

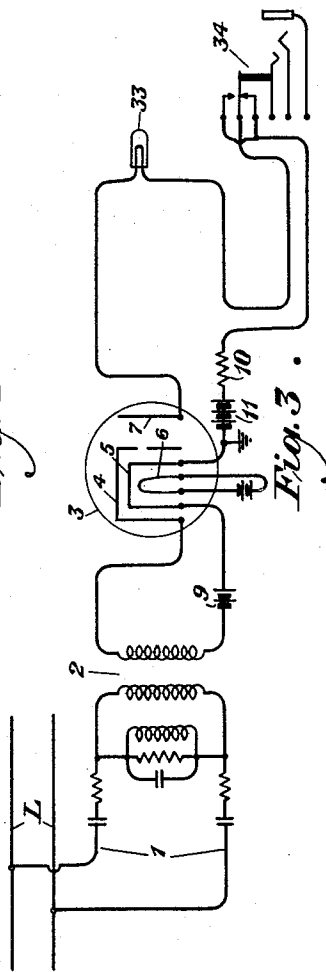
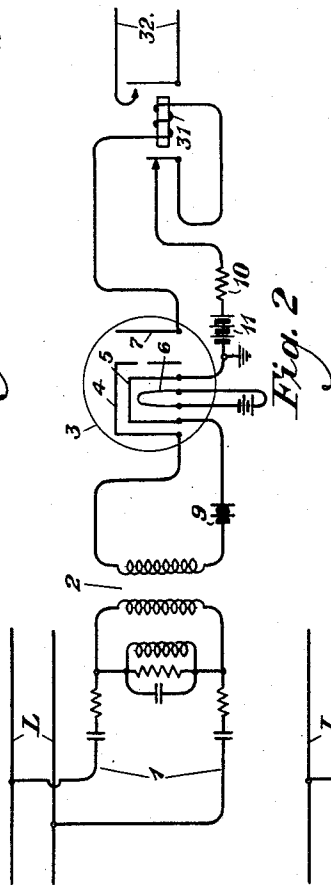
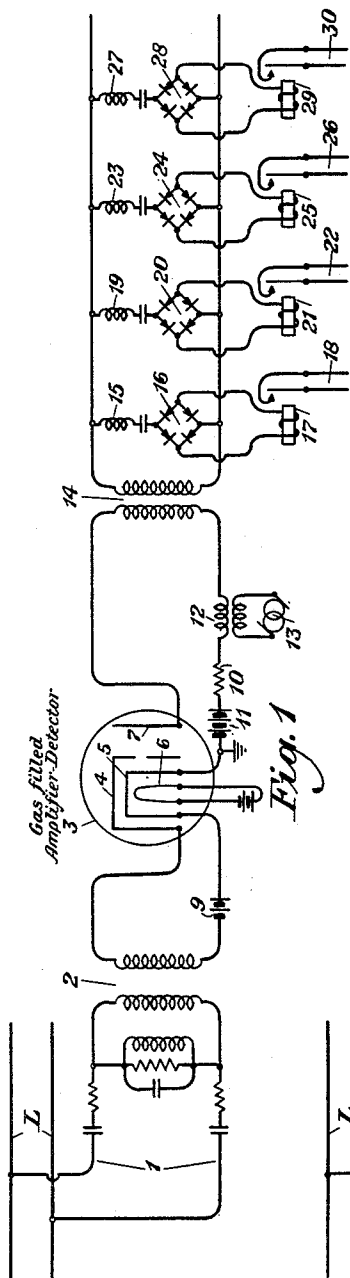
Feb. 21, 1933.

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1,898,118

SIGNALING SYSTEM

Filed Nov. 10, 1931



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SIGNALING SYSTEM

Application filed November 10, 1931. Serial No. 574,205.

This invention relates to transmission systems and more particularly to improvements in signaling arrangements associated with such systems.

5 The signaling arrangements of the invention are particularly useful on telephone systems. An illustration of a particular type of telephone system on which the arrangements of the invention might be used would
10 be the case where frequencies within the voice range are utilized for signaling purposes and in which it is desired to obtain several distinctive signals. For example, a base frequency of 1000 cycles might be utilized for
15 signaling and this frequency might be interrupted at different rates, such as 15, 25, 35 and 45 cycles, to give distinctive signals. Reference is had to the above specific system for purposes of illustration only and the
20 signaling arrangements of the invention are capable of use with other types of transmission systems.

