

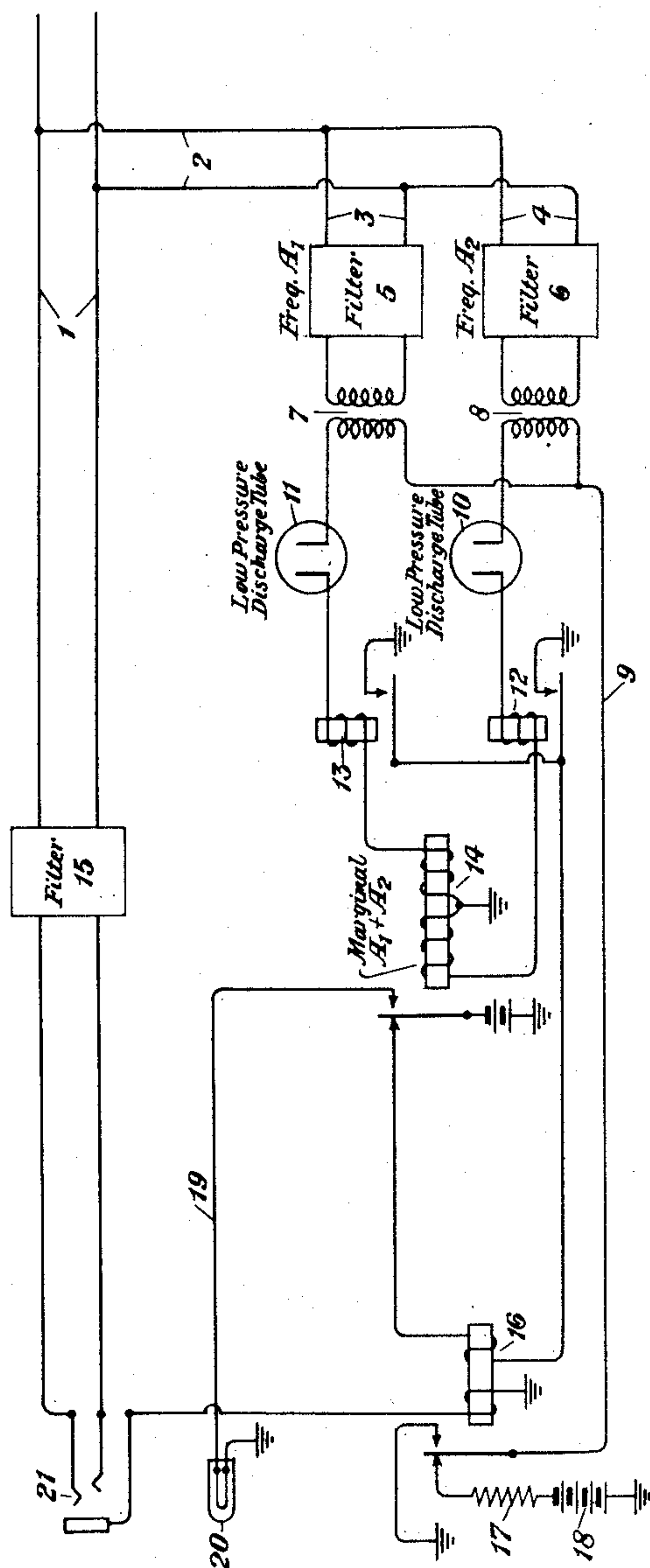
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SIGNALING SYSTEM

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SIGNALING SYSTEM

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This invention relates to improvements in signaling circuits and more particularly to the utilization in such circuits of gaseous conductor or discharge tubes.

5 The gaseous conductor or discharge tubes utilized in the arrangements of this invention are tubes filled with a low pressure gaseous content, which for purposes of illustration might be, neon, argon, helium or combinations of gases of this group. These tubes
10 will have a certain characteristic, namely, that they will break down and become conducting on one voltage, determined by the electrode design, the mixture of the gases and
15 their pressure, but once broken down will maintain this condition of conductivity on a much lower voltage. The present invention has as one of its cardinal features the utilization of this characteristic of the discharge
20 tube to provide novel signaling arrangements. A further feature of the invention consists in utilizing such tubes in improved circuits to provide selectivity and freedom from interference in signaling. Further features and
25 objects of the invention will appear more fully from the detailed description hereinafter given.

It has been found in practice that when a
30 single frequency is utilized for signaling purposes, that other transmitted frequencies in the vicinity thereof are apt to cause the signal responsive means to operate falsely. In accordance with the arrangements of this invention, two or more distinct and separate
35 frequencies would be transmitted for signaling purposes. The signal responsive means would be of a marginal character and would not respond until acted upon by all of the transmitted signal frequencies. The individual receiving circuits for each signal frequency are controlled in their operation by
40 gaseous conductor discharge tubes included therein.

