

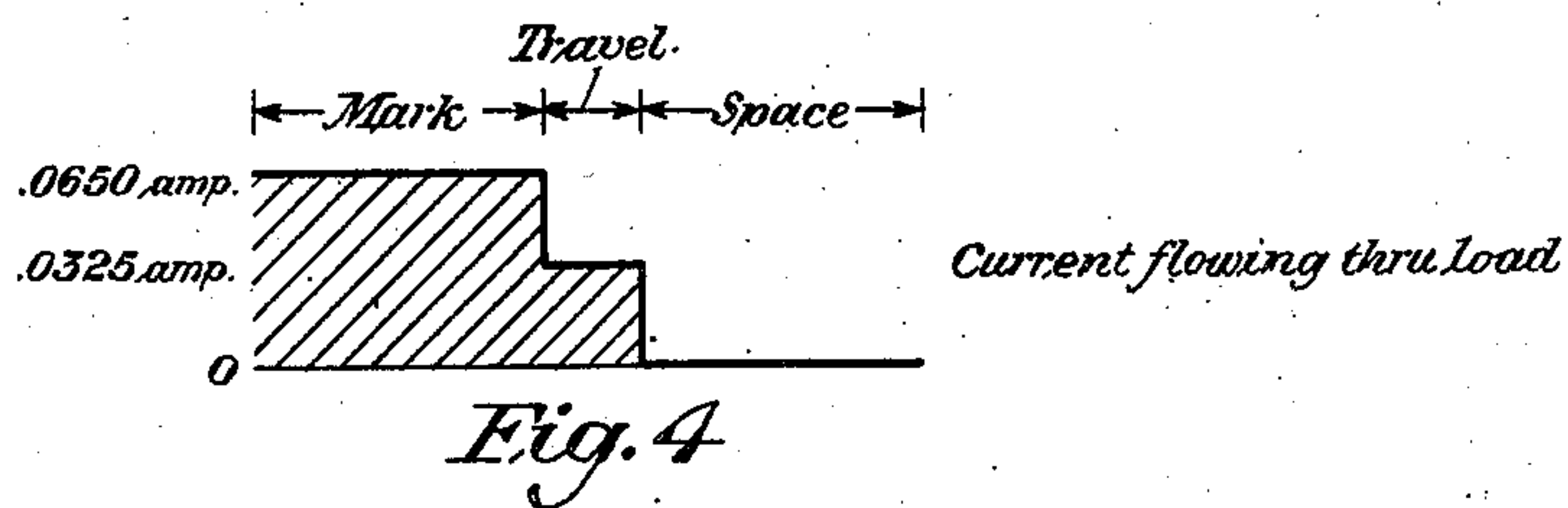
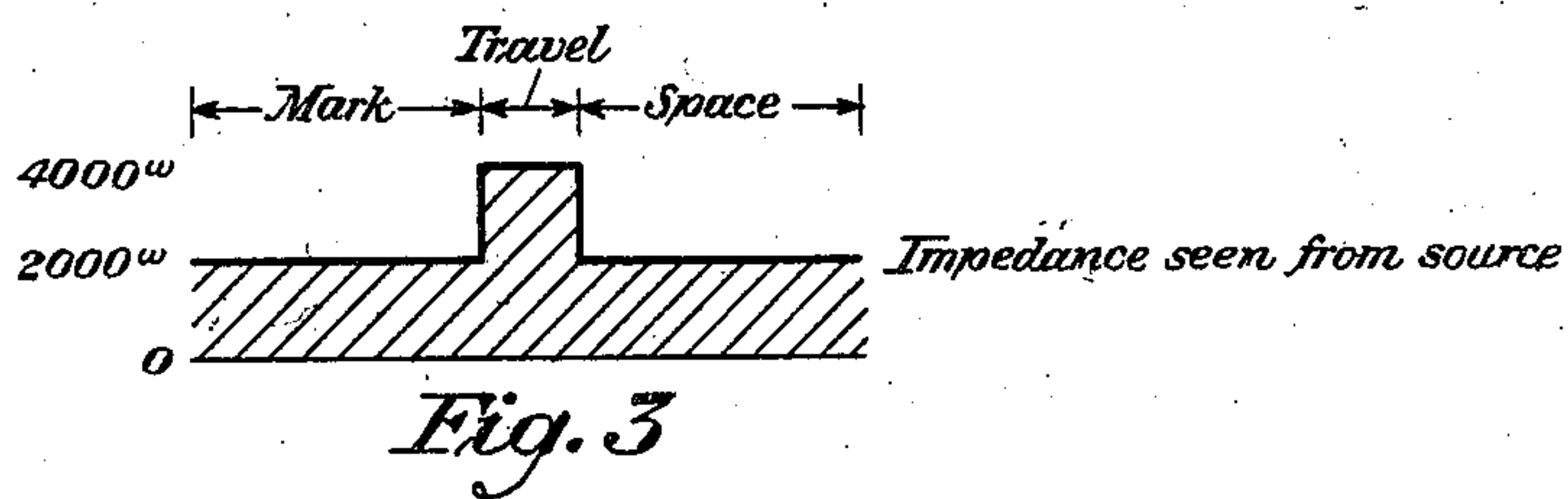
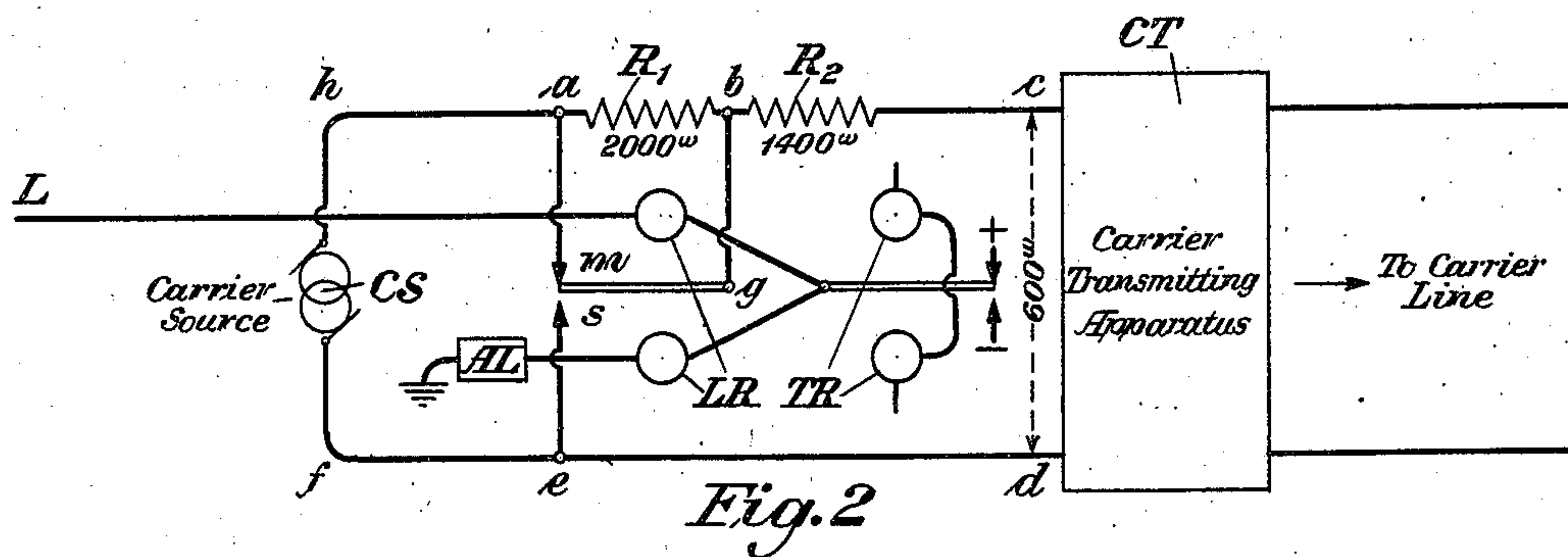