In the 1000 cycle toll signaling system above referred to, it has heretofore been the
25 practice to utilize a two-stage receiving amplifier-detector which employs a plurality of high vacuum thermionic tubes. Signaling current of 1000 cycles is used and is interrupted at the rate of 20 cycles per second in
30 order to give the signal a distinguishing characteristic and so as to aid in avoiding interference from the voice currents and transients. The used output of the detector is effectively 20 cycle current. This current
35 operates a sensitive polar relay which, through its contacts, causes a condenser to be alternately charged and discharged through a local direct current relay and an inductance which tunes the circuit to 20
40 cycles. The local direct current relay would control a local signaling circuit. In the above type of system an amplifier is employed ahead of the detector tube because the use
45 of three electrode vacuum tubes requires this in order to obtain sufficient power for the

operation of the polar receiving relay with the low values of signaling current used in practice. A sensitive polar relay is necessary for receiving because sufficient energy is not received from the detector to operate
50 directly the types of direct current relays available for use in the local signaling circuits.

In the arrangements of the invention a gas filled thermionic tube is utilized in place of
55 the separate amplifier and detector tubes of other types of systems. This presents an advantage of economy and improvement in operation. One tube unit will accomplish the result that heretofore needed a plurality
60 of tube units. Furthermore, the characteristics of the gas filled thermionic tube are such that it has high sensitivity to small changes in applied input voltage and relatively large output currents may be drawn
65 from it when ionization takes place and the current once starts to flow from the cathode to the plate. A further advantage of the arrangements of the invention consists in the
70 fact that the sensitive polar receiving relay of former systems may be eliminated because of the increased output available from the gas filled detector tube. The elimination of the sensitive polar receiving relay will greatly
75 reduce maintenance problems. Other advantages and features of the arrangements of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in the Figures 1, 2 and 3 of which the invention is illustrated. Fig. 1 is a circuit diagram embodying a preferred form of the
85 invention. Figs. 2 and 3 are modifications thereof. Similar reference characters have been utilized to denote like parts in all of the figures.

In Fig. 1 is shown a transmission line L
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over which signaling currents might be transmitted. For example, a base frequency of 1000 cycles might be utilized for signaling purposes. In order to obtain several distinctive signals this base frequency might be interrupted at different rates such, for example, as 15, 25, 35 and 45 cycles. Bridged across line L would be a receiving circuit 1 which would be tuned to the base signaling frequency transmitted over line L when interrupted at the rate of 15, 25, 35 and 45 cycles. Connected through transformer 2 to circuit 1 would be the gas filled thermionic amplifier-detector tube 3. This would have a grid 4, a cathode 5, a heater 6 for the cathode, and a plate electrode 7. The grid bias potential from battery 9 might be chosen so as to be properly related to the normal signal voltages applied to the grid so that current will flow from cathode to plate only when the receiving current approaches the desired input value. Alternating current from source 13 appreciably higher than any of the frequencies used for interrupting the signaling current, that is, considerably higher than 45 cycles, is superimposed through transformer 12 on the plate current from battery 11 in order to act as a means of quenching the arc when this is established by the input signal. The peak voltage of this alternating current would probably be approximately equal to that of the fixed direct current voltage. A current limiting resistance 10 is also shown in series with the output circuit of the detector in order to limit the plate current to a desired maximum value.

The action of the gas filled tube 3 in the circuit shown would result in unidirectional pulses of current at the rate of the speeds of interruption of the signaling current, namely 15, 25, 35 and 45 cycles, if these rates of interruption were employed. An output transformer 14 is used to deliver effectively alternating current of these frequencies to the local signal receiving circuits. A series resonant circuit of a fairly high degree of selectivity is used in each one of the local signaling branches for each of the low frequencies to be received from the detector. These series resonant circuits are shown as 15, 19, 23 and 27. Since continuous direct current is the final form desired in each of the local signaling relays 17, 21, 25 and 29, rectifiers 16, 20, 24 and 28, which might be of the copper oxide variety, are shown included in each of the local signaling circuits. The relays 17, 21, 25 and 29 respond selectively to the different signaling currents transmitted over line L. The relays 17, 21, 25 and 29 might control local signaling circuits 18, 22, 26 and 30 as shown.

