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WIRELESS TELEGRAPH SYSTEM.

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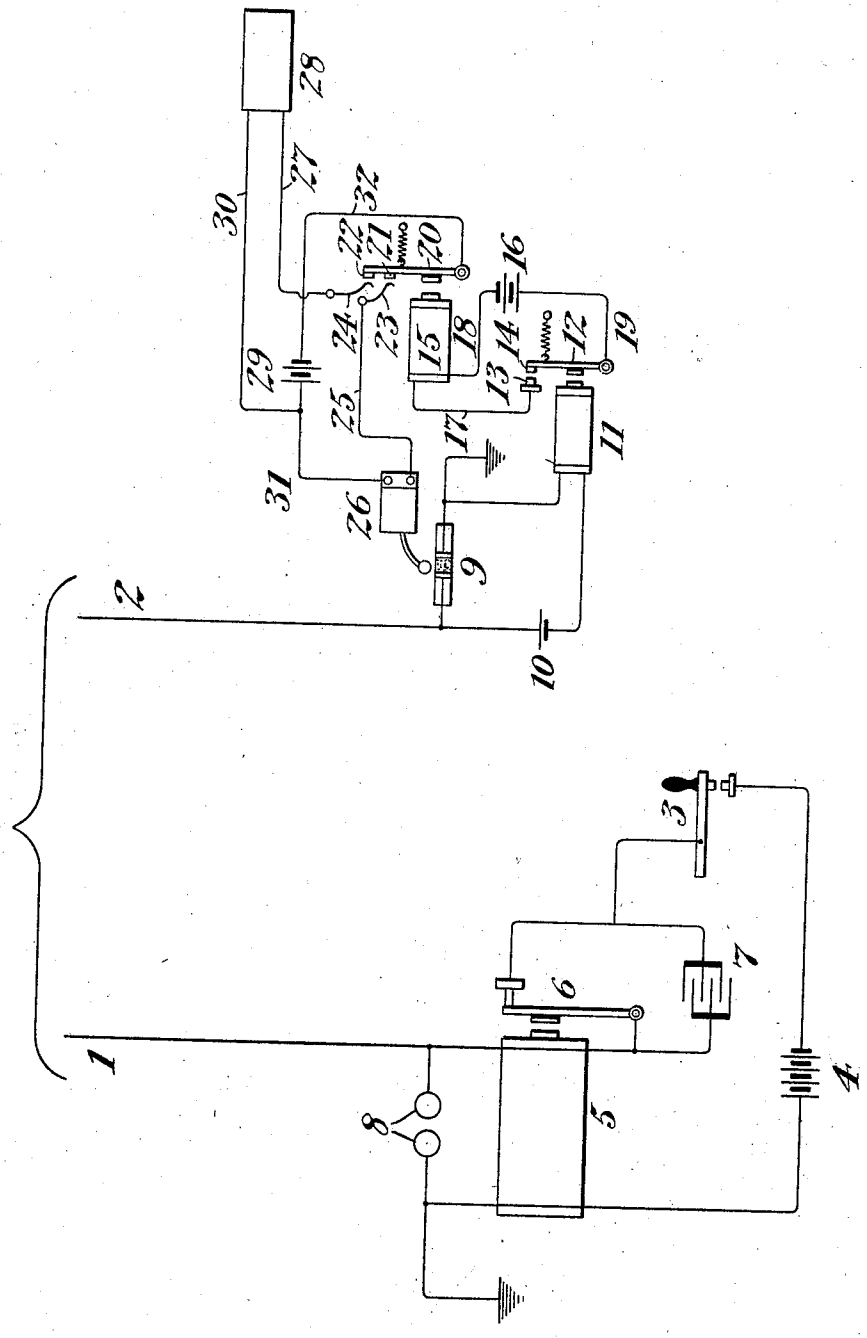

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UNITED STATES PATENT OFFICE.

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WIRELESS-TELEGRAPH SYSTEM.

No. 929,349. Specification of Letters Patent. Patented July 27, 1909.

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To all whom it may concern:

Be it known that I, CHARLES R. UNDERHILL, a citizen of the United States, and a resident of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Wireless-Telegraph Systems, of which the following is a specification.

This invention relates to a wireless telegraph system, and especially to a receiving apparatus therefor of the type in which a relay controlled by a coherer or similar device responsive to electrical impulses, disturbances or vibrations transmitted through a natural medium, is employed for governing a local circuit or circuits in which is included the principal remaining electrical element or elements of the receiving apparatus.

The principal object of this invention is to provide a wireless receiving apparatus in which all the devices controlled by a high-resistance relay or equivalent device influenced by electrical impulses, disturbances or vibrations transmitted through space may be of simpler and cheaper construction, less sensitive and more efficient, than the corresponding electrical devices heretofore used for the purpose.

