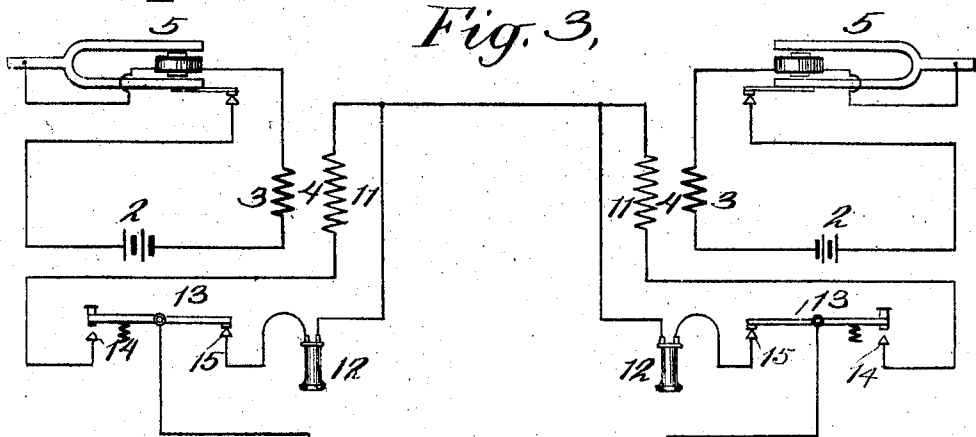
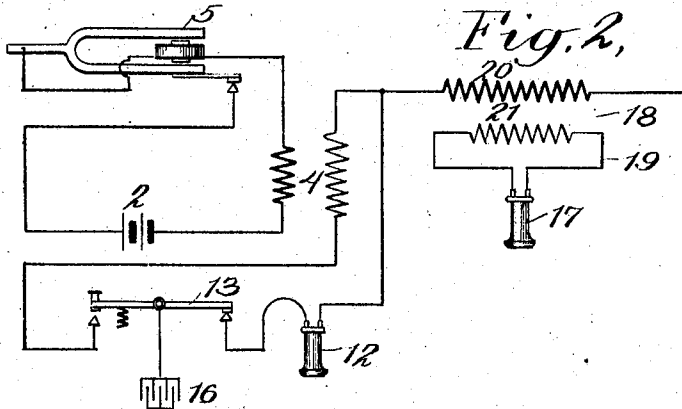
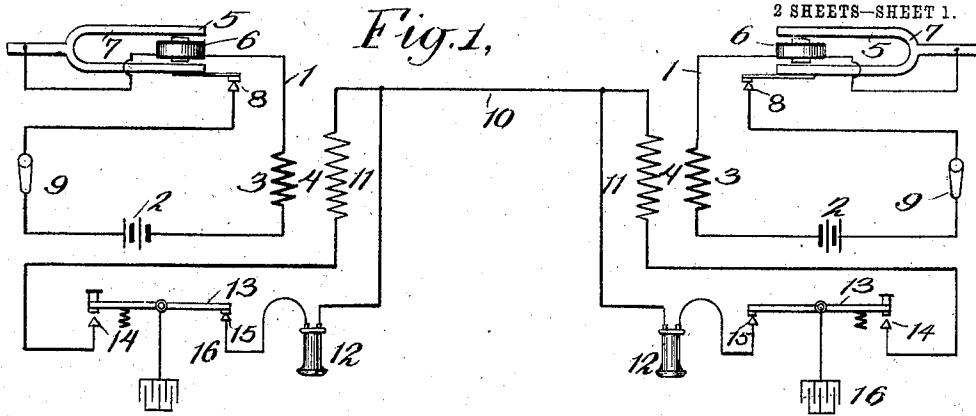


No. 823,505.

PATENTED JUNE 19, 1906.

C. G. BURKE.
ELECTRIC SYSTEM OF TRANSMISSION.

APPLICATION FILED DEC. 9, 1902.



