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1,990,232

LINEMAN'S SIGNALING SYSTEM

Filed May 10, 1932

2 Sheets-Sheet 1.

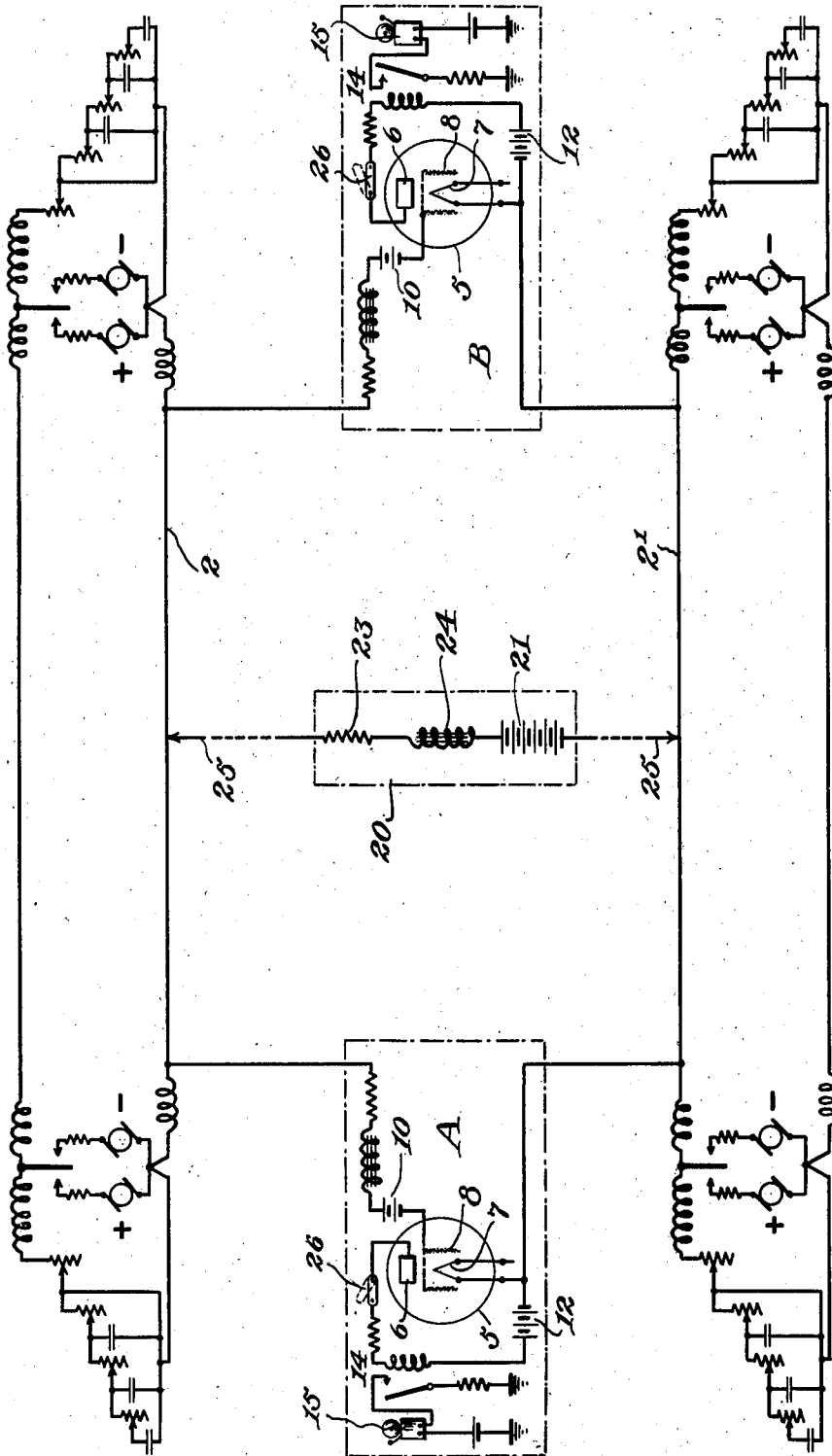


Fig. 1.