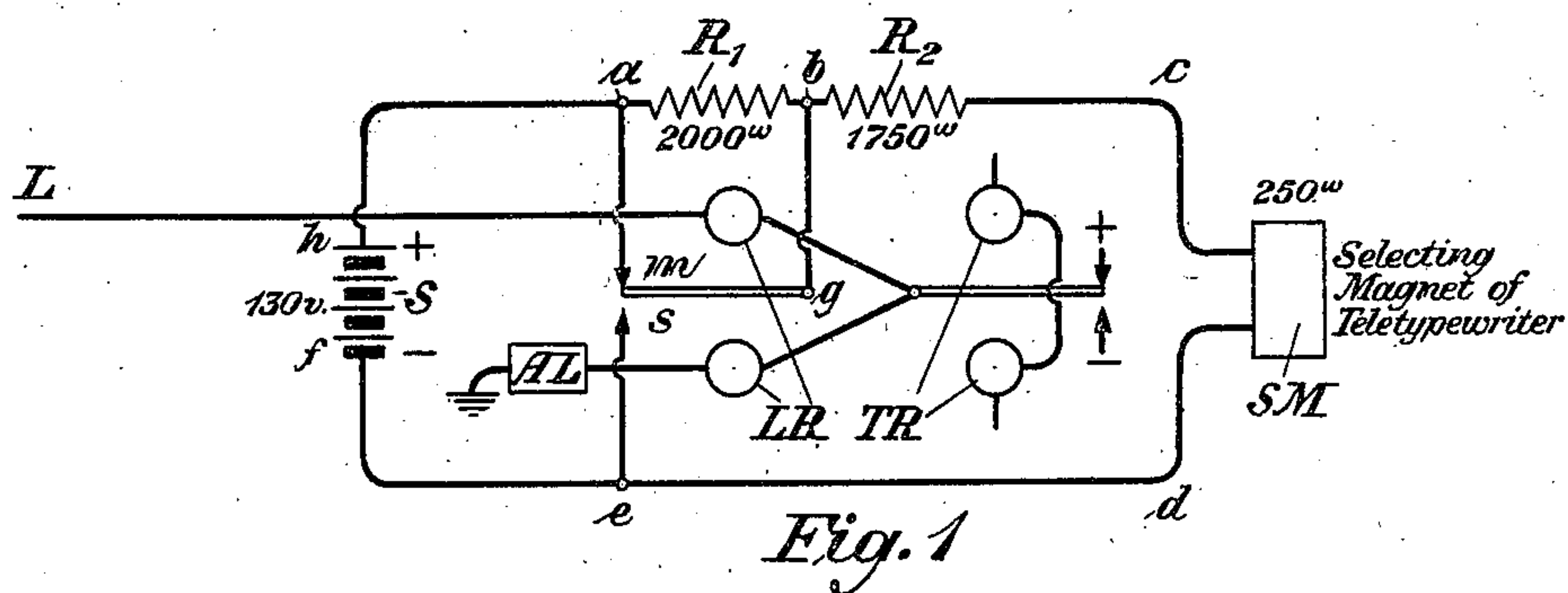
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2,284,296