WITNESSES:
Charles E. Burke
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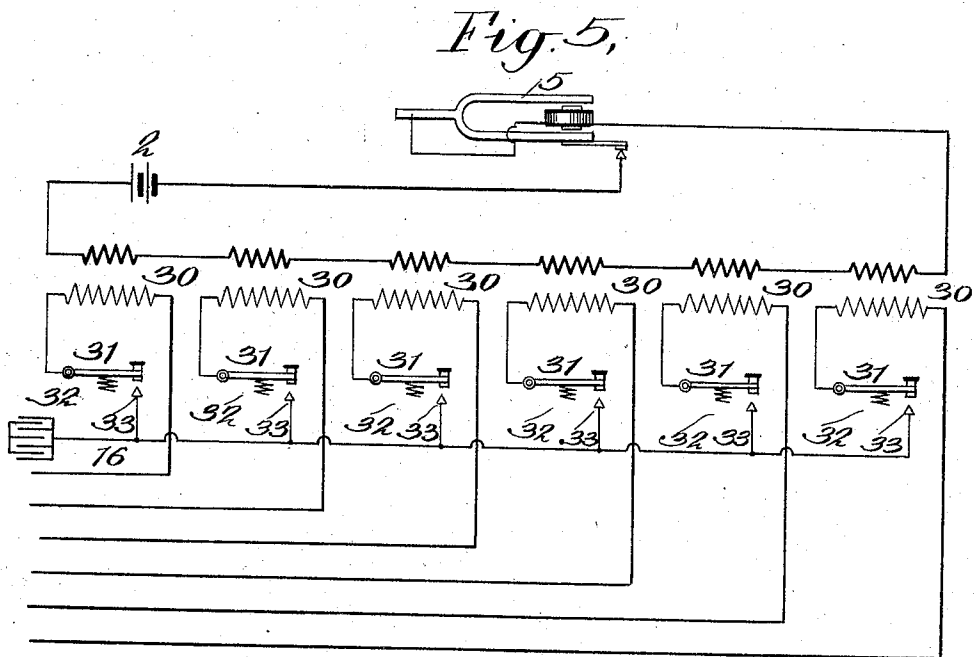
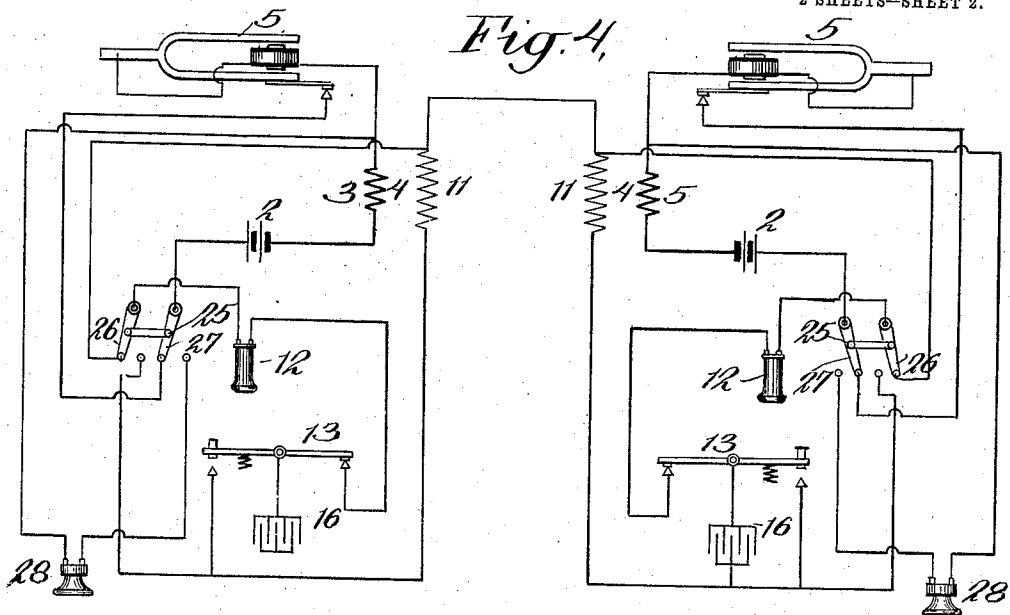
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2 SHEETS—SHEET 2.



