

1,312,433.

J. R. CARSON.
TRANSLATING CIRCUITS.
APPLICATION FILED OCT. 10, 1918.

Patented Aug. 5, 1919.

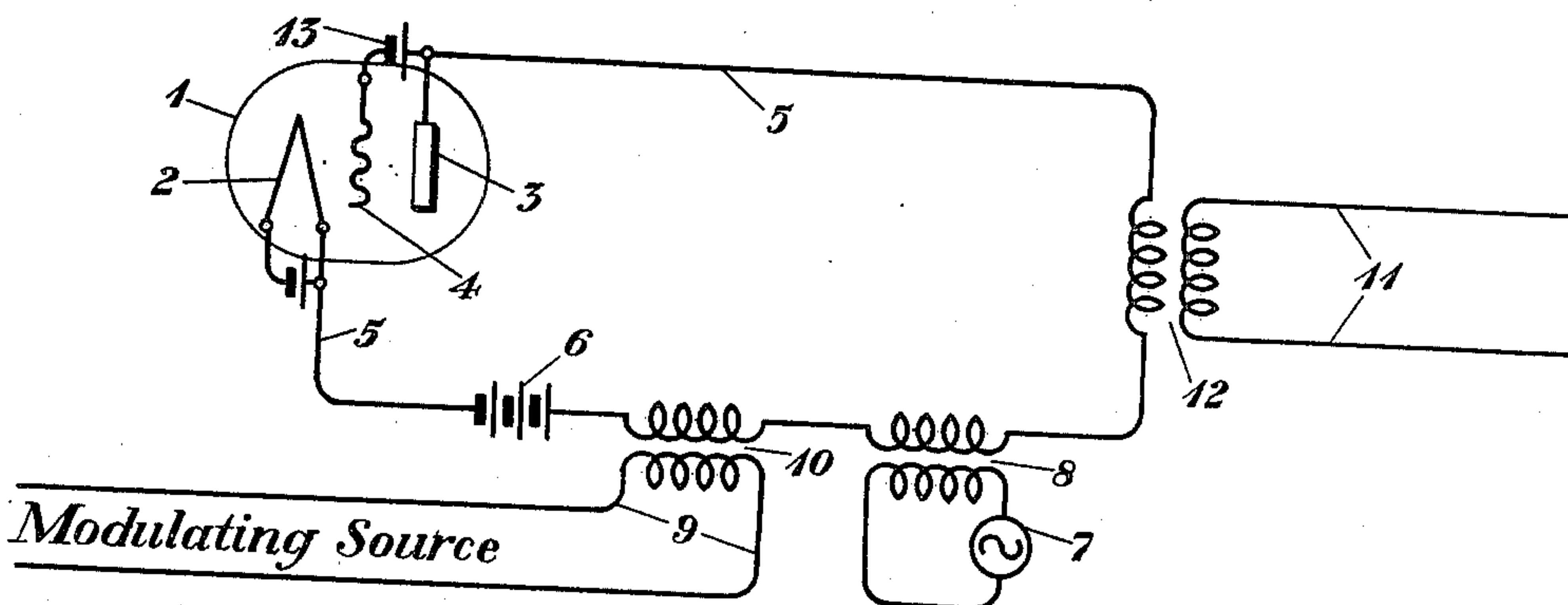


Fig. 1

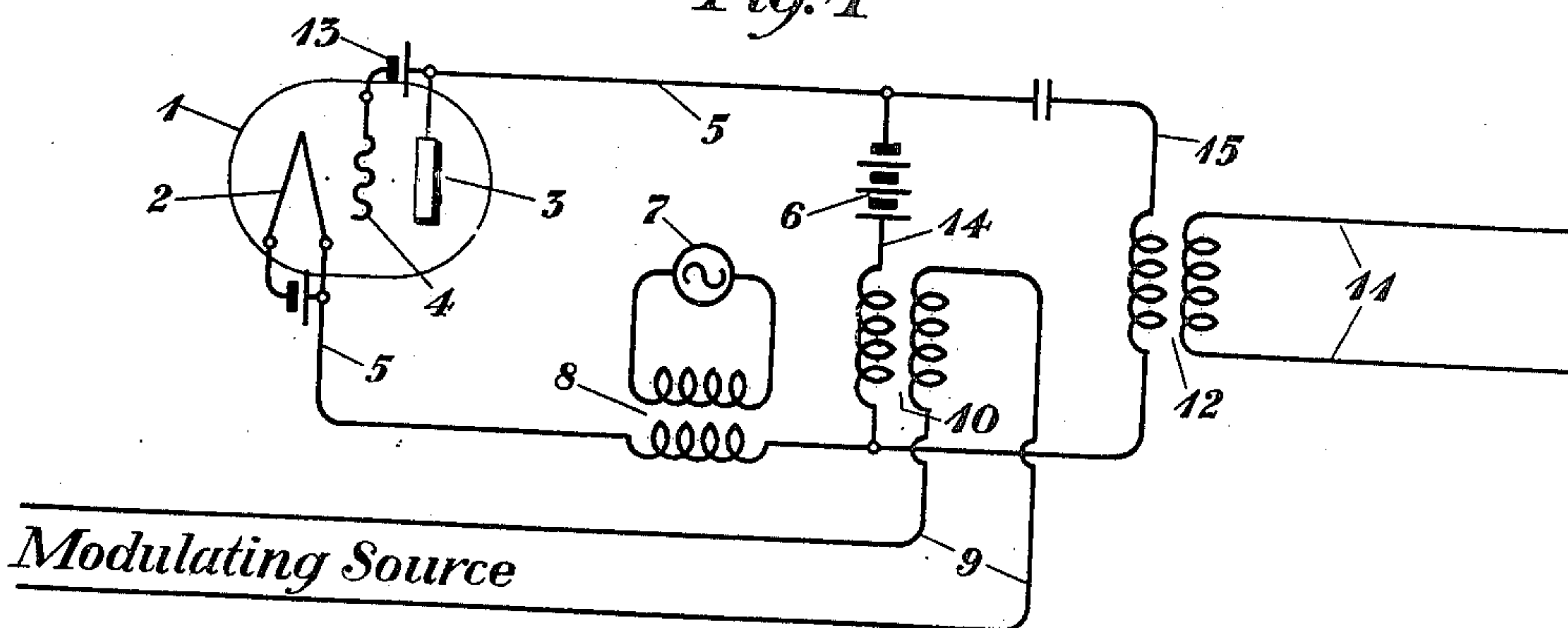


Fig. 2

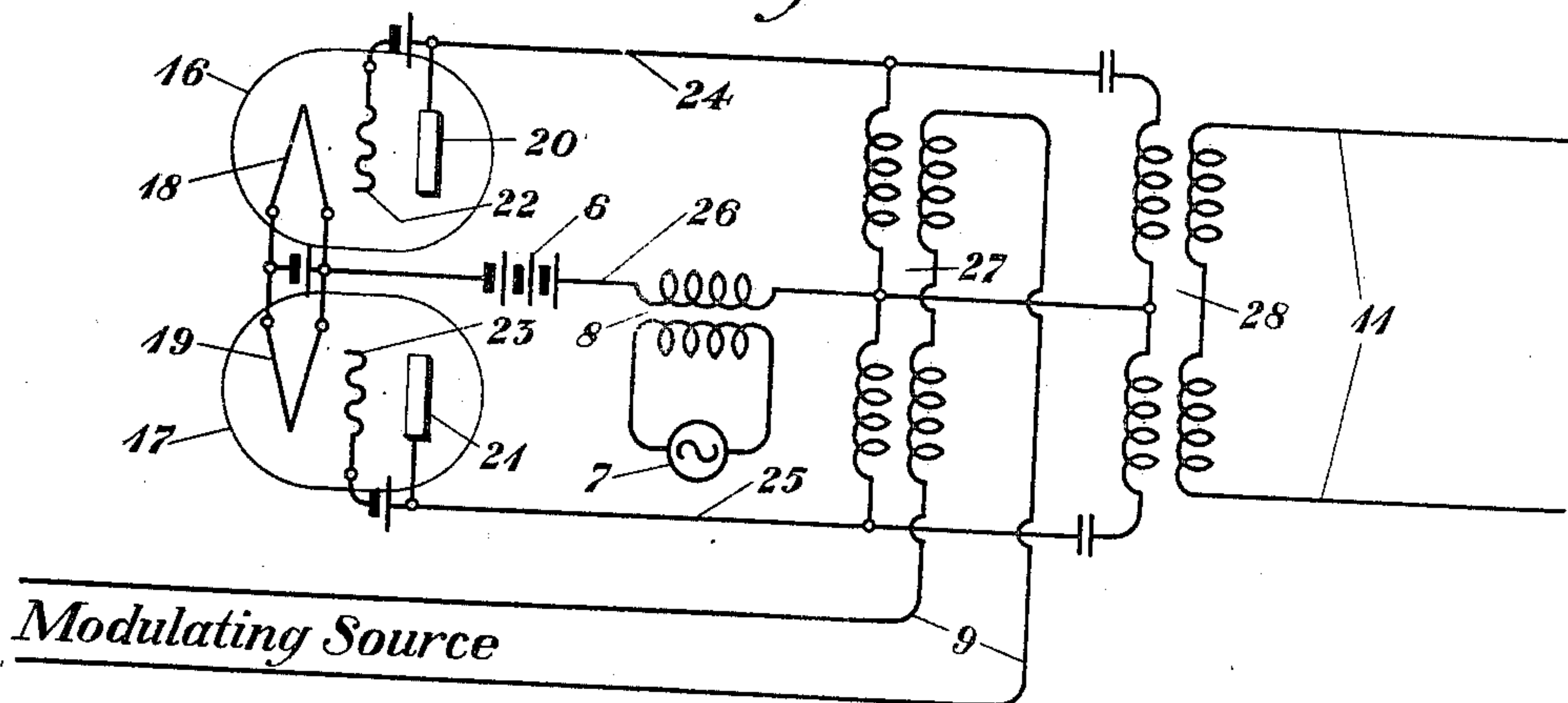


Fig. 3

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TRANSLATING-CIRCUITS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN R. CARSON, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Translating-Circuits, of which the following is a specification.

This invention relates to signaling circuits, and more particularly to signaling circuits of the type in which carrier currents are employed for the transmission of signals.

The invention has for one of its objects the provision of a translating arrangement in which there is no input or controlling circuit as distinguished from the output or controlled circuit, the functions of the two circuits being combined in a single operating circuit associated with the translating device. Another object of the invention is to produce a translating arrangement of this character which may be used either for modulating high frequency oscillations in accordance with signal variations, or for detecting the signals imposed upon high frequency carrier oscillations, by the interaction of the modulated oscillations with a local source of oscillations in accordance with the heterodyne or homodyne principle of receiving. Still another object of the invention has reference to the provision of a translating arrangement of the character above described in which the