TELEGRAPH CIRCUIT

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TELEGRAPH CIRCUIT

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This invention relates to a telegraph circuit in which a relay responding to telegraph signals repeats such signals into another circuit by controlling the application of current from a source to a circuit or circuit element operating on the "open-and-close" principle.

This type of circuit arrangement is adapted for several uses such as, for example, the operation of the selecting magnet in a teletypewriter. The function of the selecting magnet is to respond to telegraph impulses from a telegraph circuit to operate the selecting devices of the teletypewriter to print a character. The same type of circuit is also useful in carrier telegraph systems to repeat the telegraph signals into a carrier channel.

In both instances a source of current is applied to a circuit element in such a manner that the circuit element will receive current from the source during the marking signal and will receive no current during the spacing signal. In the case of the selecting magnet of a teletypewriter direct current will be applied to the magnet during the marking interval and no current will be applied during the spacing interval. In the case of the carrier system the carrier frequency current will be applied to the carrier channel during the marking interval and no carrier will be transmitted during the spacing interval. Obviously, of course, in both instances the "no-current" condition may be reversed with respect to marking and spacing intervals.

One of the objects of the present invention is to make available a circuit of the type above referred to in which current of the same value is drawn from the source which supplies the controlled circuit element during both the marking and spacing intervals, but in which the current so drawn during the travel of the armature of the controlling relay will be of approximately one-half the value of the current during the marking or spacing interval.

Another object of the invention is to make available a circuit in which the control source works into a circuit of the same impedance during the marking interval as during the spacing interval, while the impedance is about twice this value during the travel time of the relay armature.

Circuits of the type here discussed have the advantage that the load upon the current source is more uniform and, under proper conditions, the marking and spacing signals will be more nearly symmetrical than is the case with the usual type of telegraph repeating circuit.