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TO JOHN Q. A. WHITEMORE, OF BOSTON, MASSACHUSETTS.

ELECTRIC SYSTEM OF TRANSMISSION.

No. 823,505.

Specification of Letters Patent.

Patented June 19, 1906.

Application filed December 9, 1902. Serial No. 134,545.

To all whom it may concern:

Be it known that I, CHARLES G. BURKE, a citizen of the United States, and a resident of the borough of Brooklyn, in the county of Kings, State of New York, have invented a certain new and useful Improvement in Electric Systems of Transmission, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to electric systems of transmission, and it particularly relates to systems for sending signals from one point to another.

The object of the invention is to provide a system wherein a signal may be produced which has a period corresponding in length to the telegraphic signals. It also has for its object to provide a means for sending signals over a single ungrounded main line. It has a further object to provide a combined telephonic and telegraphic system.

The invention consists in a means for sending signals over a main line and causing a receiving means to be affected for periods of time varying according to the length of the signals to be sent.

The invention also consists in providing a means for constantly charging the main line of an electric system and then causing the said charging means to operatively affect the instruments of the line.

The invention also consists in providing a means whereby an electric system may be used as a telephone or as a telegraph system. In order that this may be done, there is provided means for readily changing the connections of the instruments to form one system or the other.

The invention also consists in providing signaling means for use in connection with a single ungrounded main line. Such a signaling means may be used for purposes of telegraphy or it may be used in connection with a telephone system operated either on a single ungrounded main line or a completed circuit.

The invention also consists in other features and arrangement of devices which appear in the following description and are claimed in the claims.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 illustrates diagrammatically a

form of a system which embodies my invention. Fig. 2 illustrates one of the ways in which a receiving apparatus may be connected with the main line in a system embodying my invention. Fig. 3 illustrates a system wherein the capacity of an earth connection is used. Fig. 4 illustrates a combined telephone system and a signaling system. Fig. 5 illustrates a system for sending signals to a plurality of stations from a single station.

In Fig. 1 are illustrated the connections between the instruments of two stations and the main line connecting the stations together. Each station has a receiving apparatus and a means for constantly charging the main line. The means for charging the main line cooperates with other features of the system to affect the receiving apparatus, and thus constitutes a transmitting means.

The means for constantly charging the main line, as illustrated in Fig. 1, consists of a local circuit 1, in which are connected an induction-coil 4 and a means for producing a pulsating current, such as a battery 2 and the vibrator 5. Any other means, however, may be used for charging the line, such as a generator of an alternating current and other devices known in the art. In the system illustrated the current energizes the magnet 6, which draws the ends of the tuning-fork 7 together, and the current through the back contact 8 is broken. The magnet then releases the end of the tuning-fork 7 and the circuit is again closed. The operation repeats itself, causing the tuning-fork to vibrate as long as the switch 9 is closed.

The opening and closing the local circuit by means of the vibrator causes the main line to be charged. The pulsations of the local circuit are transformed by means of the induction-coil 4 to pulsations of much higher potential than that of the battery, because of the larger number of windings of the secondary coil 11. This is particularly true if a vibrator is used to produce pulsations on the line, for as the circuit is closed and broken by means of the vibrator the "extra current" or what is known as the "electric kick" produced in the coils of the local circuit at the time of breaking of the circuit produces a very high potential, which is reproduced and magnified in the main line.

