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MULTIPLEX TELEGRAPH SYSTEM WITH MAGNITUDE DISCRIMINATION

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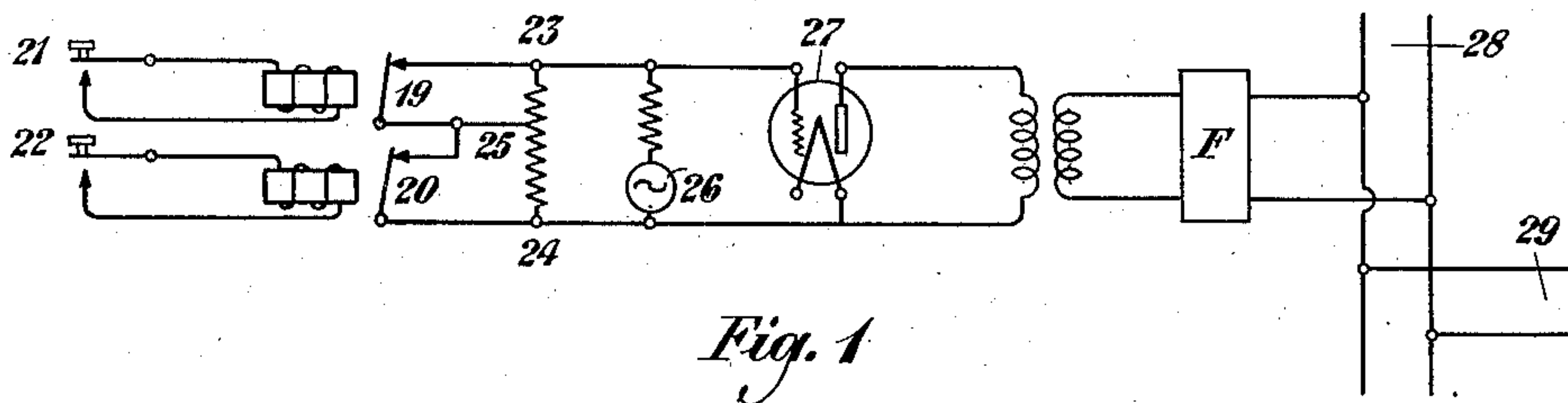


