

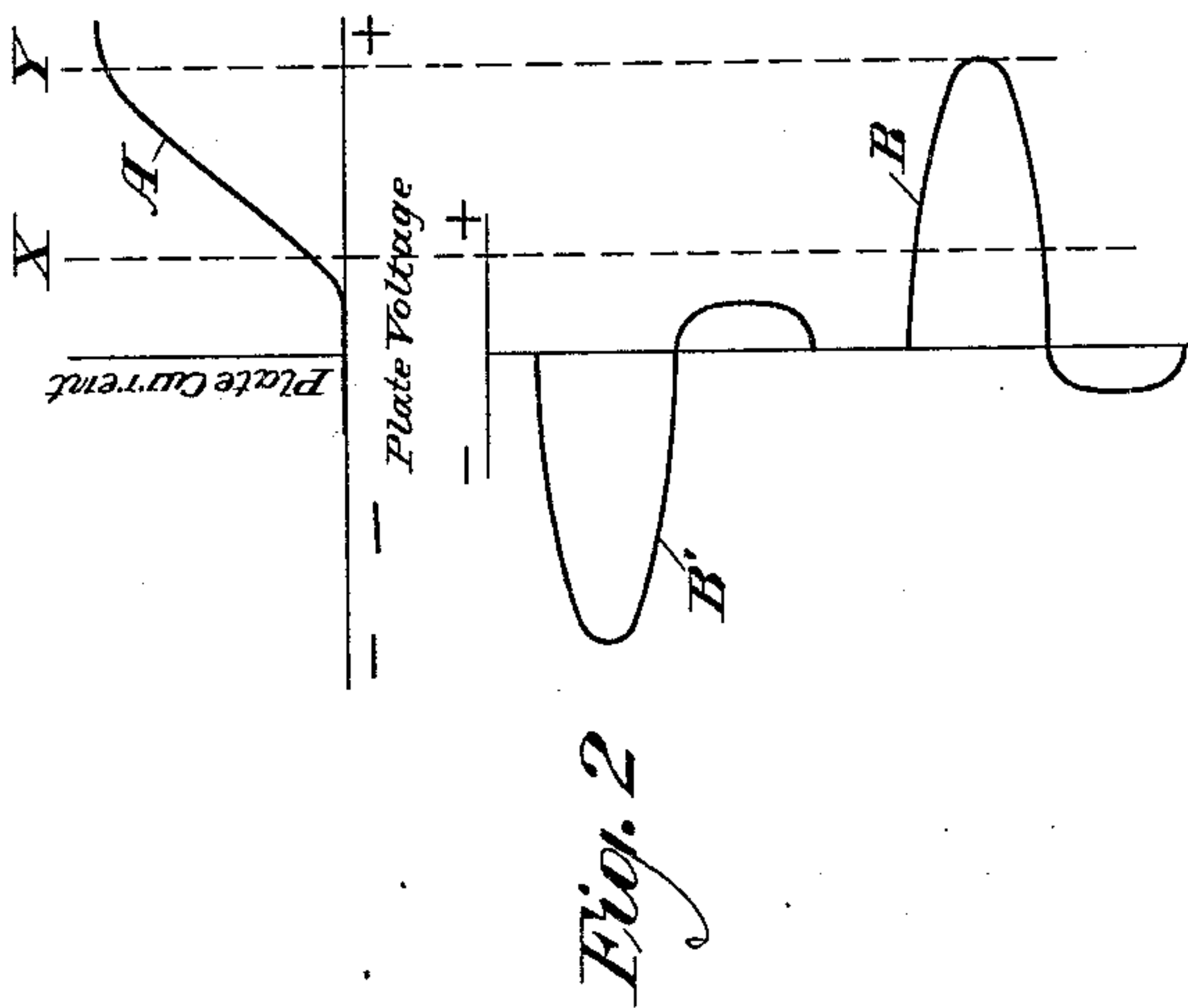
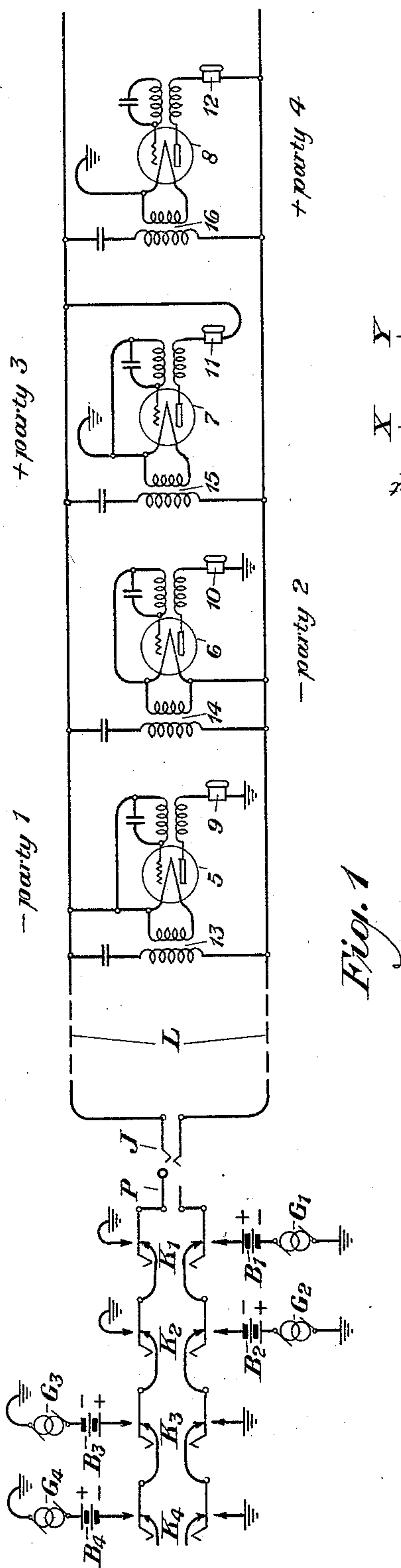
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SIGNALING SYSTEM FOR PARTY TELEPHONE LINES

