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ERROR INDICATOR FOR OPEN WIRE CIRCUITS

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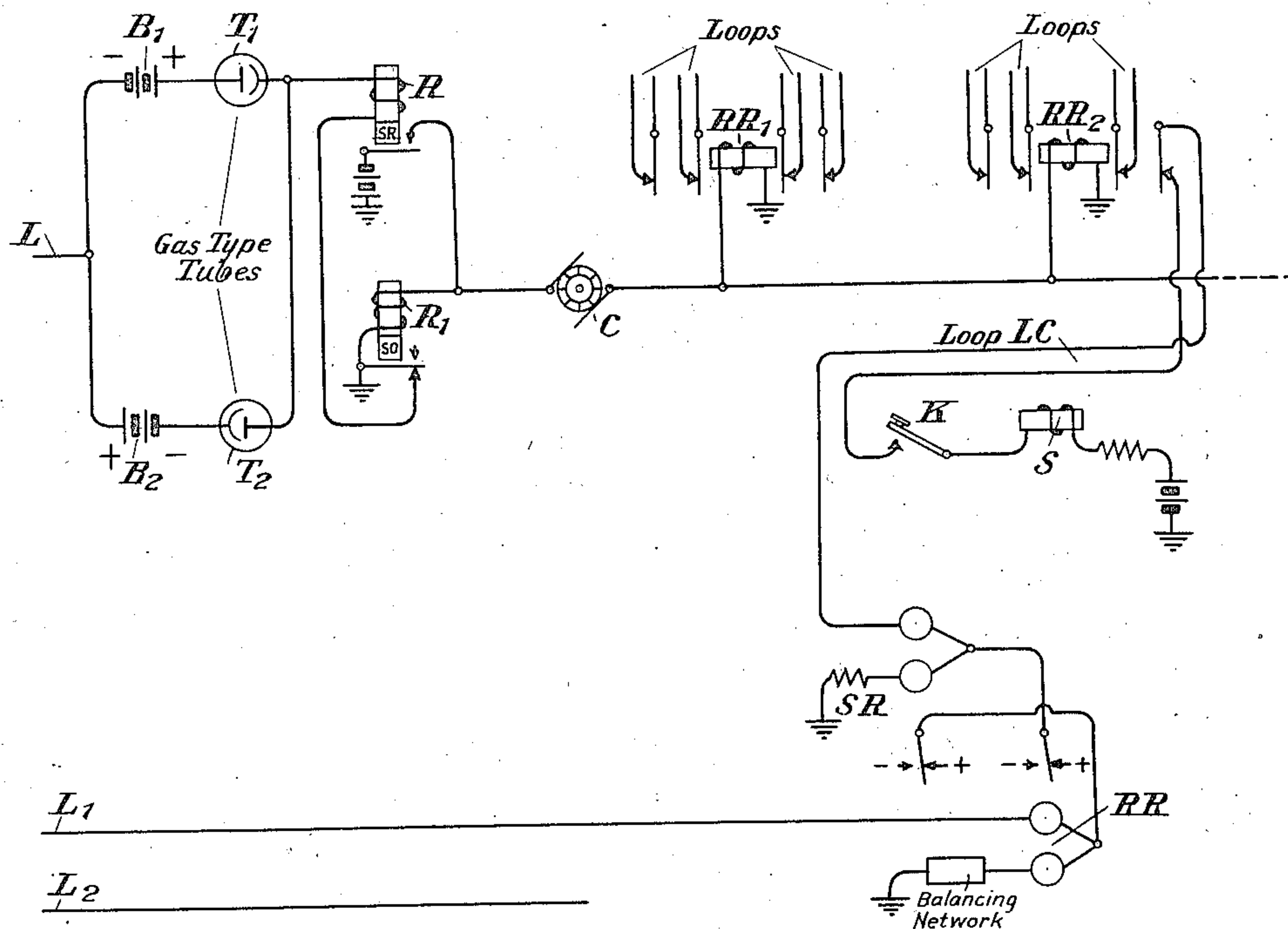


