E. R. BRODTON.

TELEPHONE SYSTEM.

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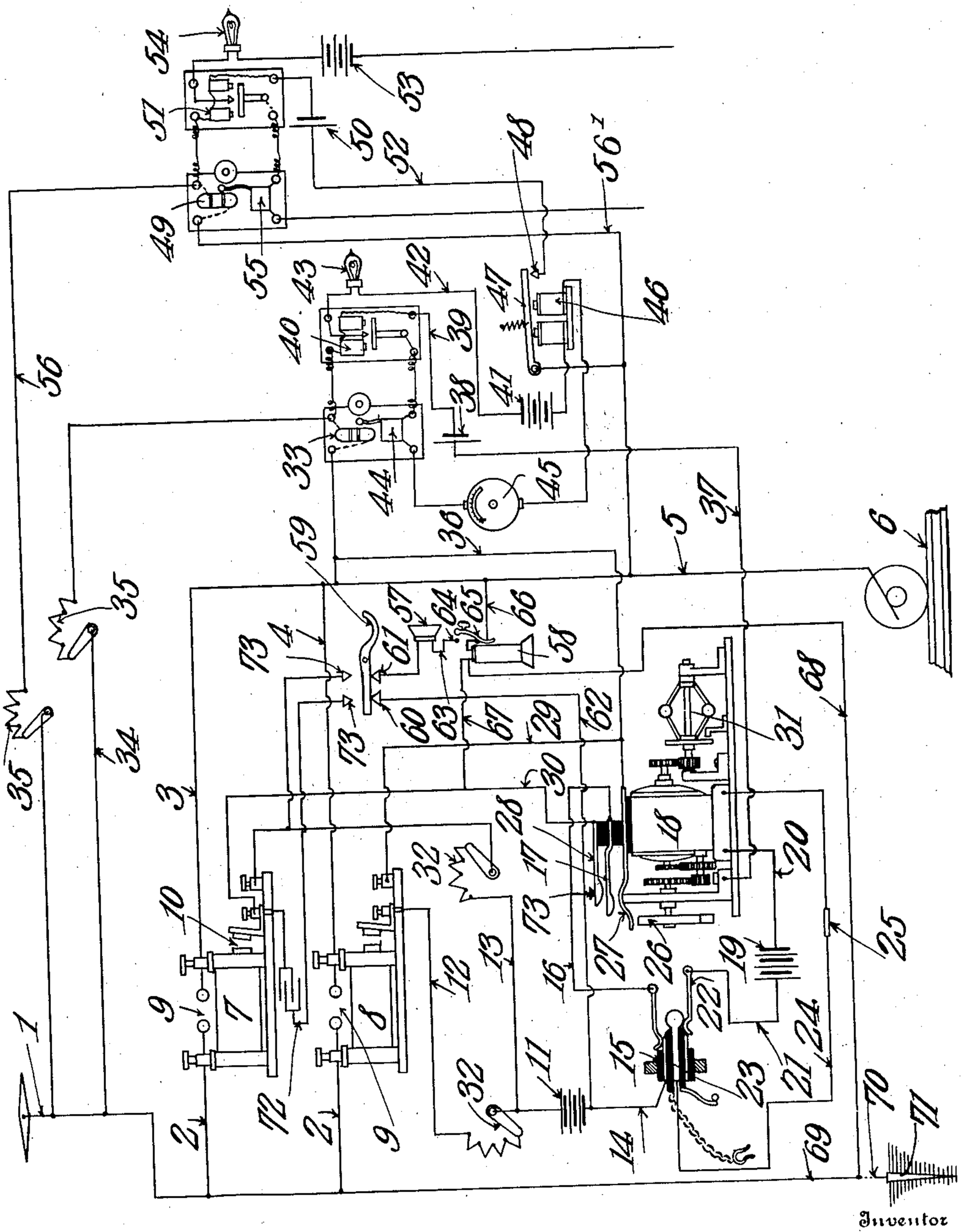
933,018.

Patented Aug. 31, 1909.



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UNITED STATES PATENT OFFICE.