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SIGNALING SYSTEM FOR PARTY TELEPHONE LINES

Application filed June 15, 1931. Serial No. 544,604.

This invention relates to telephone systems and, more particularly, to improvements in signaling arrangements for subscribers' stations on party lines connected to such systems.

In the signaling arrangements of the invention, there is provided at each subscriber's station, on the party line, a vacuum tube oscillator whose circuits are so arranged that they will be energized entirely by the ringing current coming in over the line. Subscribers' stations with signaling arrangements of this character are disclosed in a copending application in the name of W. H. Edwards, Serial No. 544,605, filed June 15, 1931. An audible, responsive device, such as a telephone receiver, will be included in the plate circuit of each oscillator to signal the subscriber. Alternating signaling current, with direct current of either positive or negative polarity superimposed thereon, will be used for signaling purposes whose signaling feature is derived from the fact that the vacuum tube used in the oscillator circuit will not operate unless the positive side of the plate voltage is connected to the plate. Of the two parties rung on the same side of the line, the plate of one party is connected to the line and the plate of the other party is connected to ground. By ringing with a positive or negative superimposed current, only one party will be signaled at a time under such conditions.

The ringing arrangements of the invention will make it easier to control the pitch and volume of the signal than heretofore and will also give a more pleasing tone than former signaling arrangements. The fact that signaling arrangements of the invention may be operated solely by the incoming ringing current will result in reducing the initial cost of the devices and lower maintenance thereafter, as the use of relays and ringers or a power supply set for the A and B current of an oscillator at each subscriber station is eliminated. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully under-

stood from the following description, together with the accompanying drawings, in Figures 1 and 2 of which the invention is illustrated. Fig. 1 is a circuit diagram showing the selective signaling arrangements of the invention, as applied to a four-party line. In Fig. 2 are shown curves illustrating the general manner in which selectivity between the various subscribers is obtained.

In Fig. 1 is shown a line L to which would be connected a plurality of subscribers' sets. This line would terminate at a central office in the jack J. As the ringing is accomplished by utilizing alternating current with direct current of either polarity superimposed thereon, there would be provided at the central office four keys such as K_1 , K_2 , K_3 and K_4 . When the key K_1 is operated, alternating current from the generator G_1 , with positive direct current from the battery B_1 superimposed thereon, will be applied to the ring side of the line L and the tip will be connected to ground. When the key K_2 is operated, alternating current from the generator G_2 , with negative direct current from the battery B_2 superimposed thereon, will be applied to the ring side of the line and the tip will be connected to ground. When the key K_3 is operated, alternating current from the generator G_3 , with positive direct current from the battery B_3 superimposed thereon, will be applied to the tip side of the line and the ring side of the line will be grounded. When key K_4 is operated, alternating current from the generator G_4 , with negative direct current from the battery B_4 superimposed thereon, will be applied to the tip side of the line and the ring side of the line will be grounded. Four subscriber stations are shown and connected to the line. These are the negative party 1, which will be rung by superimposed negative current applied to the tip side of the line; the negative party 2, which will be rung when negative superimposed current is applied to the ring side of the line; the positive party 3, which will be rung when positive superimposed current is applied to the tip side of the line; and the positive party 4, which will be rung when positive superimposed current is

applied to the ring side of the line. At each station, there is provided a vacuum tube oscillator such as the oscillators 5, 6, 7 and 8, which will operate when a certain type of ringing current is applied to one of the lines. Each station will have an audible, responsive device, such as 9, 10, 11 and 12, connected in the plate circuit of the oscillator to give an audible signal to the subscriber.

The operation of the arrangements of the invention is as follows: If it is desired to ring the positive party 3, the key K_3 will be operated, thereby grounding the ring side of the line and connecting positive superimposed current to the tip side of the line. The alternating current will be transmitted through the transformer 15 which is bridged across the line and will furnish a filament current for the tube 7. The plate voltage for the oscillator tube will be obtained from the positive component of the superimposed current consisting of a positive pulse of alternating current from the generator G_3 and positive current from the battery B_3 . The filament will be grounded, whereas the plate circuit will be connected to the tip of the line.