One terminal of the secondary coil 11 is directly connected with the main line. One terminal of the receiving apparatus 12 is also directly connected with the main line. The receiving apparatus used in the system illustrated consists of a telephone-receiver. Any receiver, however, may be used that is responsive to currents produced on the main line. The remaining terminals of the secondary coil and the receiving apparatus are connected to contacts associated with a switch or key 13. The terminal of the secondary coil is connected to contact 14 and the terminal of the receiving apparatus is connected to contact 15. The key 13 is normally held in contact with the contact 15 by means of the tension-spring usually associated with instruments of that character. The key illustrated is pivoted at its center, and when the finger end of the key is pressed it is closed upon contact 14. By this arrangement the key is normally in connection with the receiver and abnormally with the secondary of an induction-coil. A condenser 16 is connected to the center or the pivot of the key. The condenser is an ordinary type of condenser and of the kind that is commonly used in telegraphy and telephony. In the system illustrated but one of the sides of the condenser is connected with the key 13, and by means of the key the condenser is brought into connection either with the receiving apparatus or the induction-coil.

If a party at one station desires to signal a party at another station, he will start the means for charging the main line leading to that other station. In the particular system illustrated he will close the switch 9, which will start the vibrator; but inasmuch as the capacity body—the condenser—is not connected with the secondary coil the receiving apparatus at the other end of the line will not be operatively affected. If then the party about to signal presses the key the condenser of that station will be connected with the secondary coil, and the charges produced on the main line through the medium of that coil will cause pulsations of electricity to flow back and forth in the condensers located at the ends of the line. The pulsations will continue to flow as long as the condenser is connected with the charging means. This will produce a very loud sound in the receiving apparatus, which will continue as long as the key is held down by the party signaling. The quantity of sound thus produced may be reduced in many ways which are well-known in the art. The operation of the receiving apparatus will call up the party at the distant station, who will then listen to the signals that are being sent by the first party. As the key is opened and closed by the first party the receiving apparatus of the listening party is correspondingly affected by pul-

sations of electricity on the line. If the second party now wishes to answer the first party, he will likewise close switch 9 and open and close the key according to the signals that he may wish to send. If it is desired, the switches 9 may be kept closed and the tuning-fork kept in constant vibration at all times without in any way operatively interfering with the signaling or the receiving apparatus.

The receiving apparatus may be connected with the line in many ways. Also two receiving apparatuses may be used in a single station. One may be used for calling a party of the station, and another, which may be so regulated to reduce the quantity of sound ordinarily produced, may be used for listening purposes—that is, for the purpose of receiving the signal proper. One of the ways of connecting a receiving apparatus with the main line and which magnifies the effect produced in the apparatus is shown in the system illustrated in Fig. 2. In that system a receiver 17 is connected in the local circuit 19, in which is also connected a secondary coil 18. The primary coil 20 of the induction-coil 21 is connected in the main line and has a larger number of turns than the secondary coil 18. The induction-coil thus constitutes a step-down transformer. As many local circuits of the type just described may be located at different points along the main line as desired. The receiving apparatus will in each case receive the pulsations sent over the line.

In Fig. 3 is illustrated a system wherein the capacity of an earth connection may be used. The arrangement is such that the key 13 may be connected either with the earth or the condenser 16. The pivot of the key is connected with a switch 22, which has two contacts—contact 23, which is connected with the earth, and contact 24, which is connected with the condenser 16. It is found that the greater the capacity of the capacity body used in operating the system the louder is the sound produced in the receiving apparatus. When the keys located at both ends of the line are connected with the earth through the switches 22, a very loud sound is produced in the receiver. So great is this effect on the system that the charging means normally affects the receiver. It is therefore found preferable to use the earth connection at one end of the main line and the condenser at the other end of the main line. The earth connection is preferably used at the transmitting end of the main line and the condenser at the receiving end. In the latter case the switch 22 will normally be connected with the condenser, and when one of the parties wishes to signal the other party the first party will move the switch 22 so as to make connection with the earth.