unmodulated oscillations are ineffective on the outgoing circuit when the modulating source is inactive, so that, when the arrangement is used for modulating high frequency oscillations in accordance with signal waves, the resultant modulated oscillations impressed upon the outgoing circuit will have an amplitude directly proportional to that of the modulating wave. Other and further objects of the invention will be clearer from the detailed description hereinafter appearing.

The objects of the invention are secured as herein disclosed by employing as the translating device a three-element vacuum tube having a heated filament, an anode or plate and a controlling electrode or grid, the controlling electrode and anode being directly connected together, and having an operating circuit extending therefrom to the filament, upon which both the unmodulated

oscillations and the modulating waves are impressed, and from which the resultant modulated oscillations are led by means of an outgoing circuit.

The advantage attaching to the present invention is that it possesses the sensitiveness of the usual three element tube arrangement without sharing its tendency to become unstable or sing. In other words, the valuable features of the control electrode are retained and at the same time the stable characteristics of the two element device are present.

The invention may now be more fully understood by reference to the following description when read in connection with the accompanying drawing, in which Figures 1, 2 and 3 constitute circuit diagrams of three different modifications of the invention.

Referring to Fig. 1, a vacuum tube 1, having a heated filament 2, an anode or plate 3 and a controlling electrode or grid 4, is shown, the controlling electrode 4 and the plate 3 being directly strapped together. A single operating circuit 5 extends from the connection between the grid and plate to the filament 2 and includes a source of direct current 6 for providing the space current of the tube. A source of high frequency oscillations 7 is associated with the operating circuit 5 through a transformer 8, and a circuit 9 leading to a modulating source is coupled to the operating circuit 5 through a transformer 10. The circuit 9 may lead either to a source of low frequency signaling waves, or to a source of high frequency oscillations modulated in accordance with a signal at a distant station, depending upon whether the arrangement is to be used for modulating high frequency oscillations at a sending station in accordance with signals, or as a modulating detector for receiving modulated or high frequency oscillations transmitted from a distant station. An outgoing circuit 11 is also coupled to the operating circuit 5 through a transformer 12, and serves to lead off modulated oscillations if desired. A source of direct current 13 may be included between the grid and the plate in order to impress upon the grid a potential of such character as to secure the most efficient operation of the tube;

preferably this source should be of such a character as to render the grid somewhat negative with respect to the plate.