Fig. 1

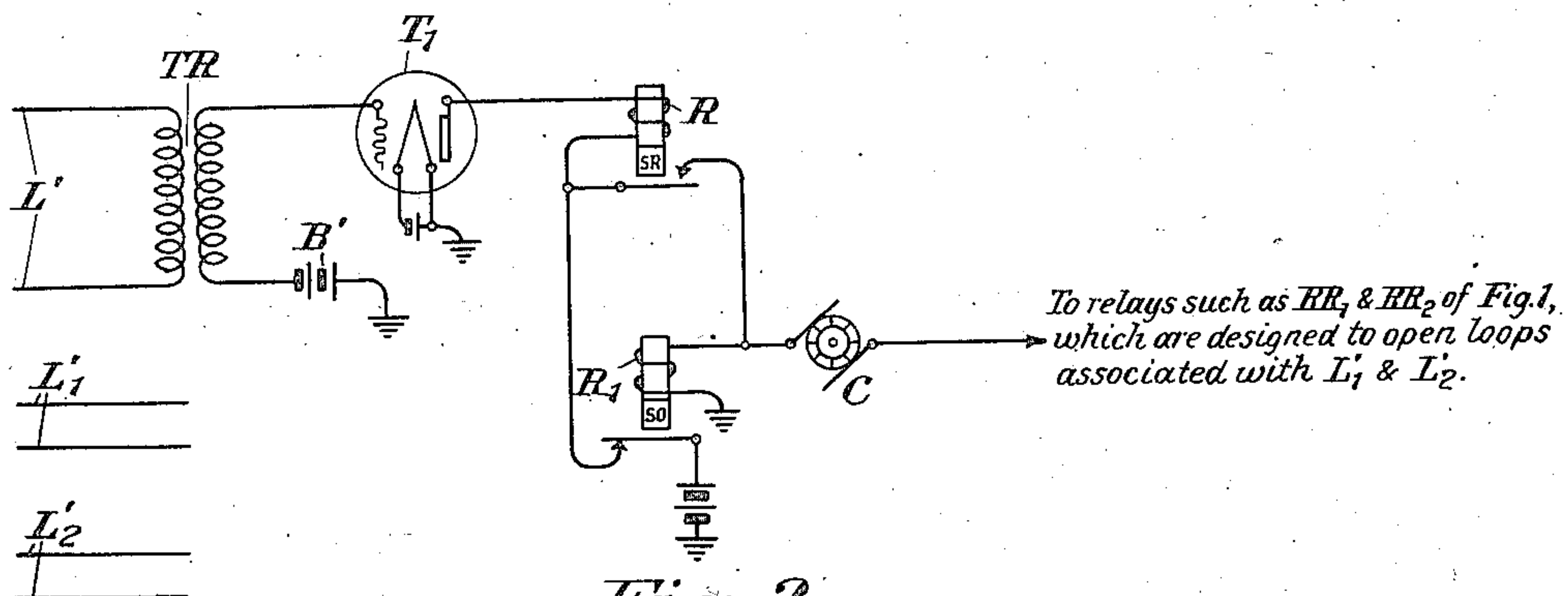


Fig. 2

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ERROR INDICATOR FOR OPEN-WIRE
CIRCUITS

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1 Claim. (Cl. 178—69)

This invention relates to communication systems and particularly to communication systems in which open wires are employed. More particularly, the invention relates to open-wire signaling circuits, such as high frequency carrier telegraph circuits, in which errors due to static or other interfering voltages may escape detection by a subscriber or other operator.

The object of the invention is to enable an operator on a loop circuit associated with a transmission line of a high frequency carrier telegraph system, for instance, to detect errors introduced by static or other interfering voltages to which the system is subject.

In general, the applicant, in attaining the above-stated object, sets up a series of distinctive impulses when the interfering voltages exceed a predetermined value, and sends these impulses into the loop circuits of some or all of the communication circuits subject to the same interfering voltages, as the indication to the operator of the error produced.

It will readily be understood by those skilled in the art that the invention is applicable to various communication systems, especially when open wires are used. Examples are high frequency carrier telegraph systems, voice frequency carrier systems and direct current grounded telegraph systems.

The invention will be clearly understood when the following description is read with reference to the accompanying drawing. Figure 1 of the drawing shows diagrammatically the application of the applicant's invention to a grounded telegraph system. Fig. 2 shows a modified form of the arrangement of Fig. 1 applied to a system using metallic circuits and having inductive coupling to the line. Like characters of reference in the two figures of the drawing designate corresponding elements.

With reference to Fig. 1 of the drawing, there is disclosed a telegraph loop circuit LC, including a key K, a sounder S, a sending relay SR, and a receiving relay RR. This loop circuit and the above mentioned elements are associated with the transmission line L₁, and L₂ represents an additional transmission line. This apparatus is well understood in the art and, accordingly, no detailed description of its operation is required herein.