In Fig. 4 is illustrated a combined tele-

phone and telegraph system embodying my invention. Either the telephone or the telegraph instruments may be placed in condition for use by merely shifting a circuit-changer. The arrangement is such that either the means for charging the line or the telephone-transmitter may be connected in the local circuit, and a corresponding change may be made in the main line. When an induction-coil is used to connect the charging means with the main line, the same induction-coil may be used to transform the telephonic currents produced by the transmitter and the battery in the local circuit to the main line. A double pole-switch 25 is used to make the change in the connections. One arm 26 of the switch 25 is used to alter the connections of the main line, and the other arm 27 is used to make the change of connections in the local circuit. The pivoted end of the arm 26 is connected with the telephone-receiver 12, which is in turn connected with the normal contact of the key 13, and when the key is in its normal position the receiver is connected with the condenser 16. One contact of the switch-arm 26 is connected with one terminal of the secondary 11 of the induction-coil 4. By this arrangement the receiving apparatus is connected directly with the main line when it is used for the purpose of signaling and to the secondary 11 of the induction-coil when it is to be used as a telephone-receiver. Telephonic speech can of course be received and heard if the telephone-receiver is connected directly with the main line in the same way that it is connected for telegraphic transmission, and also signals can be received when the receiver is connected with the main line through the secondary coil 11. The connection of the receiving apparatus may therefore be made permanent and independent of the switch and may be connected either with the main line or with the secondary coil 11; but it is found that better results are obtained by connecting the receiver in the manner described. The pivoted end of the other switch-arm 27 is connected with the battery 2, which is in turn connected with the primary coil 3 of the induction-coil 4. The contacts of the switch-arm 27 are connected, respectively, with the means for charging the main line for purposes of telegraphy and the telephone-transmitter to be used in the transmission of speech-waves. When the switch-arm 26 makes connection with the main-line instruments for the purpose of telegraphy, the switch-arm 27 makes corresponding connections in the local circuit for the same purpose. The same is true when the instruments are to be used for the purpose of telephony. When the switch is in position for signaling purposes and the party at one of the stations desires to call up a party at the other station, he may do so

by merely pressing the key 13, which will cause a loud sound to be produced in the receiving apparatus at the other station. The first party may then either continue to signal by code-signaling or he may change the connections by means of the switch 25 and converse with the other party through the telephonic instruments. This system may also be used to call up a substation in a telephone system. A simple magnetic vibrator may be used in place of the tuning-fork, and the switch may be operated by the supporting-hook for the telephone-receiver.

In Fig. 5 is illustrated a system embodying my invention and wherein a single local circuit and a single condenser may be used in connection with a plurality of outgoing lines. The means for charging the lines may consist of a plurality of induction-coils whose primaries, together with the vibrator 5 and the battery 2, are connected in the local circuit. As in the systems already described, the vibrator opens and closes the circuit of the battery 2 and causes pulsating charges to be produced on the outgoing lines through the medium of the secondaries of the induction-coils. Each of the outgoing lines is connected with one terminal of each of the secondaries of the induction-coils 30. The other terminal of each of the secondaries is connected to one of the keys 31. The keys 31 are single-contact keys having compression-springs for normally holding them open. The keys are provided with contacts 33, which are connected together and with the condenser 16. When the key associated with one of the lines is closed, the oscillatory charges produced on that line by the local circuit are permitted to produce an oscillatory current on the line, the oscillations passing in and out of the condenser 16. The signals are received in the manner already described.

The invention may be used with many forms of systems of telephony and telegraphy, and the system that I have illustrated may be altered in many ways without departing from the spirit of my invention.

Some of the advantages of my invention over the systems now known in the art consist in the fact that the high-potential charges placed upon the main line cause a clear reproduction of the signal over very long lines of high resistance, and therefore cheaper wires may be used in constructing the line. A single ungrounded main line may be used, thus doing away with either a return-line or completely obviating the disturbances due to earth-currents common to systems which depend upon the earth as return connection of the line. A system for the transmission of signals, such as telegraphic signals, may be readily altered into a system for the transmission of speech, and, except for the transmitting means, the same

instruments that are used in the one case may be used in the other. A constantly-flowing current is not required in order to keep the system in condition to call a distant operator, as is the case in many forms of telegraph systems. The system is always in condition for signaling the distant operator.

