

L. H. DARROW.
TRANSMISSION EQUALIZATION ARRANGEMENT.
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1,408,567.

Patented Mar. 7, 1922.

Fig. 1

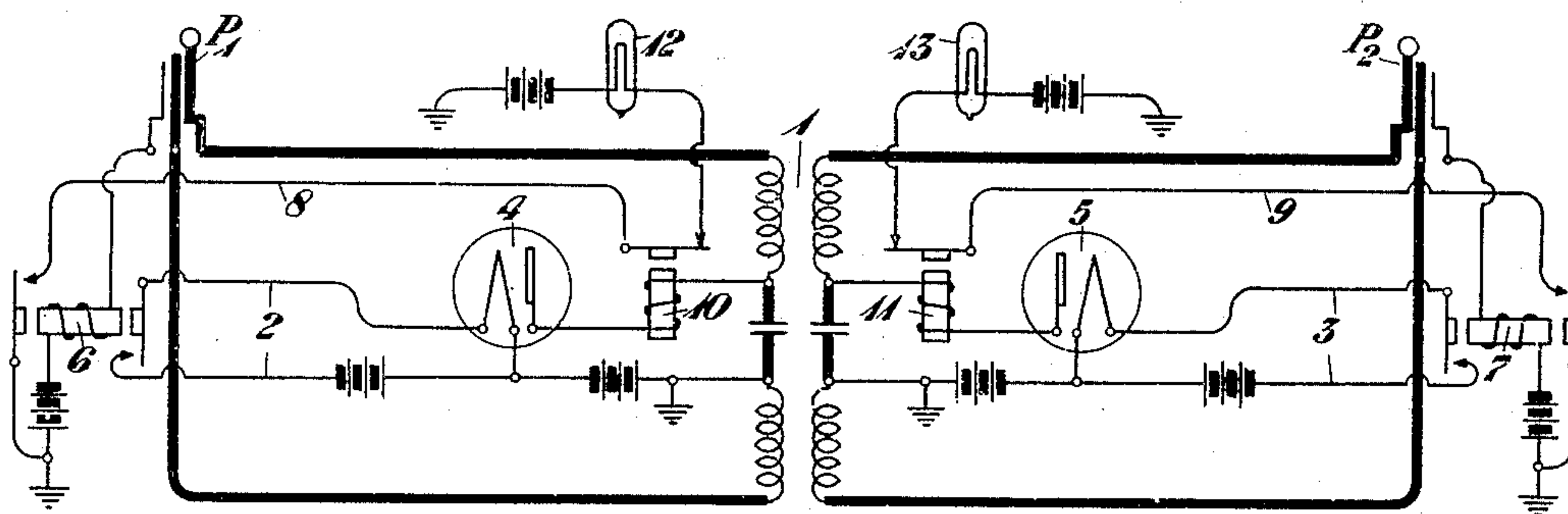
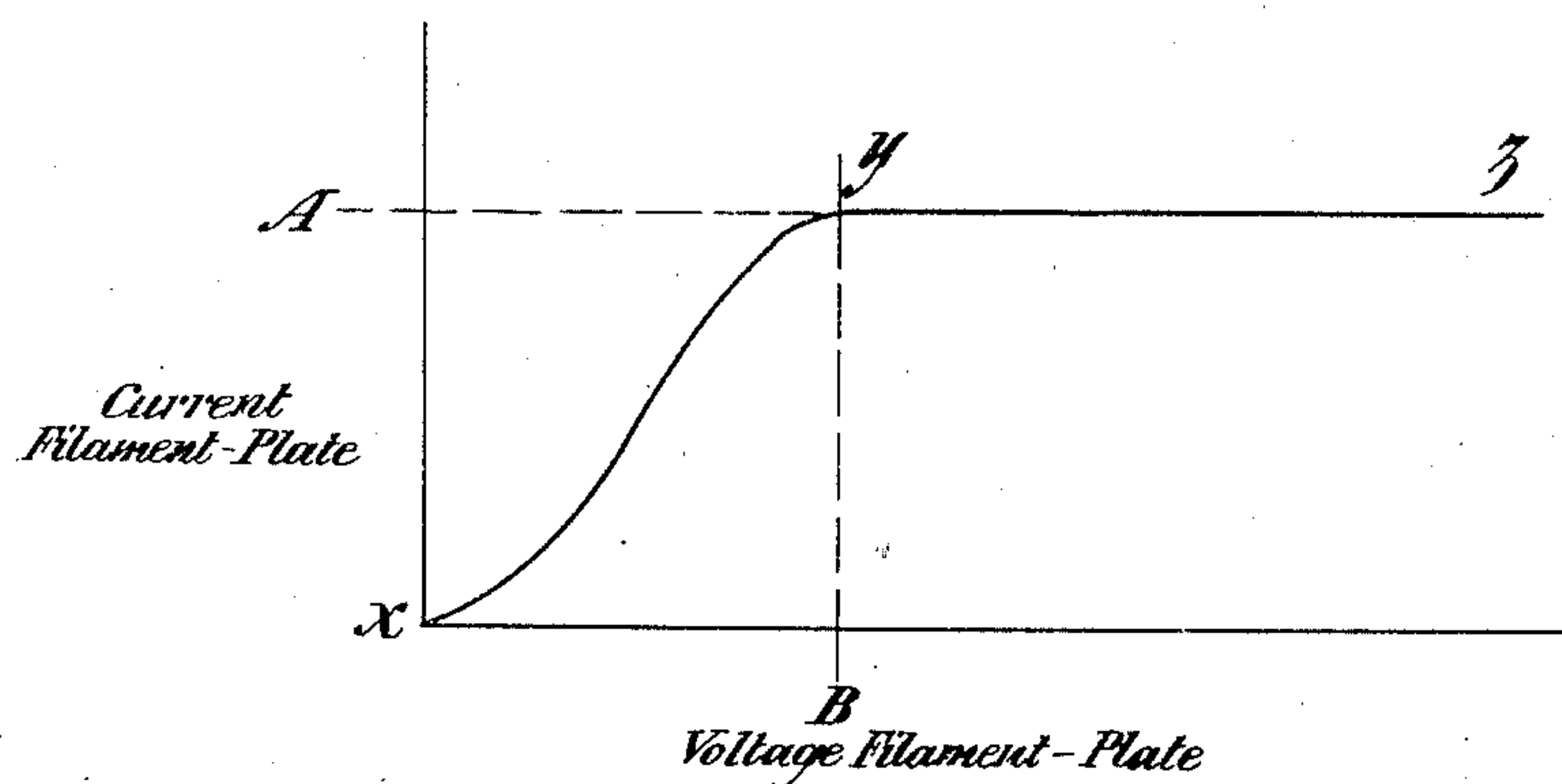