The line L is understood to be an open wire of the system which is subject to the same conditions of interference and the like as lines L₁ and L₂. The line L may also be utilized for the transmission of telegraph signals. In accordance with

the applicant's invention, the line L is connected to two gas-filled tubes T₁ and T₂ in parallel. It will be noted that the line is connected to the anode of tube T₁ and to the cathode of tube T₂. It will be noted further that batteries B₁ and B₂, which furnish the voltages for tubes T₁ and T₂, respectively, are connected with opposite polarity; in the case of the upper battery the line is connected to the negative pole and in the case of the lower battery it is connected to the positive pole. Relay R, which is preferably slow-releasing, is connected with the tubes T₁ and T₂ as shown in the drawing.

It is understood by those skilled in the art that a gas-filled tube has the characteristic that no appreciable current will pass between its electrodes until a definite voltage is applied. When the applied voltage reaches the predetermined value, the tube current builds up rapidly to a value sufficient to operate the relay R.

It will now be understood that if an interfering voltage is impressed on the line L and the other wires of the system, there will be no operation of the tubes T₁ and T₂ unless this interfering voltage reaches a predetermined value. If, however, this predetermined value is reached or exceeded, one of the tubes T₁ or T₂ will flash; if the interfering potential is positive, tube T₁ will operate, whereas if the interfering potential is negative, the lower tube T₂ will operate. The operating circuit for tube T₁ is over the line L, through the battery B₁, the tube, the winding of relay R, and the contact of relay R₁ to ground. The operating circuit for the tube T₂ is over line L, through battery B₂, the tube, the winding of relay R, and the contact of relay R₁ to ground. These two operating circuits, it will be noted, are similar, but the batteries in the two cases have opposite polarities and the tubes are connected in opposite directions. From the above description it will be understood that when an interfering voltage of excessive value is applied to the communication system, either tube T₁ or tube T₂ will operate and this operation will be followed by the operation of relay R. When this relay operates, battery is connected to the windings of a series of relays represented by RR₁ and RR₂; in addition, battery is connected to the winding of relay R₁. The relays RR₁ and RR₂ upon operation serve to open the loop circuits such as LC. It will be understood that each of the loop circuits indicated forms a part of one of the various telegraph circuits operating on the system. It will be noted that a commutator C is connected in series with the windings of relays

RR₁ and RR₂. Such a device serves to send in to the loop circuits, including the circuit LC, any desired distinctive signal to indicate to the operator that an error due to interfering voltage has occurred.

When relay R is operated, relay R₁, which is slow operating, operates after a suitable time and opens the circuit including the winding of relay R, thus restoring the system to its normal condition.

The diagram of Fig. 2 of the drawing indicates certain modifications of the system of Fig. 1 which may be made in some cases. In the first place, it will be noted that a direct connection between the line and the gas-filled tube or tubes is not necessary. In the arrangement of Fig. 2 the system is represented as consisting of metallic circuits and the line L', corresponding to the line L of Fig. 1, is coupled to the gas-filled tube circuit through a transformer TR. With such a connection between the line and the tube circuit it will in some cases be sufficient to use one gas-filled tube connected as is the tube T₁ of the drawing. In circuit with this tube T₁ are the winding of relay R and the contacts of relay R₁ which will perform the same functions as in the arrangement of Fig. 1. The normal voltage on the grid of the gas-filled tube is determined by the voltage impressed by battery B' and accordingly the tube will operate only when the interfering voltage is in excess of the predetermined value. When this value of interfering voltage is exceeded, relay R operates to complete a circuit

through the commutator C and relays such as RR₁ and RR₂ of Fig. 1. It will be understood that the relays completing this indicated circuit are designed to open loop circuits associated with transmission lines such as L₁' and L₂'.

When the slow operating relay R₁ operates, following the operation of relay R, the circuit is opened and the loop controlling relays, such as relays RR₁ and RR₂ of Fig. 1 are returned to their normal conditions.

While the arrangement of Fig. 2 will be satisfactory in some cases, it will be understood that a system that will meet the requirements of all cases should take the form of Fig. 1 with two discharge tubes and the equivalent of the circuit shown in that figure.

While the invention has been specifically disclosed for the purpose of illustration, it is to be understood that it may be embodied in many other and widely different forms within the scope of the appended claim.

What is claimed is:

In a signaling system including an open-wire transmission line, a loop circuit associated therewith and an open-wire auxiliary line subject to the same conditions as the transmission line, the method of enabling an operator at the loop circuit to detect errors due to interfering voltages on the lines, which consists in setting up a series of distinctive impulses in response to interfering voltages in excess of a predetermined value, and impressing these impulses on the loop circuit.

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