The signals produced in the receiving apparatus are exactly of the same period as indicated by the relative lengths of the telegraphic signals. The signals as heard in the receiving means do not consist of mere clicks after periods of silence, which periods correspond in length to the telegraphic signals. The line being in a state of constant excitation, the variations produced by the key are instantaneous. The system is therefore adapted to quick signaling. The system either in the form of a telephone or a telegraph system is easily operated with any form of a capacity body.

What I claim, and desire to secure by Letters Patent, is as follows:

1. In a signaling system the combination of a main line, a receiving apparatus, a means for constantly charging the main line, and a capacity body for causing the charging means to affect the receiving apparatus when signals are sent over the line.

2. In an electric system the combination of a main line, a transmitting means for constantly charging the said main line, a receiving apparatus and means for bringing into operative connection with the line either the transmitting means for operatively affecting the main line when signals are set over the line or for connecting the receiving apparatus to the main line.

3. In an electric system the combination of a main line, a transmitting means for constantly charging the said main line, a receiving apparatus, a means for causing the said transmitting means to operatively affect the said main line and for permitting the receiving apparatus to be operatively affected by charges on the line when signals are sent.

4. In a signaling system the combination of a main line, means for constantly charging the said main line, receiving apparatuses located at different points along the said main line, and means for causing the said charging means to affect one of the said receiving apparatuses and to permit another of the said receiving apparatuses to be affected when signals are sent.

5. In an electric system the combination of a main line, a transmitting means and a receiving apparatus connected to the main line, a capacity body, and means for connecting the said capacity body with the said transmitting means or the said receiving apparatus and thereby connecting the said transmitting means or the said receiving apparatus in series with the said capacity body.

6. In an electric system the combination of a main line, means for constantly charging the said main line, a receiving apparatus, a capacity body, and means for connecting the capacity body to the main line either through the charging means or the receiving apparatus.

7. In an electric system the combination of a main line, means for constantly charging the line with pulsating charges, a receiving apparatus, a capacity body, a means for connecting the said capacity body with the said charging means and thereby affecting the said receiving means during the period that the capacity body is so connected.

8. In an electric system the combination of a main line, a transmitting means for constantly charging the said main line, a plurality of receiving devices, a capacity body, and means for connecting the said capacity body with the said transmitting means so as to affect the said receiving devices when signals are to be sent.

9. In an electric system the combination of a main line, a telephone transmitter and receiver, a means for constantly charging the said main line, a switch adapted to connect either the said telephone-transmitter or the said charging means in a local circuit, a capacity body, and means for connecting the said capacity body to the said main line either through the said charging means or through the said receiver.

10. In an electric system the combination of a main line, a transmitting means, a receiving apparatus, a condenser, an earth connection, and means for bringing the said transmitting means or the said receiving apparatus into connection either with the said earth connection or the said capacity body.

11. In a signaling system the combination of a main line, a local circuit, a primary coil, a means connected in the said local circuit for producing a pulsating current, a secondary coil and a receiver connected to the said main line, a capacity body normally connected to the said receiver for permitting the receiver to be affected by charges in the said main line and a key for connecting the said capacity body with the said secondary coil and disconnecting the said capacity body from the said receiver.

12. In an electric system the combination of a single ungrounded main line, a telephone transmitter and receiver, a signaling means, a capacity body, and a means for connecting either the said receiving means or the said signaling means with the said main line.

13. In an electric system the combination of a main line, a receiving apparatus and a means for charging the said main line, the said receiving apparatus and the said charging means being connected to the said main line, a capacity body and a key normally con-

necting the said capacity body to the said
main line through the receiving apparatus
and adapted to break the connection of the
capacity body to the receiving apparatus
5 and to connect the said capacity body to the
main line through the said charging means.

In testimony whereof I have signed my

name to this specification in the presence of
two subscribing witnesses.

CHARLES G. BURKE.

Witnesses:

F. F. CRAMPTON,
EDWIN SEGER.