EDWARD ROBERT BRODTON, OF MOBILE, ALABAMA, ASSIGNOR OF ONE-THIRD TO GEORGE H. FONDE AND ONE-THIRD TO ERNEST E. WAGAR, OF MOBILE, ALABAMA.

TELEPHONE SYSTEM.

933,018. Specification of Letters Patent. Patented Aug. 31, 1909.

Original application filed November 19, 1907, Serial No. 402,856. Divided and this application filed June 29, 1908. Serial No. 440,899

To all whom it may concern:

Be it known that I, EDWARD R. BRODTON, a citizen of the United States, residing at Mobile, in the county of Mobile and State of Alabama, have invented a new and useful Telephone System, of which the following is a specification.

This invention has reference to improvements in telephone systems and is designed for use more particularly in connection with a wireless railway signal system, for which I have filed an application in the United States Patent Office on November 19, 1907, under Serial No. 402,856.

In the aforesaid application for patent, there is shown and described a signal system wherein each train and preferably the engine of the train carries a wireless signal outfit comprising a sending set by means of which impulses are sent out continuously and automatically in the form of two or more overlapping trains of waves preferably of different characteristics. The receiving apparatus on each train and preferably on the engine thereof is capable of responding to the propagated trains of waves coming from a distant point so as to actuate certain signal devices, and ultimately, if need be, cause the actuation of train controlling devices so that the train is finally brought to a standstill on entering the danger zone. Under these circumstances the engine man is apprised by the stopping of the train or otherwise that there is danger ahead or behind as the case may be, but of the character of the danger he has no information. To remedy this defect the present invention comprises a telephone system operating in conjunction with the signaling system and utilizing a portion of the signal apparatus.

In accordance with the present invention the telephone system is designed to be used only when the train is at a standstill and then by using the track rails as one side of the circuit, the other side may be grounded at a moderate distance from the track rails when it will be found that telephonic communication may be had over a distance of several miles even though the grounded side of the circuit be relatively close to the track rails.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawing forming a part of this specification, in which drawing there is shown a diagram of so much of the railway signal system as is deemed necessary for the understanding of the present invention, and in conjunction therewith there are shown the electric circuits of the telephone system at one end only of the complete system.

In order that the relation of the telephone system to the signal system may be fully understood the said signal system will be first briefly described.

Each train carries an aerial 1 which is preferably mounted on the engine and in the following description it will be assumed that the entire apparatus is mounted on the engine although it is evident that it may be mounted upon any part of the train. Connected to this aerial is one side of each secondary of two Ruhmkorff coils, by suitable conductors 2 and 2 respectively, and the other sides of these two secondaries are connected by conductors 3 and 4 to a common ground connection 5, which may be suitably connected to the engine frame and thus being in electrical connection with the track rails one of which is indicated at 6. The Ruhmkorff coils are indicated at 7 and 8 respectively and between the terminals of the secondaries of these coils are located the usual spark gaps 9.

Each coil 7 and 8 is provided with a suitable rheotome 10 by means of which a constant current supplied from any suitable source as by a battery 11, is converted into an intermittent or pulsatory current which is ultimately converted in the secondary of the coil into alternating currents passing the spark gap 9 and thereby generating Hertzian or ether waves to be finally thrown off at the aerial 1, all in the manner common in the practice of wireless telegraphy. It will be understood that of course the aerial cannot be higher above the engine than is permitted by bridges and tunnels or other low structures along the line of way, but in practice this altitude is found amply sufficient for the propagation of Hertzian waves for a distance of several miles, which is ample for the purposes of the system of railway signaling forming the subject matter of the aforesaid application

One side of the battery 11 is connected by conductors 12 and 13 respectively to one side of the primary coil of each of the Ruhmkorff coils. The other side of the battery 11 is connected by a conductor 14 to one side of a switch 15 which in the drawing is shown of the ordinary plug or jack type. The other side of the switch 15 is connected by a conductor 16 to a spring arm 17 mounted on but insulated from the casing of an electric motor 18 of any suitable type. The motor 18 is driven by a battery 19 or other suitable source of current connected on one side to one terminal of the motor by a conductor 20, and on the other side by a conductor 21 to a brush 22 in the path of the movable member 23 of the switch 15. When the switch 15 is closed the circuit is completed from the brush 22 to a conductor 24 leading to the other terminal of the motor 18 and including a simple switch 25.