It is well known that in wireless telegraph receiving apparatus the current which passes through the coherer, or other similar device responsive to impulses transmitted through space, and through the local circuit controlled immediately thereby, should be of extremely low amperage in order to facilitate decohering by mechanical or other means. This current should also be of low potential in order to prevent the passage of current through the coherer when no signal is being sent, and for the further purpose of preventing sparking between the particles constituting the circuit-making-and-breaking element of the coherer or similar responsive device. For the purpose of properly reducing the voltage and amperage of the current flowing through the coherer it is customary to employ in the local circuit of the coherer a source of energy in the form of a single cell of battery and to connect in this circuit an exceedingly sensitive relay having a very high resistance made by a fine wire winding. The local contact points of this sensitive relay, even when the circuit is closed, make a poor contact, and therefore oppose a considerable resistance to the passage of current, this resistance being due directly to the poor contact made. With such a relay it is necessary to use high resistance instruments in the local circuit controlled by such relay and to employ a source of energy having a correspondingly high potential in order to transmit the necessary power to operate the devices or instruments in such local circuit. The high resistance instruments which are ordinarily connected in such local circuit are an electromagnetic decohering device or tapper and a sounder or recording instrument. The windings of the electromagnets of these devices are of high resistance and the contact points thereof must be protected by shunts of very high resistance, as the shunt resistance for protecting such contacts must bear a certain relation to the resistance of the electromagnet winding in the circuit of the contacts to be protected. Not only are these high resistances necessary when the local circuit has high resistance contacts and includes directly the decohering device and other electrical apparatus, but it is also necessary to employ a source of energy of relatively high voltage in order to operate such electrical devices successfully. As the resistance of such a circuit is high and the voltage of the current flowing therein is also high, the tendency of the current to jump across at the contacts and cause sparking is considerable, and this tendency increases as the resistance of the circuit and of the shunt around the contact increases. If this shunt resistance be decreased it will be much more difficult to keep the instruments in the local circuit properly adjusted, and in this manner their sensitiveness is also increased. I have found that all of these difficulties and disadvantages which are inherent in a wireless receiving apparatus having high resistance contacts and windings may be overcome and obviated by employing a second local circuit governed by that local circuit which ordinarily includes the decohering device and sounder or recorder but which in my system includes only means for making firm contacts at low resistance contact points of the second local circuit, which in this system controls the decohering device, etc., and makes it possible to use low resistance windings therein.

The drawing accompanying this specification and forming part of the present application is a diagrammatic view of a wireless

telegraph system embodying my present improvements.

In this drawing 1 and 2 represent the usual antennæ at the transmitting and receiving stations respectively. Any suitable apparatus may be employed at the transmitting station for producing artificially electrical impulses, disturbances or vibrations capable of being transmitted through a natural medium and for forming these impulses, disturbances or vibrations into definite signals or code characters.

The apparatus shown at the transmitting station does not differ essentially from that ordinarily employed, the devices shown including a transmitting key 3 connected in circuit with a source of energy or battery 4 and with an induction-coil 5 having the usual vibratory circuit-maker-and-breaker 6, a condenser 7, and the usual spark-gap between the spheres 8.

At the receiving station there is employed a device responsive to such electrical impulses, disturbances or vibrations as are capable of being transmitted through a natural medium, the device shown being the usual coherer 9 connected with the antenna 2 and with ground and controlling a local circuit including a source of energy, usually a single cell 10. A high resistance relay is also employed at the receiving station and is so combined with the other elements of the receiving apparatus as to be responsive to the electrical impulses, disturbances or vibrations received. This relay, which is designated by 11, is preferably connected in the well-known manner in a local circuit which includes the coherer and the battery 10. The winding of this relay magnet is composed of fine wire in order that it may operate properly in a circuit traversed by a current of such small amperage and low voltage as that supplied by the single cell 10. This relay controls a local circuit, which circuit in this case is normally open and may be closed by means of the usual relay-switch 12 coacting with a contact 13. This contact 13 and the coöperating contact 14 on the switch 12 are always high-resistance contacts and usually are connected in a circuit through which considerable power must be transmitted, owing to the inclusion therein of the high-resistance windings of the magnets of the decohering and other devices, such as the sounder, the recorder, etc. In this system, however, while 13 and 14 are high-resistance contacts, practically no power is transmitted therethrough, because the only translating device in circuit with these contacts is some means for closing another or second local circuit governing a decohering device, etc. The preferred means employed is a relay magnet 15 connected in circuit with the contacts 13 and 14 and with a source of energy 16 by suitable conductors, such as 17, 18 and 19. When this relay magnet 15 is the only translating device employed in this circuit it will be seen that the only function of the high-resistance relay magnet 11 will be to close the circuit through the battery 16 and the second relay magnet 15 at the points 13 and 14. Because of this the resistance of the winding of the relay magnet 15 may be relatively low, say about 150 ohms, and a current of low voltage may be employed to energize the winding of the second or low-resistance relay magnet 15. Two cells of battery will ordinarily be sufficient at the point 16 to operate the second relay. The function of this second relay is to obtain a stronger energization of the local circuit controlled thereby than it is possible to make at the terminals of a high-resistance local circuit controlled directly by the relay magnet 11, and including the magnet windings of the decohering device, etc., which is the system ordinarily used. The second local circuit will usually be strongly energized by including therein only low-resistance windings and by firmly and positively closing the circuit thereof by a switch operated by the relay magnet 15. Such a switch is indicated at 20 and is connected to the armature of the relay magnet 15, and in this case has thereon two contacts 21 and 22, one of which controls a circuit through a decohering device, and the other a circuit through a sounder, a recorder, or other translating device. The contacts with which 21 and 22 coöperate may be of the type indicated at 23 and 24, said contacts being in the form of spring-tongues one of which is connected by a conductor 25 to a decohering device 26 and the other by a conductor 27 with a translating device 28 which may be a sounder, recorder or other similar electrical instrument. The devices 26 and 28 are in this system connected in parallel branches of the same circuit, a common source of energy therefor being shown at 29. This source of energy may contain only one or two cells of battery, and all of the devices included in the circuit therewith are of low resistance, the magnet windings of the devices 26 and 28 being coarse wires and the conductors 25 and 27 and also the conductors 30, 31 and 32, which complete the two branches through the source of energy 29, being conductors of large cross section as compared with those in the circuit of the magnet winding 11 of the first relay.