Fig. 1

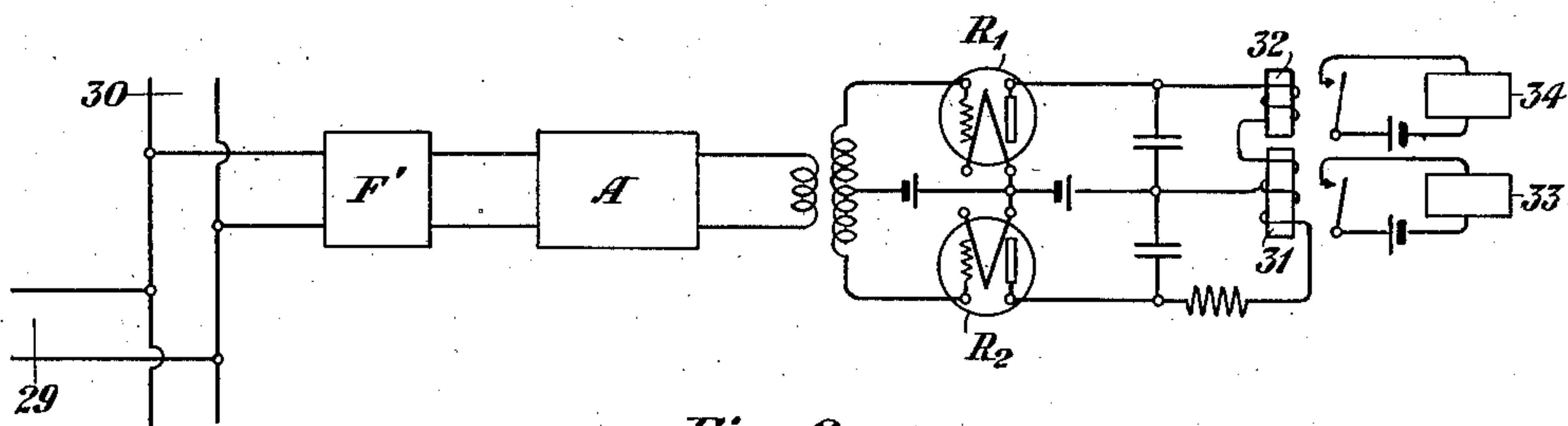


Fig. 2

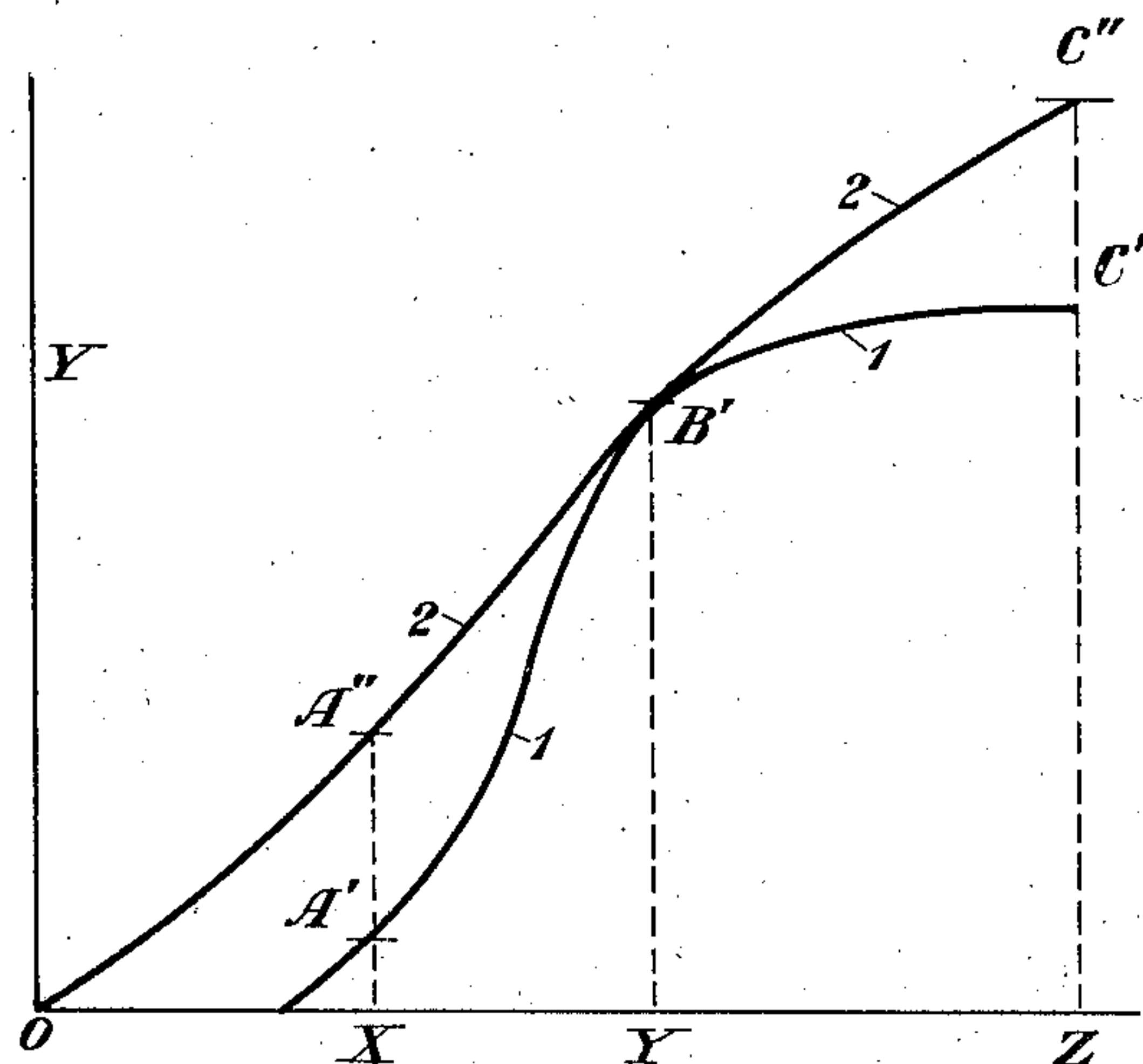


Fig. 3

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MULTIPLEX TELEGRAPH SYSTEM WITH MAGNITUDE DISCRIMINATION.

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An object of my invention is to provide a new and improved system of multiplex telegraphy, in which the discrimination between messages belonging to two different message channels is effected by discrimination of the magnitude of the corresponding signal currents. Another object of my invention is to provide for magnitude discrimination by utilizing vacuum tube rectifiers of different characteristics. These and other objects of my invention will become apparent on consideration of a specific example which I have chosen to be described in the following specification. With the understanding that the description here given applies to this particular embodiment of the invention, the invention will be defined in the appended claims.

Referring to the drawings, Figure 1 is a diagram of the sending end of my transmission system; Fig. 2 is a diagram of the receiving end; and Fig. 3 is a diagram of the characteristics of vacuum tubes employed at the receiving end.