In operation, the evacuated space between the filament 2 and the plate 3 serves as a path of variable impedance for the oscillations from the source 7 and the modulating waves from the circuit 9 which are impressed upon the direct current source 6. The conductivity of this path is varied in accordance with the variable potential impressed upon the grid 4 due to the variations in potential from the circuit 9 and the source 7. The tube, therefore, functions to modulate the high frequency oscillations from the source 7 in accordance with the waves impressed upon the circuit 9, the modulated output being transmitted through the transformer 12 to the outgoing circuit 11. If the arrangement is to be used for modulating high frequency oscillations in accordance with low frequency signal waves, the signal waves will be impressed upon the circuit 9 and the modulated oscillations will be transmitted to the circuit 11. If the arrangement is to be used as a modulating detector for detecting modulated high frequency oscillations transmitted from a distant station, the modulated high frequency oscillations will be impressed upon the circuit 9 and by their interaction with the oscillations from the constant source 7 will result in the transmission to the circuit 11 of low frequency waves corresponding to the modulating signal wave. The source of oscillations 7 should be of the same frequency as the source of carrier oscillations modulated at the distant station if the arrangement is to detect upon the homodyne principle, while if it is to be employed in accordance with the heterodyne principle the frequency of the source 7 should differ from that of the received oscillations by an amount sufficient to cause an audible beat frequency in the circuit 11.

A slightly modified arrangement is shown in Fig. 2 which differs from that of Fig. 1 in that the operating circuit 5 is provided with two branches 14 and 15, the former including the direct current source 6 and the secondary of the transformer 10, by which the circuit 9 is associated with the operating circuit, while the branch 15 includes the primary of the transformer 12 through which the outgoing circuit 11 is associated with the operating circuit 5. The source of high frequency oscillations 7 is coupled through a transformer 8 to a common conductor of the circuit 5. Since the arrangement functions in substantially the same manner as that already described in connection with Fig. 1, no further description is necessary.

Where it is desired to render the source of unmodulated high frequency oscillations

ineffective upon the outgoing circuit when the modulating source is inactive, a duplex circuit, such as is illustrated in Fig. 3, may be employed. In this case the modulating tubes 16 and 17, having filaments 18 and 19, plates 20 and 21, and grids 22 and 23, are employed. Each of the tubes is provided with an operating circuit arrangement similar to that of Fig. 2. The operating circuits 24 and 25 of the two tubes have a common conductor 26 in which is included the direct current source 6 and the secondary winding of the transformer 8 through which the source of high frequency oscillations 7 is associated with the modulating tubes. The circuit 9 leading to the modulating source is associated with the operating circuits 24 and 25 through a transformer arrangement 27 having windings in each of the operating circuits. In a similar manner the outgoing circuit 11 is associated with the operating circuits 24 and 25 by a transformer arrangement 28.

It will be seen that the source of oscillations 7 is associated with the tubes 16 and 17 by means of a circuit which is balanced with respect to the outgoing circuit 11, provided the conductivity of the two tubes is the same, so that normally no effect is produced upon the outgoing circuit 11. When, however, modulating waves are impressed upon the circuit 9, the potentials upon the grids 22 and 23 are varied in such a manner as to disturb the balance of the circuits in proportion to the amplitude of the modulating wave, so that modulated high frequency oscillations are transmitted through the transformer 28 to the circuit 11, the amplitude of said oscillations being directly proportional to that of the modulating wave.

As in the case of the modification shown in Figs. 1 and 2, this arrangement may also be used either for modulating high frequency oscillations in accordance with signal waves, or for detecting, in accordance with the homodyne or heterodyne principle of receiving, modulated high frequency oscillations transmitted from the distant station. In the former case, the circuit 9 will lead to a source of signal waves, and in the latter case, the modulated high frequency oscillations transmitted from the distant station will be impressed upon the circuit 9.

By means of the arrangements above described a simple and efficient translating arrangement is provided which is capable of use either as a modulator for transmission purposes, or as a modulating detector for receiving purposes. Furthermore, it will be obvious that the general principles herein disclosed may be embodied in many other organizations widely different from those illustrated without departing from the spirit

of the invention as defined in the following claims.

What is claimed is:

1. In a signaling system, a modulating device comprising an evacuated tube including a heated filament, an anode and a controlling electrode, said anode and controlling electrode being directly connected, a single operating circuit for said tube extending from said filament to said directly connected anode and controlling electrode, and a source of unmodulated oscillations and a source of variable oscillations connected with said operating circuit.

2. In a signaling system, a modulating device comprising an evacuated tube including a heated filament, an anode and a controlling electrode, said anode and controlling electrode being directly connected, a single operating circuit for said tube extending from said filament to said directly connected anode and controlling electrode, and a source of unmodulated oscillations, a source of variable oscillations and an outgoing circuit connected with said operating circuit.