The invention will be more fully understood from the following detailed description when read in connection with the accompanying drawing, in which Figures 1 and 2 represent two circuit embodiments of the invention, and Figs. 3 and 4 are diagrams showing certain electrical characteristics of the circuit of the invention during its operation.

Fig. 1 shows the invention as applied to operating the selecting magnet of a teletypewriter. In this figure, L designates a line or loop circuit in which telegraph signals in the form of code combinations are transmitted to operate a polar receiving relay LR to shift the armature of the relay from its marking to its spacing condition, and vice versa, as marking and spacing signals are received from the line L. The two windings of the receiving relay LR are connected one in the line circuit and another in the balancing circuit in which is included an artificial line AL. The armature of a sending relay TR is shown connected to the apex of the circuit to transmit in the reverse direction into the line L.

Signals received from the line L are arranged to operate the selecting magnet SM of a teletypewriter, and mechanism (not shown) controlled by the selecting magnet operates certain selecting devices in the teletypewriter to determine the type of character which is to be printed in response to a given code combination. The selecting magnet SM is supplied with current from the source S which is usually of 130 volts. In series with the source S and the selecting magnet SM, two resistances R_1 and R_2 are connected. During the marking condition of the line relay LR the resistance R_1 is short-circuited, and during the spacing condition the resistance R_2 in series with the resistance of the selecting magnet SM is shorted. The resistance R_1 is made equal to the resistance R_2 plus the resistance of the selecting magnet. For example, if the selecting magnet has a resistance of 250 ohms and the resistance R_1 is made 2000 ohms, the resistance R_2 will be 1750 ohms.

During a marking signal received from the line L the armature of the line relay LR is upon its marking contact m and current flows from the positive terminal of the 130 volt battery S over the following circuit: $h-a-m-g-b-c$, through selecting magnet SM, and thence over $d-e-f$. The resistance R_1 is shorted and the total resistance seen from the source S is therefore 2000 ohms.

During the spacing interval the current flows from the source S over the following circuit:

$h-a$, through resistance R_1 , and thence over $b-g-s-e-f$. Again the impedance into which the source S works is 2000 ohms as before, but no current flows through the selecting magnet SM because of the short-circuit from b through points g and s to e .

During the brief interval between marking and spacing, while the armature of the receiving relay LR is being shifted from its marking contact to its spacing contact, the short-circuit will be removed from the resistance R_1 and will not yet have been applied to the circuit including the resistance R_2 and the selecting magnet SM . The current flow from the battery S will now be over the following circuit: $h-a$, through resistance R_1 to b , through resistance R_2 to c , through the selecting magnet SM , and over $d-e-f$. The source S is now working into a resistance of 4000 ohms, instead of 2000 ohms as was the case during marking and spacing.

From the foregoing it will be obvious that the current supplied by the source S will be the same during marking and spacing, and during the travel of the armature will be of about one-half that value; and yet, there will be no current through the selecting magnet during the spacing interval. This will be clear from the diagrams of Fig. 3 and Fig. 4. Fig. 3 shows the impedance as seen from the source during marking, armature travel and spacing conditions. During marking, the impedance is 2000 ohms, during the travel of the armature it is 4000 ohms and then, during the spacing interval, it drops back again to 2000 ohms. Assuming the battery (or rectifier) supplies a direct voltage of 130 volts to the circuit, the current flowing from the source will be as follows:

	Amperes
Marking -----	.065
Transition -----	.0325
Spacing -----	.065

During both marking and transition the currents supplied by the source flow through the selecting magnet SM , but during the spacing interval the circuit through the selecting magnet is shorted and, consequently, no current flows through the selecting magnet. We therefore have the condition shown in Fig. 4 in which the current through the selecting magnet is as follows:

	Amperes
Marking -----	.065
Transition -----	.0325
Spacing -----	Zero

Fig. 2 shows the principle of the invention applied to a carrier circuit. Here again, the polar line relay LR is connected with one winding in the line or loop circuit L and the other winding in the balancing circuit AL . The resistances R_1 and R_2 are connected, with respect to the armature of the line relay LR , in a manner similar to that shown in Fig. 1, but instead of having a selecting magnet connected across the terminals c and d the input of the carrier transmitting apparatus CT is connected to these terminals. This carrier transmitting apparatus may be of any well known type and is, therefore, shown in the form of a box or a rectangle, to the output of which is connected the carrier line over which the carrier signals are to be transmitted. The carrier current is supplied by a suitable alternating current source CS which may be an oscillator, a generator, or other source of alternating current of well known type.