Fig. 2



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TRANSMISSION EQUALIZATION ARRANGEMENT.

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Specification of Letters Patent.

Patented Mar. 7, 1922.

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To all whom it may concern:

Be it known that I, LEO H. DARROW, residing at Brooklyn, in the county of Kings and State of New York, have invented certain
5 Improvements in Transmission Equalization Arrangements, of which the following is a specification.

This invention relates to transmission lines and particularly to arrangements for
10 equalizing transmission over such lines when such lines possess different electrical characteristics.

The arrangements of the invention are particularly applicable to a link, or cord circuit which is used to establish connections with a plurality of subscribers' lines. As
15 the subscribers' lines might be of different lengths and different electrical characteristics, it is apparent that the source of current supply in the former types of link circuits would furnish varying amounts of current over the various lines and thus give variable transmission, the transmission being
20 better over the shorter lines than over the longer lines ordinarily. In general it is the object of the invention to overcome this difficulty and to provide arrangements which will insure equal transmission over the various types of lines. Other objects and purposes of the invention will appear more
25 fully from the detailed description hereinafter given.

The equalization of the transmission is accomplished by the arrangements of this invention by providing a constant battery
35 supply for all of the lines with which connections are established by the link circuit, irrespective of the lengths of said lines. This is accomplished by including in the current supply circuit of the link circuit a vacuum tube arrangement so designed that it will allow to be transmitted therethrough no more than a definite amount of current regardless of the impedance of the circuit in
40 which it is included. In other words, the tube will always allow a constant current to be transmitted therethrough, irrespective of the resistance of the apparatus connected therewith and the tube will be so designed that this constant current will be of a value desirable for use over the longest type of line with which a connection may be made. With such an arrangement no matter
45 whether a connection be made with a long line or a short line a desirable and also a

constant current, or in other words, a current of the same value, will be transmitted over said lines and the transmission over said lines will be substantially of the same volume.

The invention may be more fully understood from the accompanying drawing and from the description of the operation of the arrangements disclosed therein.

