

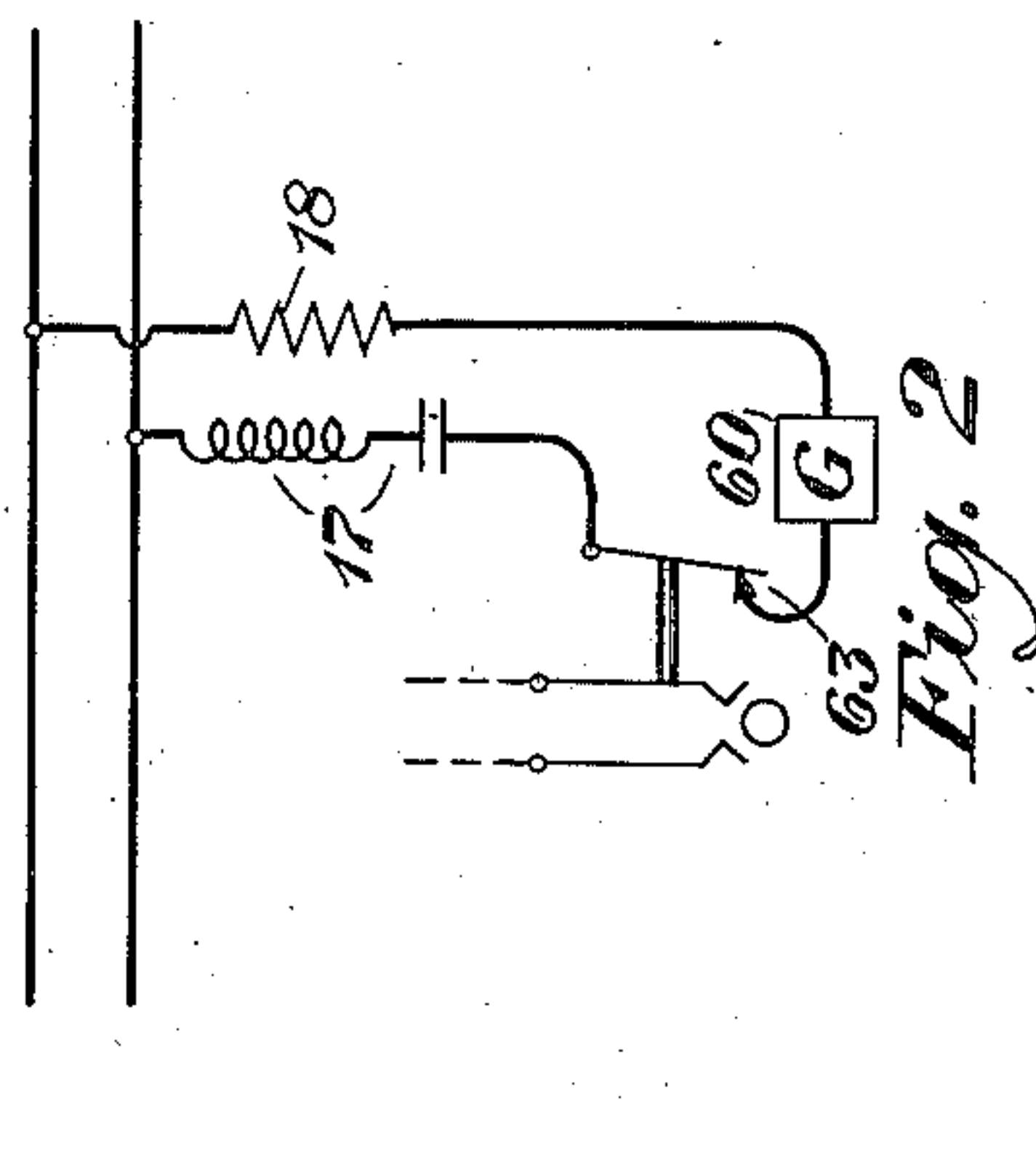
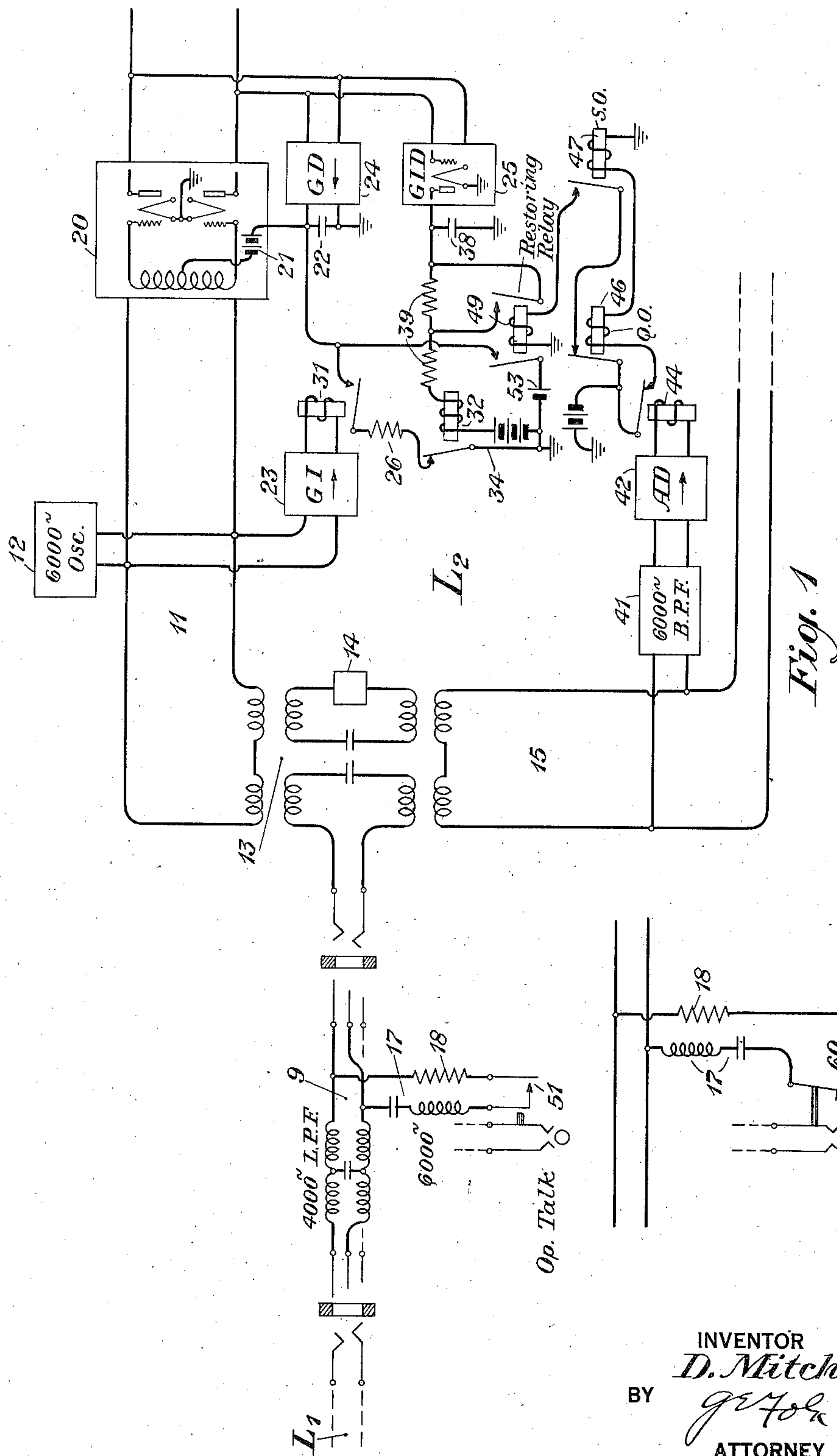
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SIGNALING SYSTEM