3. In a signaling system, a modulating device comprising an evacuated tube including a heated filament, an anode and a controlling electrode, said anode and controlling electrode being directly connected, a single operating circuit for said tube extending from said filament to said directly connected anode and controlling electrode, and a source of unmodulated oscillations and a source of modulating signal waves connected with said operating circuit.

4. In a signaling system, a modulating device comprising an evacuated tube including a heated filament, an anode and a controlling electrode, said anode and controlling electrode being directly connected, a single operating circuit for said tube extending from said filament to said directly connected anode and controlling electrode, and a source of unmodulated oscillations, a source of modulated signal waves and an outgoing circuit connected with said operating circuit.

5. In a signaling system, a modulating arrangement comprising a pair of evacuated tubes each including a heated filament, an anode and a controlling electrode, the anodes and controlling electrodes of each tube being directly connected, a single operating circuit for each tube extending from the filament to the directly connected anode and controlling electrode of the tube, and a source of unmodulated oscillations and a source of variable oscillations connected with said operating circuits.

6. In a signaling system, a modulating arrangement comprising a pair of evacuated tubes each including a heated filament, an anode and a controlling electrode, the anodes

and controlling electrodes of each tube being directly connected, a single operating circuit for each tube extending from the filament to the directly connected anode and controlling electrode of the tube, and a source of unmodulated oscillations, a source of variable oscillations, and an outgoing circuit connected with said operating circuits.

7. In a signaling system, a modulating arrangement comprising a pair of evacuated tubes each including a heated filament, an anode and a controlling electrode, the anodes and controlling electrodes of each tube being directly connected, a single operating circuit for each tube extending from the filament to the directly connected anode and controlling electrode of the tube, and a source of unmodulated oscillations and a source of modulating signal waves connected with said operating circuit.

8. In a signaling system, a modulating arrangement comprising a pair of evacuated tubes each including a heated filament, an anode and a controlling electrode, the anodes and controlling electrodes of each tube being directly connected, a single operating circuit for each tube extending from the filament to the directly connected anode and controlling electrode of the tube, and a source of unmodulated oscillations, a source of modulating signal waves and an outgoing circuit connected with said operating circuits.

9. In a signaling system, a modulating arrangement comprising a pair of evacuated tubes each including a heated filament, an anode and a controlling electrode, the anodes and controlling electrodes of each tube being directly connected, a single operating circuit for each tube extending from the filament to the directly connected anode and controlling electrode of the tube, and a source of unmodulated oscillations and a source of variable oscillations connected with said operating circuits, the connection of said sources and said outgoing circuit to said operating circuits being such that said first mentioned source is without effect upon said outgoing circuit when said second mentioned source is inactive.

10. In a signaling system, a modulating arrangement comprising a pair of evacuated tubes each including a heated filament, an anode and a controlling electrode, the anodes and controlling electrodes of each tube being directly connected, a single operating circuit for each tube extending from the filament to the directly connected anode and controlling electrode of the tube, and a source of unmodulated oscillations, a source of variable oscillations, and an outgoing circuit connected with said operating circuits, the connection of said sources and said outgoing circuit to said operating cir-

cuits being such that said first mentioned source is without effect upon said outgoing circuit when said second mentioned source is inactive.

5 11. In a signaling system, a modulating arrangement comprising a pair of evacuated tubes each including a heated filament, an anode and a controlling electrode, the anodes and controlling electrodes of
10 each tube being directly connected, a single operating circuit for each tube extending from the filament to the directly connected anode and controlling electrode of the tube, and a source of unmodulated oscillations
15 and a source of modulating signal waves connected with said operating circuit, the connection of said sources and said outgoing circuit to said operating circuits being
20 such that said first mentioned source is without effect upon said outgoing circuit when said second mentioned source is inactive.

12. In a signaling system, a modulating arrangement comprising a pair of evacuated tubes each including a heated filament, an anode and a controlling electrode, the anodes and controlling electrodes of each tube being directly connected, a single operating circuit for each tube extending from the filament to the directly connected anode and controlling electrode of the tube, and a source of unmodulated oscillations, a source of modulating signal waves and an outgoing circuit connected with said operating circuits, the connection of said sources and said outgoing circuit to said operating circuits being such that said first mentioned source is without effect upon said outgoing circuit when said second mentioned source is inactive.

In testimony whereof, I have signed my name to this specification this 7th day of October, 1918.

JOHN R. CARSON.