The motor drives a cam disk 26 in the path of which is a spring finger 27 adapted to make contact with the finger 17 to move the same for a distance. In the path of the finger 17 is another spring finger 28 adapted to be ultimately engaged by the finger 17 when the latter is moved by the finger 27 under the action of the cam disk 26.

The spring finger 27 is connected by a conductor 29 to the other terminal of the primary winding of the coil 8 and the spring finger 28 is connected by a conductor 30 to the other terminal of the primary winding of the coil 7.

The motor 18 is under the control of a suitable governor 31 by means of which its speed may be fixed and maintained indefinitely.

In the primary circuit of each coil 7 and 8 there is included a rheostat 32.

In the operation of the system, the motor 18 is assumed to be constantly running and at a regular interval causes a closure of the primary circuit of the coils 7 and 8 in succession through the contact fingers 17, 27 and 28, the arrangement being such that one coil has its primary circuit closed before the second coil, and the second coil has its primary circuit opened before the opening of the first named coil. The result is, that there is sent from the aerial a train of waves corresponding to the first named coil, and while this train of waves is being propagated the circuit through the primary winding of the second coil is established, and another train of waves is propagated while the first coil is still active. The circuit of the second coil is broken prior to the breaking of the circuit of the first coil, as the cam disk 26 passes out of active engagement with the spring finger 27. The second train of waves is therefore of shorter duration than the first train of waves, but is active during the activity of the first train of waves, being overlapped on each end by the first train of waves.

On each engine there are two or more receiving elements corresponding in number and adjustment to the number of sending coils in the sending system. Each receiver includes a suitable coherer 33 included in a conductor 34 coming from the aerial 1 and ultimately grounded through the rail 6 and conductor 5. Each conductor 34 includes a suitable resistance or rheostat 35 for the purpose of adjusting the receiver circuit to the character of the propagated waves.

The local circuit of the coherer 33 may be traced by the conductor 36 to the spring arm 27, through the frame-work of the structures driven by the motor 18 and then by conductors 37 to a battery 38, and from the battery 38 by a conductor 39 to the relay magnet 40, and back to the other side of the coherer. The relay 40 controls another circuit charged by a battery 41 and this circuit may be traced as follows. From the battery 41 the circuit is by the conductor 42, through a lamp 43 or other suitable indicating device to one terminal of the relay, thence to a bell 44 or other suitable signal preferably an audible signal, thence through an indicator 45, through electromagnets 46 and finally returning to the battery 41. In operative relation to the magnets 46 is an armature 47 arranged to make contact with a circuit terminal 48 in its path as it moves toward the magnet 46. The armature 47 and contact terminal 48 are included in the local circuit of another coherer 49, and this circuit may be traced from its charging battery 50 through relay magnets 51, then through the coherer and by a conductor 56′ to the armature 47, and the circuit is completed from the contact terminal 48 to the battery 50 by the conductor 52. The relay 51 controls a circuit charged by a battery or other source of current indicated at 53, and this circuit includes a lamp 54 or other suitable visual signal and a bell 55 or other suitable audible signal. The coherer 49 is included in the aerial circuit by a conductor 56 and with the ground conductor 5 by another conductor 57. The receiving circuit is designed also to include certain train operating devices which however form no part of the present invention and are not shown in the drawing. It may be stated however, that the train controlling devices are designed to operate subsequent to the operation of the visual and audible signals so that if these last named signals be ignored by the engineman, then the train on entering a danger zone will be automatically brought to a standstill. The receiving apparatus is so designed that the first of a series of train waves will set the receiving apparatus in condition to receive the subsequent train of waves.