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SIGNALING SYSTEM

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5 Claims. (Cl. 178—44)

This invention relates to transmission lines having automatic gain control circuits connected thereto and, more particularly, it relates to means for the control of a voice operated gain adjusting device now known in the art as a vogad.

5 A vogad is a device which receives speech messages of different volumes as that from a strong speaker and that from a weak speaker, and within certain limits changes or adjusts its own gain in such manner that the volume delivered by the
10 vogad is practically constant, that is, practically independent of the volume of the incoming speech. Such a device may take on a variety of forms, but its general structure and behavior is well indicated by the patent to Hogg et al., No.
15 1,853,974, April 12, 1932. It consists essentially of a gain device such as a vacuum tube amplifier, the gain of which is determined by the biasing voltage on its grid. This biasing voltage, usually
20 determined by the charge on a condenser, is increased or decreased, or held stationary, depending on the volume of the incoming speech message.

The vogad, in general, has a gain increaser associated with the input of the amplifier which
25 permits change of charge on a condenser if the received volume is below a certain value in such direction as to increase the gain of the amplifier. It also has a gain decreaser associated with the
30 output of the amplifier which changes the charge on the condenser in the reverse direction if the output of the amplifier is too large. And, it also has a gain increase disabler which prevents further effect by the gain increaser if the output
35 volume is above a certain level. All of this is described in the above patent to Hogg et al., and its association, as well as its cooperation, with a telephone communication system is further disclosed, quite fully, in British Patent, No. 381,831.

40 A transmission line having the volume of the signals thereon maintained substantially constant by such a vogad will, at the time of connecting a toll line or subscriber line to the transmission
45 line, have the vogad first adjusted by the speech of the operator at the central office making the connection, and then by the speech of the subscriber on the toll line. The speech currents of the operator will usually be relatively strong and operate the vogad circuits to lower the gain on
50 the transmission line prior to the operation of the vogad by the speech currents of the subscriber. The voice currents of the subscriber received on the transmission line from the toll line are often much weaker than the voice currents received on the transmission line from the

operator's talking circuit. Accordingly, at the time of connection of the toll line to the transmission line, the voice operated gain control circuits are often set for a much lower gain than is required by the speech currents from the toll
5 line, and this may, in fact, be so low that if the subscriber is a weak speaker his speech message may not effectively operate the various devices which it is expected to operate, until the lapse of an appreciable time during which several syllables
10 of the speech may be lost.

The object of this invention is to provide means whereby this difficulty is obviated. More specifically, one object of the invention is to provide a central office for connecting a toll line to a
15 transmission line having a vogad connected thereto, with means under the control of the operator at the central office to adjust the setting of the vogad approximately to the appropriate setting for a talker on the line and to do this
20 prior to arrival of speech message from the toll line. Another object of the invention is to do this without resorting to the use of direct current supply through the cord operator's circuit. This for the reason that most of the D. C. channels,
25 both on the sleeve and on the main transmission circuit, will already have been set aside for other functions.

The invention will be better understood by reference to the following specification and the accompanying drawing, in which Figure 1 shows one specific circuit arrangement by which my invention may be carried out, and Fig. 2 shows a modification of a portion of the circuit of Fig. 1 and indicates a different method by which the
35 broad purposes of the invention, as given above, may be carried out.

Broadly, the circuit, which is shown in the figures to remedy the difficulty, provides a function in the operation of the system so that when the
40 operator throws her talking key from the talk to the normal position (or from talk to monitor) she will cause the vogad to be brought to a neutral condition, and also under the same control will cause its gain to be brought up to some pre-
45 determined value. This action will take place in a very short time, and after that the action of the vogad will proceed in a normal manner.

Referring particularly to Fig. 1, which illustrates one circuit for carrying out my invention,
50 there is shown at the left-hand side of the drawing the operator's cord 9 which is adapted for associating the line L₁ with the transmission line L₂, the whole being adapted to change the communication circuit from a two-wire basis, as in
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L₁, to a four-wire basis, as in L₂. Associated with the transmission side 11 of the transmission line L₂, is a source of oscillations 12 preferably of a frequency somewhat above that to be used for the transmission of speech. This generator is supplied primarily to perform a number of functions at the terminal of the line L₂, some of which functions are described in detail in the British patent, cited above, or in the application of Wright & Mitchell, Serial No. 756,334 filed December 6, 1934, and in this modification of my invention I propose to use this source of oscillations to carry out the purpose of this invention. The transfer from the two-wire to the four-wire basis, or the reverse, is accomplished by means of a hybrid terminating set 13 of a form now well known in the art. With this hybrid coil is associated a balancing network 14 of such impedance characteristics as to quite closely match the impedance of the incoming toll line over the band of frequencies used for speech transmission. Under these circumstances, as is well understood, the transmitting side of the line 11 is in conjugate relationship to the receiving side 15. In the main transmission path of the operator's cord circuit I include a 4,000 cycle low-pass filter which will cause practically no loss in the voice range (250 to 3,000 cycles) but will present a high impedance at 6,000 cycles. Also, bridged across the cord circuit is a circuit consisting of a resistance 18 of say 600 ohms in series with a 6,000 cycle tuned circuit 17, this circuit being closed when the operator's key is thrown. The introduction of this tuned shunt circuit will cause very little reaction on the voice band, but will effectively terminate the circuit in approximately 600 ohms at a frequency of 6,000 cycles. The value of 600 ohms is taken for illustrative purposes on the basis that the impedance, as seen looking into the toll line, is 600 ohms, this being a more or less standard value in present day telephone communication. If the impedance of the line should change, then the impedance of the balancing network and the impedance of the shunt circuit should be correspondingly changed.