In Figure 1 of the drawing the arrangements of the invention are illustrated as associated with a link, or cord circuit while in Fig. 2 is illustrated graphically the characteristic curve of the current transmitted through the vacuum tube device of the invention shown in Fig. 1.

In Fig. 1 there is shown a cord circuit terminating in plugs P_1 and P_2 with which connections may be established with a plurality of types of lines, such as subscribers' lines, which might be of various lengths and different resistances. The cord circuit includes a repeating coil 1. Connected to the left-hand windings of coil 1 is the current supply circuit which includes a source of current for the transmission purposes of the connection established by means of plug P_1 . Connected in series in this current supply circuit is a two element vacuum tube device 4. This device contains two electrodes, a filament, which can be heated to incandescence by an electric current flowing through it, and a plate. The circuit 2 is normally open and is closed by the operation of relay 6 which is included in the sleeve circuit of plug P_1 and which operates when the plug P_1 is inserted into the jack of a line with which a connection is made. When the circuit 2 is closed it causes the filament of the vacuum tube device to be heated to incandescence which allows it to function. Talking current for the connection will then be supplied from the batteries shown through the vacuum tube device, relay 10, the left-hand windings of coil 1, tip and ring strands of the cord, tip and ring contacts of plug P_1 , the jack of the line, and thence over the talking strands of the line. The current through the vacuum tube device is produced by the flow of electrons from the heated filament to the plate. Relay 10 is a supervisory relay which controls the circuit 8 of the usual type of supervisory lamp 12. Associated with the right-hand windings of coil 1 is a current supply cir-

cuit containing a vacuum tube device 5, the operation of which is controlled by the sleeve relay 7. Included in the current supply circuit is supervisory relay 11 which controls the circuit 9 of the supervisory lamp 13.

The characteristic of the current between the filament and plate of a two-element vacuum tube, such as the tubes 4 and 5, as the voltage between the filament and plate is varied is shown graphically in Fig. 2 by the curve XYZ. As the voltage between the filament and plate is increased from zero the current between the filament and plate will be increased until a certain voltage point, such as B, of the potential between filament and plate is reached. It will be noted that after the voltage point B is arrived at the current between the filament and plate does not increase but remains substantially constant, as illustrated by the portion YZ of the curve. The tubes 4 and 5 are so constructed and adjusted that the voltage between the filament and plate, whenever a connection is established with any of the types of lines by the cord circuit, will always be above the minimum point, such as B, and accordingly a constant current, such as YZ, will be supplied through the tubes to the lines, the changes in voltage between filament and plate due to the differing lengths of the lines thus having no effect on the current. While the horizontal part of the current curve shown in Fig. 2 does not continue indefinitely, still a sufficient range may be obtained to allow for variations in the lengths of the lines connected to the cord circuit through all the commercial ranges of resistance. In this manner, no matter whether the cord circuit be connected to a long line or a short line, a constant or equal current flow will result over said lines and the transmission thereover will be substantially the same for all lines. The vacuum tube device thus functions as a current regulator.

While the vacuum tube elements have been shown as of a specific form and in specific circuit arrangements, it is pointed out that the arrangements of the invention are ca-

pable of embodiment in many and widely varied forms and arrangements without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A plurality of lines of different electrical characteristics, a link circuit for establishing connections with said lines, a current supply circuit in said link circuit, and a vacuum tube arrangement in said current supply circuit so adjusted that it will allow to be transmitted therethrough a constant current irrespective of the different electrical characteristics of the lines with which connections are established.

2. A plurality of lines of different electrical characteristics, a link circuit for establishing connections with said lines, a current supply circuit in said link circuit and a vacuum tube arrangement in said current supply circuit adjusted so that it will always operate above the voltage point at which the current across the filament and plate becomes constant.

3. A plurality of lines of different electrical characteristics, a link circuit for establishing connections with said lines, a current supply circuit in said link circuit, and a vacuum tube arrangement in said current supply circuit adjusted so that it will always operate above saturation.

4. A plurality of lines of different electrical characteristics, a link circuit for establishing connections with said lines, a current supply circuit in said link circuit, and a two-element vacuum tube in said current supply circuit so adjusted that it will always operate above saturation irrespective of changes in the voltage across the filament and plate due to the different electrical characteristics of the lines with which connections are established whereby the current across the filament and plate will always remain constant.

In testimony whereof, I have signed my name to this specification this 22nd day of December, 1920.

LEO H. DARROW.