With a gas filled tube, once the arc has started, it will continue without further application of an input signal, if a suitable posi-

tive plate voltage is maintained without superposed alternating current to quench the arc. Accordingly, a gas filled tube in accordance with the arrangements of the invention may be used to provide in effect a locking input signal for a transmitted signal of very short duration, or it may be employed to give a flashing signal in response to a continuous transmitted signal.

In Fig. 2 is shown a modification of the invention in which a gas filled tube is utilized to provide a flashing signal in response to a continuous transmitted signal. In Fig. 2 similar reference characters have been utilized to denote like parts with respect to Fig. 1. In Fig. 2 is shown a line L connected by the tuned circuit 1 and transformer 2 to the input of the gas filled amplifier-detector tube 3. The output or plate circuit of the tube includes the winding of a relay 31. If a continuous signal is transmitted over line L and to the tube 3, the tube will break down and current will flow in the plate circuit. This will operate relay 31 which will open the plate circuit and extinguish the arc. This cycle of operations will again be repeated and the relay 31 will be operated intermittently in response to a continuous transmitted signal. The relay 31 may operate any desired type of local signaling circuit 32.

In Fig. 3 is shown a further modification of the invention in which a gas filled tube is utilized to provide in effect a locking input signal for a transmitted signal of short duration. Similar reference characters have been utilized in Fig. 3 to denote like parts with respect to Fig. 1. In Fig. 3 the plate circuit of the gas filled tube 3 is completed over the contacts of a jack 34. A signal lamp 33 may also be included in the plate circuit. As has been pointed out with a gas filled tube, once the arc has started in the tube, it will continue without further application of an input signal. Accordingly, even if the applied signal is of very short duration, the plate circuit of the tube 3 will remain closed when the arc has once started in the tube due to the applied signal, and the lamp 33 will remain lighted after the input signal has closed. The opening of the contacts of jack 34 will extinguish the arc and put out the lamp 33.

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 claims.

What is claimed is:

1. A transmission line over which signaling currents are transmitted, a signaling circuit connected to said line and tuned to receive currents of said signaling frequency, a single

gas filled thermionic tube in said signaling circuit operating as an amplifier-detector for said signaling currents, a plurality of individual signal circuits each including rectifying means and direct current signal controlling relays, and means for applying the output of said amplifier-detector tube to said individual signal circuits.

2. A transmission line over which signaling currents of a base frequency interrupted at various rates of frequency are transmitted, a signaling circuit connected to said line and tuned to receive currents of said signaling frequencies, a single gas filled thermionic tube in said signaling circuit operating as an amplifier-detector for said signaling currents, a plurality of individual signal circuits each including rectifying means and direct current signal controlling relays, each of said individual circuits being tuned to different ones of the rates of frequencies at which said base frequency is interrupted, and means for applying the output of said amplifier-detector tube to said individual signal circuits.

3. A transmission line over which signaling currents of a base frequency interrupted at various rates of frequency are transmitted, a signaling circuit connected to said line and tuned to receive currents of said signaling frequencies, a single gas filled thermionic tube in said signaling circuit operating as an amplifier-detector for said signaling currents, a plurality of individual signal circuits each including rectifying means and direct current signal controlling relay, each of said individual circuits being tuned to different ones of the rates of frequencies at which said base frequency is interrupted, means associated with the plate circuit of said tube for periodically quenching the arc created when said tube discharges, and means for applying the output of said amplifier-detector tube to said individual signal circuits.

4. A transmission line over which signaling currents are transmitted, a signaling circuit connected to said line and tuned to receive currents of said signaling frequency, a single gas filled thermionic tube in said signaling circuit operating as an amplifier-detector for said signaling currents, signaling means controlled by the output current from said tube, and means associated with the plate circuit of said tube for quenching the arc created when said tube discharges.

5. A transmission line over which signaling currents are transmitted, a signaling circuit connected to said line and tuned to receive currents of said signaling frequency, a single gas filled thermionic tube in said signaling circuit operating as an amplifier-detector for said signaling currents, a relay having its winding in series in the plate circuit of said tube, contacts controlled by said relay for opening said plate circuit, and signaling means controlled by said relay.

6. A transmission line over which signaling currents are transmitted, a signaling circuit connected to said line and tuned to receive currents of said signaling frequency, a single gas filled thermionic tube in said signaling circuit operating as an amplifier-detector for said signaling currents, a signaling device in the plate circuit of said tube, and switching means for opening said plate circuit.

In testimony whereof, I have signed my name to this specification this 9th day of November 1931.

CHARLES S. DEMAREST.

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