Referring more specifically now to the four-wire terminating circuit, there is shown the vogad and the arrangements for bringing it to a neutral condition. For simplicity the vogad is shown in conventional form only, and briefly, it consists of the balanced amplifier circuit 20, the gain of which is determined by the biasing voltage of the battery 21 and the charge on the condenser 22. Associated with this amplifier are the gain increaser 23, the gain decreaser 24, and the gain increase disabler 25. As described in greater detail in the references mentioned above, the gain increaser 23 operates through the relay 31 to permit the leakage of charge from the condenser 22, this relay being operated whenever the incoming speech is above that corresponding to the weakest speech to be transmitted. If the incoming speech is above this minimum level and if the gain of the amplifier 20 is such as to give a power at the output of 20 in excess of a predetermined amount, the gain increase disabler 25 operates the relay 32 to open the conductor 34, thus preventing further leakage of charge from the condenser 22 through the contact of relay 31. Furthermore, if the power output of the amplifier 20 exceeds a certain predetermined value the gain decreaser 24 permits the building up of a charge on the condenser 22 in a direction to place further negative bias on the grids of the amplifier 20, thus decreasing the gain.

In order to control the rate at which the condenser 22 discharges on operation of the relay 31, a resistance 26 is introduced in series with the conductor 34. Also, in order to give the disabler 25 a desired slow release characteristic a condenser 38 and a resistance 39 are inserted in the output circuit of the disabler 25, in the manner shown. As thus far described, the circuit has the characteristics of the vogads used in the circuits referred to above.

Certain additions to the circuit, in order to carry out the purposes of my invention, will now be described. When the operator's talking key is normal the balance between the network on the four-wire terminating set and the line is very poor at 6,000 cycles due to the fact that, although there is a 600 ohm impedance in the balancing network, the low pass filter in the operator's set offers a high impedance at 6,000 cycles. Consequently, 6,000 cycle power will be transferred across the hybrid coil and pass through a band-pass filter 41 to operate the amplifier-detector 42 with its relay 44. This relay in turn operates two other relays, one of which, 46 is quick operating, and the other of which, 47, is slow operating. The quick operating relay 46 applies battery to the armature of the slow operating relay 47, but the latter, upon being operated, removes battery from a restoring relay 49. Since the latter relay is unoperated the action of the vogad is normal, as described above.

When the operator throws the talking key, closing contact at 51, it effectively terminates the line with 600 ohms, so far as 6,000 cycles is concerned, and the lines 11 and 15 are then substantially conjugate to each other so that there is a very considerable decrease in the 6,000 cycle power passing through the hybrid coil to the filter 41. Consequently, the relay 44 is released and this causes both the quick operating and slow operating relays 46 and 47 to release, thus removing battery from the contact of the relay 46 and from the armature of the relay 47.

During the time that the operator talks the gain of the vogad will be adjusted to a fairly low value due to the operator's loud speech. When she finishes talking, however, and releases the talking key, the 6,000 cycle power is again transmitted with comparatively small loss across the hybrid coil thus operating the relay 44. This causes the almost immediate operation of the quick operating relay 46 thus placing battery on the armature of the slow operating relay 47. During the time that the armature of the relay 47 does move, however, the restoring relay 49 will be operated, and this latter performs two functions.

In the first place, a substantial portion of the resistance 39 is short-circuited, thus the condenser 38 which gives the relay 32 its slow release is charged up very quickly and this relay has to release placing the device, as a whole, in a condition to increase gain if necessary. A small portion of the resistance 39 is still preferably kept in the circuit so that the tube in the gain increase disabler 25 will not be harmed by an excessive value of current.