The operation of the oscillator 7 on the positive superimposed ringing current and its non-operation on negative superimposed ringing will be more clearly understood from reference to Fig. 2. An oscillatory vacuum tube circuit has the characteristic that it will oscillate when the applied plate voltage is between certain positive values. During the time the plate is negative, the plate current is zero. Curve A is the characteristic curve for a vacuum tube. The oscillation limits are between the dotted lines X to Y. Curve B illustrates the voltage applied to the plate at party 3 when positive superimposed ringing current is applied to the tip side of the line. It will be seen from Fig. 2 that when the voltage is between the limits X and Y the tube 7 will oscillate and give an audible signal in the receiver 11. When the small negative portion of the voltage from the positive superimposed current is applied to the plate the tube stops operating for the duration of the negative voltage. Curve B' illustrates the voltage across the plate of tube 7 when negative current is applied to the tip side of the line. When the large negative voltage is applied to the plate, the tube 7 will not oscillate. When the smaller positive voltage is applied it is below the oscillation limit X and the tube will not oscillate. Thus selectivity between ringing with positive and negative superimposed currents is provided.

Referring to the negative party 1 on the tip side of the line, the positive superimposed current will not operate the oscillator 5 because the plate of tube 5 is connected to ground and the filament is connected to the tip side of the line. Thus the plate of tube 5 is negative with respect to its filament when

the plate of tube 7 is positive with respect to its filament. To sound the signal of negative party 1, the key K_4 is operated transmitting negative superimposed ringing current over the tip side of the line. Under such conditions the tube 5 will oscillate.

If it is desired to ring the negative party 2, the key K_2 will be operated. This will ground the tip side of the line and apply negative superimposed current to the ring side of the line. The alternating current through the transformer 14 will furnish filament current for the oscillator tube 6. The plate circuit potential is obtained from the superimposed current from the battery B_2 and the generator G_2 . The negative side of the battery is connected to the filament terminal of the plate circuit. The plate electrode is connected to ground and hence to the positive side of battery B_2 . Accordingly, the positive side of the plate voltage is connected to the plate, and the vacuum tube will oscillate and cause the receiver 10 to give an audible signal to the subscriber. The positive party 4 will not be operated by this application of ringing current, as the plate electrode of the tube 8 is connected to the ring side of the line and hence to the negative side of the plate voltage. To operate the positive party 4, the key K_1 should be operated on positive superimposed current applied to the ring side of the line.

In case it is desired to change the sensitivity of the oscillator tubes to the various ringing voltages this may be done by connecting a "C" battery in the grid circuits of the tubes in the well known manner.

The arrangements described herein for superimposed ringing current will of course work satisfactorily on pulsating ringing current as well.

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 party telephone line signaling system comprising a line, means for applying alternating current with direct current of either polarity superimposed thereon to either the tip or ring side of said line, a plurality of subscribers' sets connected to said line, vacuum tube oscillators with audible responsive devices in their plate circuits at each of said subscribers' sets, means for supplying the filament current for each of said tubes from the alternating current applied to the line, and means for obtaining selectivity in the operation of said oscillations by supplying the plate potential for said tubes from the different signaling current potentials applied to said line.

2. A party telephone line signaling system comprising a line, means for applying alternating current with direct current of either polarity superimposed thereon to either the tip or ring side of said line, a plurality of subscribers' sets connected to said line, vacuum tube oscillators with audible responsive devices in their plate circuits at each of said subscribers' sets, means for supplying the filament current for each of said tubes from the alternating current applied to the line, means for grounding the plate of one of said tubes and for connecting the filament thereof to the tip side of the line, means for grounding the plate of another of said tubes and connecting the filament thereof to the ring side of the line, means for grounding the filament of another of said tubes and connecting the plate thereof to the tip side of the line, and means for grounding the filament of another of said tubes and connecting the plate thereof to the ring side of said line.

3. A party telephone line signaling system comprising a line, means for applying alternating current with direct current of either polarity superimposed thereon to one of the sides of said line, a plurality of subscribers' sets associated with said line, vacuum tube oscillators with audible responsive devices in their plate circuits at each of said subscribers' sets, and means for connecting the plate circuits of said oscillators to the side of the line to which said superimposed current is normally applied to signal the subscriber so that the plate of only one of said oscillators will have a positive potential with respect to its filament for a particular application of said superimposed current to said side of the line.

4. A party telephone line signaling system comprising a line, means for applying alternating current with direct current of either polarity superimposed thereon to either side of said line, a plurality of subscribers' sets associated with said line, vacuum tube oscillators with audible responsive devices actuated thereby at each of said subscribers' sets, means for supplying the filament current for each of said tubes from the alternating current applied to said line, means for supplying the plate circuit potential for each of said tubes from the superimposed direct and alternating current applied to said line, and means for connecting said tubes to said line, so that for a given application of said current to said line only one of said tubes will have its plate connected to the positive side of a source of plate potential.

In testimony whereof, I have signed my name to this specification this 12th day of June, 1931.

WILLIAM H. EDWARDS.