If now it be assumed that a train has entered a danger zone and has been brought to a standstill, the engine man will be aware of the fact that there is danger within a predetermined distance of his train, but will be unaware of the dangerous condition. To enable the engine man or other authorized person to communicate with the point of danger there is provided a telephone system which forms the subject matter of the present invention.

In the drawing there is indicated a telephone transmitter 57 and a telephone receiver 58, and the ordinary telephone receiver hook is indicated at 59. The telephone hook 59 controls two circuit terminals 60 and 61. The terminal 60 is connected by a conductor 62 to the conductor 14 between the battery 11 and the switch 15. The terminal 61 is connected to one side of the transmitter 57. The other side of the transmitter is connected by a conductor 63 to a terminal 64 in the path of a switch 65 carried by the receiver 58 within easy reach of the hand of the operator, and this switch 65 is connected by a conductor 66 to the conductor 5 in circuit with the rails 6. The switch 65 is connected to one side of the receiver 58 while the other side of the receiver coil is connected by a conductor 67 to the conductor 30 before described, and this same side of the receiver is connected by a conductor 68 to a conductor 69 leading from and connected to the conductor 2 before described. Leading from the conductor 69 is a conductor 70 which may be a flexible conductor, say for instance about 200 ft. in length and at the end of this conductor there is a ground stake 71, adapted to be driven into the ground at a considerable distance from the track 6. When the coils 7 and 8 are used with rheotomes 10 then it is necessary in order to reduce the spark to introduce in the primary circuit in multiple therewith a suitable condenser such as indicated at 72, it being understood that each coil has its individual condenser. One of the coils 7 or 8, say the coil 7 is utilized as an inductorium for the telephone circuit and when the telephone is in use it is advisable to cut out the condenser 72, but when the coil is in use and the telephone is not being used, then the condenser 72 should remain in the circuit. For this reason the condenser circuit terminates at two terminal contacts 73, in the path of and adapted to be bridged by the telephone hook 59 when the telephone receiver is hung therefrom. When the receiver is lifted from the hook, then the circuit of the condenser is broken at these terminal contacts 73.

Let it be assumed that the train has come to a standstill because of the presence of some danger either ahead or behind the train, and such dangerous condition may be the presence of another train in the same block within dangerous proximity, or an open switch, or an open draw in a bridge, or a broken down bridge, or in fact any dangerous condition. Under these conditions it is not necessary that the motor 18 should continue to cause the sending out of trains of waves. The switch 25 may therefore be opened and the motor be brought to a standstill. The engine man may now cause the closure of the primary circuit of the coil 7 by moving the spring finger 28 against the spring finger 17. This operation is facilitated by providing the spring finger 28 with a suitable manipulating button 73. By pressing down upon the button 73 to bring the finger 28 into contact with the finger 17 and the latter ultimately in contact with the finger 27, trains of waves may be propagated in accordance with some recognized code signal system, and the receiving devices within range of sending stations will thereby be notified that at some distant point an operator wishes to talk over the telephone system. Then at each end the receiver 58 is lifted from the hook 59, thus cutting out the condenser 72 of a respective coil 7 or 8 and cutting in the transmitter 57. In the meantime the engine man on the stalled train has inserted the stake 71 at an appropriate distance from the track 6 and after receiving the appropriate signal the operator at the other end will do likewise.

Now at the transmitting end the operator closes the switch 65 thus completing the transmitting circuit, which may be traced from the battery 11 through the conductor 62 to the terminal 60, sent by way of the hook 59 to the terminal 61, and to the transmitter element 57, thence by the conductor 63 and switch 65 to the receiver, and through the latter by the conductor 67 to the conductor 30, and primary coil of the Ruhmkorff coil 7, returning by way of the conductor 13 to the other side of the battery 11. Now by talking into the transmitter 57 electrical impulses are generated in the primary circuit thus traced, and these are converted into high tension electrical impulses in the secondary coil of the Ruhmkorff coil 7. The terminals of the secondary winding of this coil are connected on one side by the conductor 3 to the conductor 5 and ultimately to the rail 6, and on the other side by the conductor 2 and conductor 69 to the conductor 70 and stake 71, which latter is inserted in the ground at a considerable distance from the rails 6, say one or two hundred feet. During transmission the receiving end of the line is established through the receiver 58 at that end of the line by having the switch 65 open, when the receiver is included in a circuit from the rails 6 through the conductor 5 and conductor 67 to one side of the receiver, and from the other side of the receiver through the conductor 68 to the