The second function performed by the restoring relay, when thus operated, is to connect a battery 53 across the condenser 22 which controls the gain of the variable repeater or amplifier 20. This battery 53 may be of any specified value, positive or negative or zero, which will give the repeater 20 such predetermined value of gain as is desired.

The operations described above can be made to take place in a comparatively short time, perhaps about 1/20 of a second. After that the slow operating relay 47 will operate, the restoring relay 49 will release, and the operation of the vogad will be normal. However, it will be evident that the disabling of the slow release of the relay 32 and the setting of the gain of the repeater 20 at some fairly high predetermined value will give the subscriber a better opportunity to both increase the gain of the vogad, if necessary, and successfully operate the other apparatus incidental to the circuit, as a whole, on his first few words.

In the circuit of Fig. 1, use has been made of the oscillator 12 for the reason that in some circuits of this type such a generator is present in connection with certain other functions, which are to be performed. It should be apparent, however, that an oscillation generator, quite independent of the generator 12 and even of a different frequency, may be used if desired; that such a generator might be supplied for the specific purpose of this invention in the event that an oscillation generator is not already present in connection with the performance of other functions, and also that such a generator might be placed in other portions of the circuit. Such a modification is shown, for example, in Fig. 2, in which generator 60 of any desired frequency, preferably outside the voice range, is placed in series in the tuned circuit 17, the contact to be controlled by the operator's key being such, as shown in Fig. 2, that the generator circuit is normally closed permitting the flow of power from the generator to the filter 41 in the same manner that power ordinarily flows from the generator 12 of Fig. 1. When the operator talks the contact at 63 is opened and the relay 44 is released. When she finishes talking, however, power from the generator 60 is again transmitted and the relay 44 is operated to bring about the succeeding steps, all as described in connection with Fig. 1.

What is claimed is:

1. In a signaling system, a transmission path, control means for automatically maintaining the signals on said path at substantially constant volume, a toll line, a central office having means for connecting said toll line to the transmission path, an A. C. source associated with the transmission path, and means operated at the central office at the time of connecting the toll line to the transmission path and prior to the operation of the control means by the signals from the toll line whereby power from the A. C. source resets the control means to a value appropriate for the volume of signal coming from the toll line.

2. In a signaling system, a transmission path, a vogad associated with said path for maintain-

ing the signals on the path at substantially constant volume, an A. C. source of a definite frequency associated with the transmission path, a toll line, a central office having means for connecting said toll line to the transmission path, and means associated with the vogad for quickly increasing its gain, said means being controlled by current from the A. C. source, and further means for permitting the said current to exercise its control at the time of making the connection to the toll line.

3. In a circuit of constant volume having separate paths for transmitting in opposite directions and adapted to be switched to a two-wire subscriber circuit, a vogad in the transmission path of the first-mentioned circuit to deliver substantially constant volume of speech message, a source of pilot current associated with the transmission path, an operator's set with a cord circuit at the switching point delivering relatively high volume to the input of the vogad and so reducing its gain, means associated with the vogad and controlled by current from the pilot source which upon its connection to the operator's talking key quickly resets the vogad gain to a normal gain.

4. In a circuit of constant volume having separate paths for transmitting in opposite directions and adapted to be switched to a two-wire subscriber circuit, a vogad in the transmission path of the first-mentioned circuit to deliver substantially constant volume of speech message, a source of pilot current associated with the transmission path, an operator's set with a cord circuit at the switching point delivering relatively high volume to the input of the vogad and so reducing its gain, means associated with the vogad and controlled by current from the pilot source which upon its connection to the operator's talking key quickly resets the vogad gain to a gain appropriate for a distant subscriber's message.

5. In a circuit of constant volume having separate paths for transmitting in opposite directions and adapted to be switched to a two-wire subscriber circuit, a vogad in the transmitting path of the first-mentioned circuit to deliver substantially constant volume of speech message, an operator's set with a cord circuit at the switching point, the operator's set delivering relatively high volume to the input of the vogad and so reducing its gain, an oscillation generator associated with the cord circuit and controlled by the key of the operator's set, and means associated with the vogad whereby upon this connection of the operator's talking key power from the generator quickly resets the vogad gain to a gain appropriate for the distant subscriber's message.

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