The invention may be more fully understood from the following description, together with the accompanying drawing in the figure of which is shown a circuit diagram illustrating a preferred form of the invention.

In the drawing is shown a section of a transmission line 1 terminating in the jack 21 and

including a filter 15 for preventing incoming signaling currents from interfering with apparatus connected to the line at jack 21. Bridged across the line 1 is a signaling circuit 2, which is further divided into two branches 3 and 4, each branch including a filter, such as 5 and 6. Filter 5 might be selective for a frequency, such as A_1 , and filter 6 might be selective for a frequency, such as A_2 . To
55 operate the signal means at the end of the line shown, the distant operator would simultaneously transmit over line 1 both of these frequencies, such as A_1 and A_2 . These signaling frequencies would be transmitted
60 through the transformers 7 and 8. The secondary winding of transformer 7 is included in a circuit which may be traced as follows: battery 18, resistance 17, contact and armature of relay 16, conductor 9, secondary winding of transformer 7, discharge tube 11, winding of relay 13, and right-hand winding of
65 marginal relay 14 to ground. The secondary winding of transformer 8 is included in a circuit which may be traced as follows: battery 18, resistance 17, conductor 9, secondary
70 winding of transformer 8, discharge tube 10, winding of relay 12, and left-hand winding of marginal relay 14 to ground. Relay 14 is marginal and will not operate until both of the tubes 10 and 11 are broken down and current flows through both of the windings of
75 relay 14.

The gaseous conductor or discharge tubes 10 and 11 are tubes filled with a low pressure gaseous content, which, for purposes of illustration, might be of gases of the helium
80 group. They will have the characteristic that they will break down and become conductive on one voltage, but once broken down, will remain in a conductive state on a much lower voltage. Accordingly the voltage of battery 18 will be adjusted to be just below the critical or break-down voltage of the discharge tubes 10 and 11. The resistance 17 is placed in series with the tubes
85 because their resistance decreases with increase of current flow. Under these conditions, the tubes are non-conductive and the secondary windings of transformers 7 and 8 will be in an open condition. Accordingly
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the incoming signaling frequencies A_1 and A_2 coming in over circuit 2 will have their voltages stepped up to a high value by the transformers. This increase in the voltage applied to the tubes 10 and 11 will cause them to break down and become conductive. They will remain in a conductive state due to the voltage from battery 18. The break-down of both tubes in response to the incoming frequencies A_1 and A_2 will close circuits through both of the windings of marginal relay 14 and it will operate. The operation of relay 14 will apply battery to circuit 19 and light the signal lamp 20.

If it is desired to extinguish the signal lamp 20, a source of potential may be applied to the sleeve of jack 21 and the relay 16 operated. This will open the previously traced circuits through the discharge tubes and windings of relay 14 and will release relay 14 and return the tubes to a state of non-conductivity.

In order to guard against false operation of the signaling means and to make it essential that both frequencies A_1 and A_2 be received together to obtain a signal, the relays 12 and 13 are provided. If only one frequency, such as A_1 , were transmitted over the line, this frequency would have its voltage stepped up and would break down tube 11, which in turn would be held in conductive state by the voltage of battery 18. The breaking down of tube 11, as has been pointed out, would close a circuit through the right-hand winding of relay 14, which, however, due to its marginal characteristics, would not operate. The closing of this circuit would operate relay 13. This would close a circuit from ground, through the right-hand winding of relay 16, over the left-hand contact and armature of relay 14, to battery. This would operate relay 16 and would open the circuit from battery 18 to the tube 11 and would allow the tube to return to a state of non-conductivity. In a similar manner, the reception of a single frequency, such as A_2 , might break down the tube 10. However, this would cause relay 12 to operate relay 16 to open the circuit for the tube again.

It is pointed out that the reception of both frequencies A_1 and A_2 together, will operate the marginal relay 14 and this will remove battery from its left-hand contact. Under these conditions the operation of relays 12 and 13 will not affect relay 16. Relays 12 and 13 should be slower acting than relay 14, to permit the operation of the latter before relays 12 and 13 establish a ground contact upon the right hand winding of relay 16.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing

from the spirit of the invention as defined by the appended claim.

What is claimed is:

A transmission line, a circuit associated therewith selective for a certain signaling frequency, a second circuit associated with said line and selective for another signaling frequency, individual circuits associated with each of said selective signaling circuits, each of said individual circuits including a low pressure gaseous discharge tube having the characteristic that it will break down on one voltage and remain conductive on a lower voltage and a source of current having a voltage between said two last mentioned voltages, responsive means under the joint control of both of said individual circuits, said responsive means having a marginal characteristic and operating only when both of said tubes are broken down together, and means controlled by the breaking down of a single tube for disconnecting said source of current from said tube to restore it to a non-conductive state.

In testimony whereof, I have signed my name to this specification this 3rd day of March, 1928.

NEAL D. NEWBY.

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