Since a good contact for the second local circuit is assured by the use of the second relay and by the elimination from the circuit of its magnet winding 15 of all unnecessary resistances, it will be obvious that not only will it be possible to use low resistance windings for the decohering device, etc., and thereby assure a strong and positive operation of each of these devices, but that only

low-resistance shunts will be needed across the local contacts of the second relay and at the terminals of all the magnet windings in the second local circuit. Low voltages and low resistances will therefore prevail both in the first local circuit containing the relay magnet 15 and in the second local circuit governed thereby, and sparking at the local contacts will be reduced to a minimum. Moreover, the apparatus employed may be of cheaper construction and will be much less sensitive than the devices heretofore used for the purpose, and the windings of the electromagnets will be far more efficient than those employed in a high-resistance circuit, owing to the greater efficiency of the large size wires employed, which makes the ratio of conductor to insulator greater than in the case of high-resistance windings.

What I claim is:

1. In a system of wireless telegraphy, the combination with an electrical receiving device responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, and a second local circuit controlled by said first local circuit and comprising receiving means only, said receiving means including low-resistance circuit-controlling contacts and one or more translating devices with low-resistance winding.

2. In a system of wireless telegraphy, the combination with an electrical receiving device responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, and a second local circuit controlled by said first local circuit and comprising receiving means only, said receiving means including means with low resistance winding for governing the operation of said electrical receiving device.

3. In a system of wireless telegraphy, the combination with an electrical receiving device responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, and a second local circuit controlled by said first local circuit and comprising receiving means only, said receiving means including one or more controlling devices and all the elements of said circuit being of relatively low resistance as compared with the resistance of said relay.

4. In a system of wireless telegraphy, the combination with a coherer responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, and a second local circuit controlled by said first local circuit and comprising receiving means only, said receiving means including one or more translating devices with low resistance winding.

5. In a system of wireless telegraphy, the combination with a coherer responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, and a second local circuit controlled by said first local circuit and comprising receiving means only, said receiving means including a decohering tapper with low resistance winding coöperating with said coherer.

6. In a system of wireless telegraphy, the combination with an electrical receiving device responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, and a second local circuit controlled by said first local circuit and comprising receiving means only, said receiving means including a decohering tapper coöperative with said coherer and all the elements of said circuit being of relatively low resistance as compared with the resistance of said relay.

7. In a system of wireless telegraphy, the combination with an electrical receiving device responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, and a second local circuit controlled by said first local circuit and comprising receiving means only, said receiving means including a recorder and all the elements of said circuit being of relatively low resistance as compared with the resistance of said relay.

8. In a system of wireless telegraphy, the combination with a coherer responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, and a second local circuit controlled by said first local circuit and comprising receiving means only, said receiving means including a recorder and a decohering tapper and all the elements of said circuit being of relatively low resistance

as compared with the resistance of said relay.

9. In a system of wireless telegraphy, the combination with an electrical receiving device responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, a second relay controlled by said local circuit, and a second local circuit controlled by said second relay and comprising receiving means only, said receiving means including one or more translating devices with low resistance winding.

10. In a system of wireless telegraphy, the combination with a coherer responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, a second relay controlled by said local circuit, and a second local circuit controlled by said second relay and comprising receiving means only, said receiving means including a decohering tapper with low resistance winding coöperative with said coherer.

11. In a system of wireless telegraphy, the combination with an electrical receiving device responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, a second relay controlled by said local circuit, and a second local circuit controlled by said second relay and comprising receiving means only, said receiving means including a recorder.

12. In a system of wireless telegraphy, the combination with a coherer responsive to electrical impulses or disturbances transmitted through a natural medium, of a relay also controlled by said impulses or disturbances, a local circuit controlled by said relay and embodying a low-resistance circuit-controlling winding, a second relay controlled by said local circuit, and a second local circuit controlled by said second relay and comprising receiving means only, said receiving means including a decohering tapper with low resistance winding coöperative with said coherer and a recorder.

Signed at New York, in the county of New York, and State of New York, this 8th day of August A. D. 1904.

CHARLES R. UNDERHILL.

Witnesses:

C. S. CHAMPION,

R. CHAMPION.