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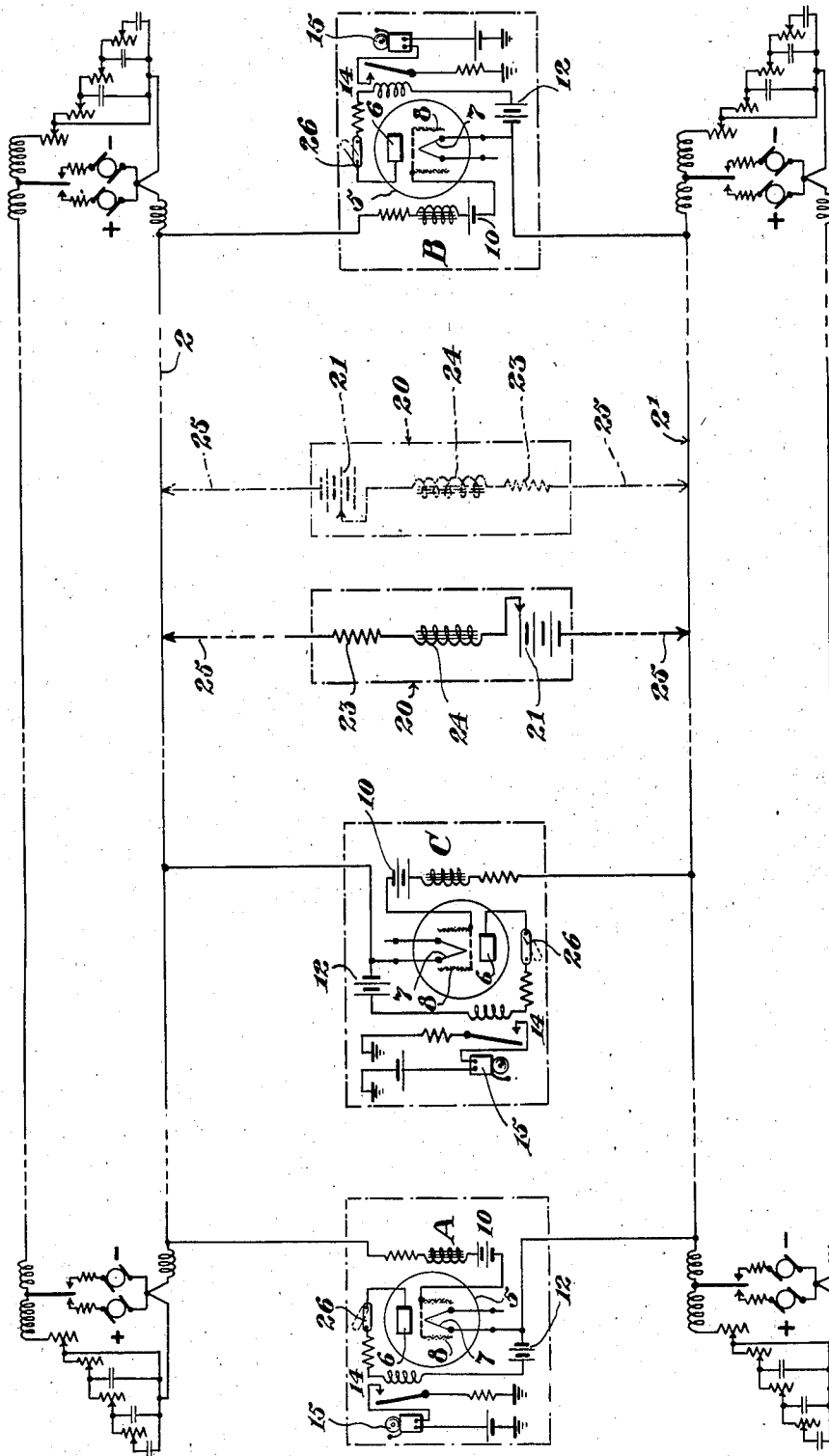


Fig. 2.

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UNITED STATES PATENT OFFICE

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LINEMAN'S SIGNALING SYSTEM

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6 Claims. (Cl. 177—352)

This invention relates to a signaling system especially adapted for linemen who may wish to signal the central office or other station from any point along the line at which they may be working.

The purpose of the invention is to provide a signaling arrangement which may utilize the same wires that are employed in telegraph circuits without in any manner interfering with such circuits; to provide a signaling system which is simple in construction, requiring practically no supervision and is dependable; also one which requires a compact and light equipment to be carried by the linemen.

In the following description I shall refer to the accompanying drawings in which—

Figure 1 is a diagram illustrating a circuit arrangement embodying my invention, and

Figure 2 is a modification thereof.

The conductors for the signaling circuit may comprise a wire from any two circuits in which one is ungrounded. I may therefore employ a wire from each of two metallic circuits as illustrated in the drawings. These two circuits may or may not be portions of two superposed systems, such as shown for instance in patents granted to R. V. Morgenstern Nos. 1,758,900 and 1,817,702. I may use one common wire of a metallic circuit and two or more grounded circuits, each grounded circuit being connected to a different signaling set. The lineman would then connect his portable set to the common metallic wire and to the particular wire of the grounded circuit to which the desired station is connected.