The carrier current generator 26 applies a corresponding electromotive force to the grid of the three-electrode vacuum tube amplifier 27. As shown in Fig. 1, the grid is shunted through the closed armature contacts 19 and 20. The sending key 21 operates when closed to open the contact 19 and interpose the resistance 23, 25 in the shunt referred to, so that a corresponding magnitude of electromotive force is then applied to the grid. On the other hand, the closure of the key 22 opens the contacts at 20 and interposes the resistance 24, 25 and puts a greater magnitude of electromotive force on the grid. Simultaneous closing of the keys 21 and 22 puts an electromotive force on the grid corresponding to the sum of the two electromotive forces determined by the keys 21 and 22 separately. The output current from the amplifier 27 goes through the band filter F to the bus-bars 28 and thence over the line 29 to the receiving station bus-bars 30. The band filter F' corresponding to the filter F receives the carrier current wave trains of corresponding frequency and applies them to the amplifier A and thence to the rectifiers R_1 and R_2 .

These rectifier have the volt-ampere characteristics shown in Fig. 3. The rectifier R_1 is designed and adjusted so that the cur-

rent starts up from zero only after a substantial electromotive force is applied and after an abrupt rise it turns quickly to a nearly constant value as indicated by the characteristic 1. In the other rectifier R_2 of Fig. 2, the current increases more nearly uniformly from zero all the way, as shown by the characteristic 2. The two characteristics touch at the value corresponding to input voltage OY.

When the key 21 is closed at the sending station, the input voltage on the rectifiers R_1 and R_2 is OX. When the key 22 is closed, the input voltage is OY and when both keys are closed simultaneously, this voltage is OZ.

The relay 32 is in the output circuit of rectifier R_1 and the relay 31 has differential windings in the output circuits of both rectifiers R_1 and R_2 . The relay 32 controls the sounder 34, and the relay 31 controls the sounder 33.

When key 21 only is closed, the voltage OX gives an output current XA' from rectifier R_1 and XA'' from rectifier R_2 . The current XA' is too small to actuate the relay 32 but the current XA'' is so much greater than XA' that there is a substantial differential effect in the relay 31 and it operates the circuit of the sounder 33.

On the other hand, when the key 22 alone is closed, the electromotive force OY gives the same output current for the two rectifiers R_1 and R_2 as represented by the ordinate YB'. This current is of sufficient magnitude to operate the relay 32 and its associated sounder 34 but in the relay 31 the effect neutralizes or balances out so that there is no operation of the sounder 33.

When both keys 21 and 22 are closed simultaneously, the electromotive force OZ produces respective currents ZC' in the output circuit of rectifier R_1 and ZC'' in the output circuit of rectifier R_2 . The current ZC'' actuates the relay 32 and the differential current $C'C''$ operates the relay 31, so that both sounders 34 and 33 are operated.

Thus it will be seen that key 21 controls sounder 33 and key 22 controls sounder 34 each independently of the other.

I claim:

1. The method of discriminating between signal currents by their magnitude effect, which consists in applying them simultane-

ously to a plurality of vacuum tubes of different shaped characteristics and getting the differential effect of the output currents from those tubes.

5 2. In a multiplex signaling system, means to send superposed signal currents of different intensity for different message channels, two vacuum tubes of different characteristics to which the said currents are
10 applied, and a differential relay with windings to receive the output currents from both tubes.

3. The method of discriminating between two signal currents by their magnitude effect, which consists in applying them simultaneously to each of two vacuum tubes with characteristics as shown in Fig. 3, and getting the differential effect of the output currents from those tubes.

20 4. In a multiplex signaling system, means to send superposed signal currents of different intensity for different message channels, two vacuum tubes having characteristics of different degrees of curvature and tangent
25 at an intermediate point, a relay in the output circuit of one tube and another relay

having differential windings in the output circuits of both tubes.

5. The method of discriminating between signal currents by their magnitude effect 30 whether such currents are separate or superposed, which consists in applying them to two vacuum tubes of different shaped characteristics and getting the differential effect of the output currents from the tubes 35 for one message channel, and getting the direct effect of the output current from one of the tubes for another message channel.

6. In a multiplex signaling system, means to send superposed signal currents of different intensity for different message channels, two vacuum tubes of different characteristics to which the said currents are applied, a differential relay with windings to receive the output currents from both tubes, 45 and another relay to receive the output current from only one of the said tubes.

In testimony whereof, I have signed my name to this specification this 15th day of December, 1924.

HOWARD V. HUNTER.