connected to the other ends of the blocks, their secondaries supplying a coil of the relays E, E.

In order to provide a return path for the power-current the central point of the secondaries of each transformer C is connected to the central point of the primary of transformer D at the adjacent end of the adjacent block. The adjacent blocks are thus connected at equipotential points with respect to the signal current, and this connection enables the rails to serve as conductors for both the signal-current and power-current without mutual interference, as is fully described in Patents Nos. 645,907 and 647,741, issued to Badell, dated March 20, 1900, and April 17, 1900, respectively. The relays E are shown as of the polyphase induction type, one primary coil being supplied from the track transformer D and the other directly or through a transformer from the alternating-current supply conductors A. When both phases of the relay are energized, as is the case when no train is on the track, the contact member carried by the armature of the relay closes a circuit comprising the signal operating mechanism F of the signal H and a suitable source of current G. The signal-operating mechanism is merely indicated diagrammatically, as it forms no part of the present invention, and any well-known type of operating mechanism may be employed. I represents a relay in series with the secondary of the transformer B and the primary of transformer C. J represents an impedance, preferably a non-inductive resistance.

The operation is as follows: Normally the relays I are in the position shown, in which the full voltage of the secondaries of transformers B are supplied to the primaries of transformers C. When a train on a block short-circuits the secondary of a transformer C, thereby producing an abnormal flow of current, the corresponding relay I draws up its armature, cutting out a portion of the secondary of transformer B and including in circuit the impedance J. In this manner, the voltage supplied to the track circuit is reduced and the flow of excessive current due to the short-circuiting effect of the train is prevented. Since the impedance J is normally out of circuit, it does not impair the efficiency of the system.

I do not desire to limit myself to the particular construction and arrangement of parts here shown, but aim in the appended claims to cover all modifications which are within the scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In a block signal system, in combination with the rail circuit of a block, a source of voltage supplying the rail circuit, and an overload relay in series with said source arranged to cut a portion of said source out of circuit upon an abnormal flow of current therefrom.

2. In a block signal system, in combination with the rail circuit of a block, a source of voltage supplying the rail

circuit, an overload relay in series with said source arranged to cut a portion of said source out of circuit upon an abnormal flow of current therefrom, and an impedance arranged to be inserted in series with said source by the operation of said relay.

3. In an alternating-current block signal system, line-wires extending along the track, supply connections from the line-wires to the rail circuits of the blocks, transformers comprised in said connections, and means for reducing the number of effective secondary turns of said transformers upon an abnormal flow of current therein.

4. In an alternating-current block signal system, line-wires extending along the track, supply connections from the line-wires to the rail circuits of the blocks, transformers comprised in said connections, and overload relays in said connections comprising contacts arranged to cut a portion of the secondary turns of said transformers out of circuit.

5. In an alternating-current block signal system, line-wires extending along the track, supply connections from the line-wires to the rail circuits of the block, transformers comprised in said connections, and means for increasing the ratio of effective primary to effective secondary turns in said transformers upon abnormal flow of current therein.

In witness whereof, I have hereunto set my hand this 6th day of March, 1906.

ELMER F. BLISS.

Witnesses:

BENJAMIN B. HULL,

HELEN ORFORD.