With this arrangement, assuming the impedance looking into the carrier transmitting apparatus is 600 ohms, the impedance during the marking interval with the resistance R_1 short-circuited is 1400 ohms plus the 600 ohms of the carrier transmitting apparatus, or a total of 2000 ohms. When during the spacing interval the armature is shifted to its spacing contact, the short-circuit is removed from the resistance R_1 , and the resistance R_2 in series with the impedance of the carrier transmitting apparatus is short-circuited. The carrier source CS is now working into the impedance represented by the resistance R_1 or an impedance of 2000 ohms. During the transition from marking to spacing, resistances R_1 and R_2 and the impedance of the carrier transmitting apparatus are in series so that the carrier source is working into an impedance of 4000 ohms.

While the impedances are the same during both marking and spacing, and the impedance is double during the transition interval, the carrier current is supplied to the carrier transmitting apparatus only during the marking interval and no carrier current is supplied during the spacing interval. During the transition period the carrier current supplied to the carrier transmitter apparatus is one-half of that supplied during the marking period.

In the circuits of Figs. 1 and 2 current is supplied to the load during marking, and no current is supplied during spacing. The reversed condition may be obtained by merely reversing the connections of the armature of the line relay LR so that the resistance R_1 is shorted out during the spacing interval, and the resistance R_2 , plus the impedance of the load, is shorted out during the marking interval.

What is claimed is:

1. In a signaling circuit, a relay responsive to telegraph signals, a load arranged to be connected to a source of current over the contacts of said relay, a first impedance in series with the impedance of said load, a second impedance substantially equal to the sum of said first and said load impedances, means whereby said second impedance is short-circuited when the relay armature is in one position so that current flows through said first impedance and said load impedance but not through said second impedance, and means to short-circuit said first impedance and said load and to enable current from said source to flow through said second impedance but not through said first impedance and said load when the relay armature is in its alternative position.

2. In a signaling circuit, a relay responsive to telegraph signals, a load arranged to be connected to a source of current over the contacts of said relay, a first impedance in series with the impedance of said load, a second impedance substantially equal to the sum of said first and said load impedances, means whereby said second impedance is short-circuited when the relay armature is in one position so that current flows through said first impedance and said load impedance but not through said second impedance, and means to short-circuit said first impedance and said load and to enable current from said source to flow through said second impedance but not through said first impedance and said load when the relay armature is in its alternative position, the connections being such that during the travel of said armature current from said source flows serially through said first and

second impedances and through the impedance of said load.

3. In a signaling system the combination of a relay responsive to telegraph signals, a load, an impedance connected in series with said load to form one circuit, another impedance forming a second circuit, the impedance of said two circuits being equal, a source of potential connected in series with both circuits, means responsive to the operation of said relay to short one of said circuits, and means responsive to the release of said relay to short the other of said circuits.

4. In a signaling system the combination of a relay responsive to telegraph signals, a load which is to respond to the operation and release of said relay, said load forming one circuit branch, an impedance forming a second circuit branch, the impedances of both circuit branches being equal, means responsive to the operation of said relay to short-circuit one of said circuit branches, and means responsive to the release of said relay to short-circuit the other circuit branch.

5. In a signaling system the combination of a relay responsive to telegraph signals, two circuits of equal impedance, a load which is to re-

spond to the movement of the armature of said relay, said load being included in one of said circuits, a source of voltage connected in series with both circuits, means responsive to the reception of current of one polarity by said relay to short one of said circuits, and means responsive to the reception of current of the opposite polarity by said relay to short the other of said circuits.

6. In a signaling system the combination of a relay responsive to telegraph signals, a selecting magnet for a teletypewriter, said magnet being included in one circuit branch, a second circuit branch having the same impedance as the first-mentioned circuit branch, a source of voltage connected in the form of a loop in which the two circuit branches are arranged in series relationship, means responsive to the flow of current through the relay winding in one direction to shunt one of said circuit branches, and means responsive to the flow of current through said relay winding in the opposite direction to shunt the other circuit branch.

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