The metallic circuits are substantially the same as each of the side circuits shown in said Patent 1,758,900 and therefore need not be further described herein. The pair of wires employed for my signaling circuit include the wire 2 of one metallic circuit and the wire 2' of the other metallic circuit. At the terminal stations or other stations at which the signaling apparatus is located there is installed a signal responsive device which comprises an electrostatically controlled gas discharge tube 5 having the characteristic of continuing in operation after being started by application of potential to the starting electrode until it is stopped by some external means, as by opening the circuit of the anode. One type of device which may be employed for my purpose comprises a three-element thermionic gaseous discharge tube having an anode or plate 6, a cathode 7 and a grid or starting electrode 8. In this type the grid is in the form of an inverted cup composed of fine wire mesh which completely

surrounds the cathode. By means of a small battery 10, a negative bias is applied to the grid which prevents the operation of the tube until a predetermined critical voltage is impressed upon the grid. The instant the critical voltage is reached, a discharge takes place in the plate circuit of the full value produced by the battery or generator 12 which is maintained irrespective of the starting electrode potential until stopped by some external means. The action of the tube in continuing the discharge unaffected by the grid voltage and until the voltage of the plate 10 is reduced or stopped, is attributed to the formation of a sheath of positive ions around the grid, usually only a fraction of a millimeter in thickness, which contains the entire voltage drop between the grid and the surrounding space. Varying the potential of the grid merely changes the thickness of this sheath without affecting the potential of the remaining space. The action of the grid may, therefore, be likened to a trigger which is effective to initiate the discharge but which has no further influence on the discharge, being thus distinguished from the usual audion grid, which exerts a continuous influence on the discharge through the tube.

In the output circuit of this thermionic tube or relay is included the local battery or generator 12 and the winding of a neutral relay 14. The armature of the relay 14 is adapted to close a circuit which actuates a signal 15 that may be either visual or audible.

The lineman carries a compact light equipment 20 containing a suitable generator 21 of relatively high potential, which may consist of dry cells and in series with the generator is a high resistance 23 and an inductance 24 of high value. The choke coils are inserted for the purpose of protecting against the passage of telegraph or carrier current signals from one line to the other. The resistance in the lineman's set prevents any appreciable current flow and also guards against any duplex balance change in the two metallic circuits when they are connected through the lineman's set. The grid bias on the thermionic tube is maintained at a value which will prevent the operation of the tube due to the small potentials existing between the two metallic circuits.

The operation of the signaling system will be evident to engineers and to those familiar with circuits of this character from the above description of the apparatus employed.

When a lineman out on the line desires to signal the central office or other station equipped

with the signal receiving apparatus, he connects the contacts or clips attached to the flexible conductors 25 of his set to the proper conductors of the two circuits which form the pair of lines of the signaling system, thus applying a potential of critical value to the grid 8, thereby causing an immediate discharge through the tube which continues in the local or output circuit of the tube until the circuit is broken by the attendant at the switch 26. This current in the local circuit energizes the relay 14, thus operating the signal 15.

In Figure 2 I have illustrated an arrangement for signaling the several stations selectively. Stations A and B may be signaled in the manner previously described. If it is desired to signal only station B, the lineman reduces the voltage of his signaling battery 21 by cutting out some of the cells. The grid biasing battery 10 at station A is of higher voltage than that at station B and hence the tube 5 at station B will start upon the application of a lower voltage. Accordingly when the lineman has reduced the voltage of his signaling battery 21 the proper amount, he can signal station B without affecting the signal receiver at station A.

When stations A or B are being signaled, station C is not affected because the grid and cathode elements are connected to the lines in the reverse manner. Consequently when the lineman desires to signal station C he reverses the battery connections 25 of his portable set 20 in the manner indicated in dotted lines.

I have described in detail the specific arrangements shown for the purpose of clearly disclosing my invention, but it will be evident to engineers that various modifications and changes in the circuit arrangements may be made within the scope of the invention.

I claim:

1. In a communication system, a pair of conductors, each conductor forming one leg of separate communication circuits carrying intelligence signals, terminal apparatus including an electrostatically controlled gaseous discharge tube having its input circuit bridged between said con-

ductors and its output circuit connected to an electroresponsive device, said tube having grid, anode and cathode elements so constructed and arranged that, when started, the current flowing between anode and cathode is unaffected by the grid potential, biasing means in said input circuit to determine the starting potential, and portable means adapted to be bridged across said conductors at any desired points, said portable means including a potential source adapted to impress a potential sufficient to initiate a discharge in said tube.

2. In a communication system as defined in claim 1, means for interrupting the flow of current in the output circuit.

3. In a communication system as defined in claim 1, an impedance element in series relation with said potential source to thereby limit the flow of current and prevent any disturbance in said lines due to the connection of said source.

4. In a communication system, a pair of conductors, each conductor forming one leg of separate communication circuits carrying intelligence signals, a plurality of stations each provided with apparatus including a thermionic gaseous discharge tube having its input circuit bridged between said conductors and its output circuit connected to an electro-responsive device, said tube being characterized by continuous current flow in its output after starting, biasing means in said input circuit to determine the starting potential and portable means adapted to be bridged across said conductors at any desired points, said portable means including a potential source adapted to impress a potential sufficient to start the operation of a tube.

5. In a communication as defined in claim 4, certain of said tubes being biased to different potentials, and means to vary the potential of the potential source in said portable means.

6. In a communication as defined in claim 4, certain of said tubes being reversely connected to said conductors.

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