conductor 70 and stake 71. When it is desired to reply over the same circuit, the receiving circuit is made a transmitting circuit by closing the switch 65 and the transmitting circuit is made a receiving circuit by opening the switch 65 at the corresponding end, thus conversation may be carried on over a considerable distance very successfully. A practical operation of the system has demonstrated that conversation may be carried on in this manner over a distance of two or more miles, which distance is ample for the stoppage of even high speed trains before coming into close proximity to a dangerous condition.

The Ruhmkorff coil 7 or 8 as the case may be, operates after the manner of an ordinary telephone coil, when connected up as described with the transmitter of the engine carried telephone set, but because of the large size of the coil, and the conditions under which it is operated, it acts with much greater vigor than the ordinary telephone coil.

The invention has been described as being used in connection with a wireless propagating system in which Ruhmkorff coils supplied with the ordinary rheotomes are employed. Experience has taught, however, that rheotomes are troublesome adjuncts in systems of this character. It is therefore preferable that the prime source of current for the Ruhmkorff coils 7 and 8 should be an alternating current generator, in which case the rheotomes become unnecessary and the condensers are omitted. But the battery 11 is still retained for the primary circuit of the transmitter element. All the other circuits remain as described.

This application is a division of the aforesaid application filed November 19, 1907, Serial Number 402,856.

What is claimed is:

1. In a system of the character described, for transmitting trains of waves, said means including an induction coil, and a telephone circuit having a transmitter capable of inclusion in the primary winding of the induction coil, and a receiver connected to the ground wire of the aerial transmitting system, and provided with a supplemental ground connection capable of being grounded at a distance from the aerial ground.

2. In a system of the character described, means for propagating trains of waves including an induction coil, means for receiving trains of waves, and including signals actuated by the effect of said waves, and a telephone transmitting and receiving system including the said induction coil, and means for grounding two sides of the same at two points spaced apart.

3. In a system of the character described, a means for propagating trains of waves, said means including a Ruhmkorff coil, receivers responsive to the trains of waves and including signal devices responsive to the action of said trains of waves, a telephone transmitter includable in the primary winding of the Ruhmkorff coil, a ground connection for the aerial side of the Ruhmkorff coil capable of being placed at a distance from the normal ground connection of the coil, and a receiver bridged across said ground connection.

4. In a system of the character described, a means for propagating trains of waves, said means including a Ruhmkorff coil, receivers responsive to the trains of waves, and including signal devices responsive to the action of said trains of waves, a telephone transmitter, means for including the transmitter in the primary winding of the Ruhmkorff coil at will, a ground connection for the aerial side of the Ruhmkorff coil capable of being placed at a distance from the normal ground connection of the coil, and a receiver bridged across the said ground connections.

5. In a railway telephone system, a telephone set including a transmitter and receiver and having a ground connection to the track rails, and another removable ground connection capable of being placed a distance from the track but still in the vicinity of the telephone set.

6. In a telephone system, portable telephone stations each including a transmitting element and a receiving element, a constant ground connection for one side of the receiver and a removable ground connection for the other side of the receiver constantly connected with said receiver and capable of being placed at a distance from the first named ground connection.

7. In a railway telephone system, a telephone set carried by a train, a ground connection for one side of the receiver of the system through the traffic rails of the railway, and a removable ground connection for the other side of the receiver also carried by the train carrying the telephone set and capable of being inserted in the ground at a distance from the traffic rails.

8. In a railway telephone system, a receiver element grounded on one side through the traffic rails, and means for grounding the other side of the receiver comprising a suitable conductor and a terminal stake carried thereby and insertible in the ground at a distance from the traffic rails.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

EDWARD ROBERT BRODTON.

Witnesses:
E. H. ROBERTSON,
D. P. BESTER, Jr.