W. M. BRUCE, Jr.
TELEGRAPH APPARATUS.
APPLICATION FILED MAR. 29, 1915.

1,289,637.

Patented Dec. 31, 1918.
2 SHEETS—SHEET 1.

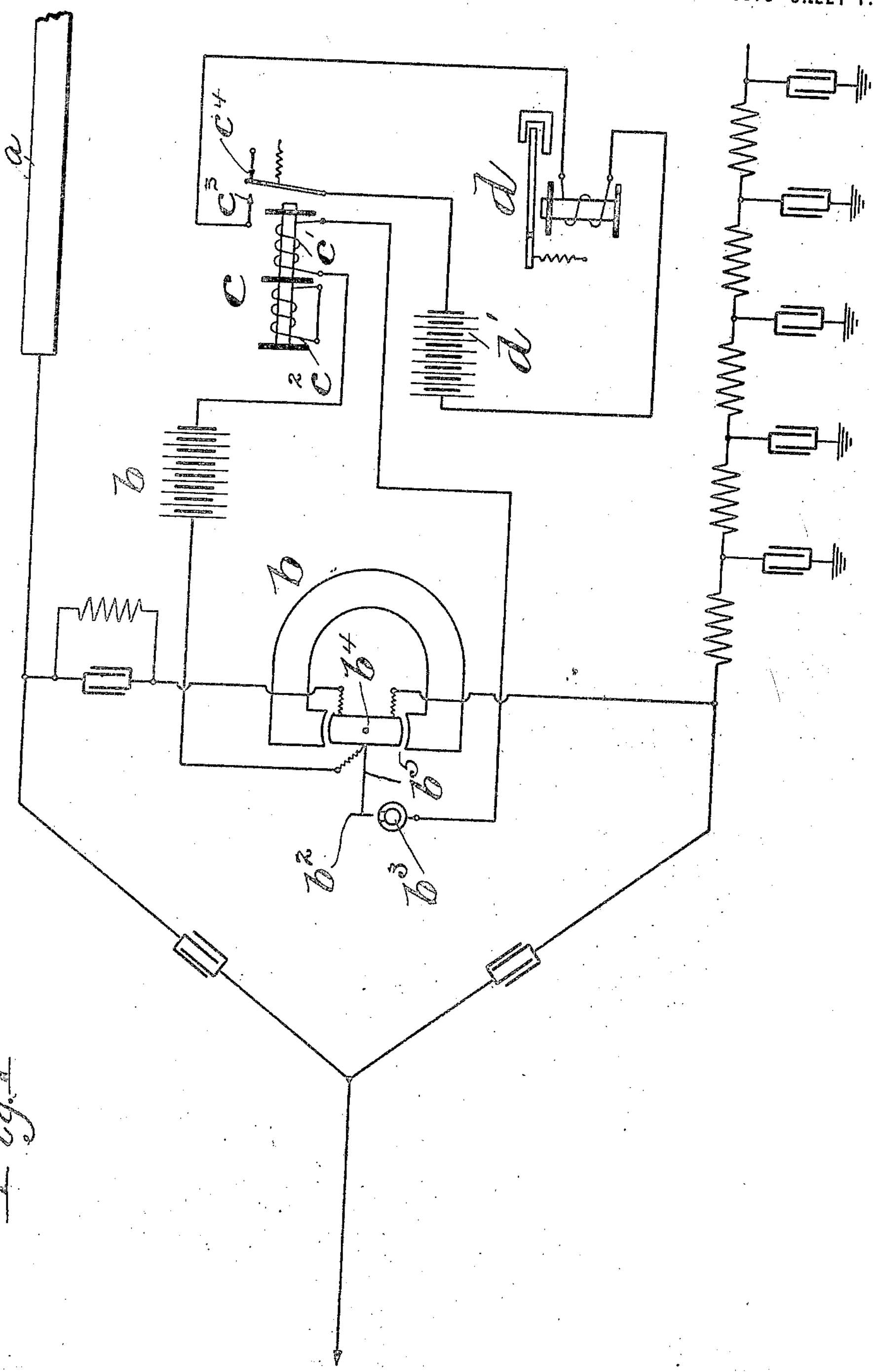

Fig. 1

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2 SHEETS—SHEET 2.

Fig. 2

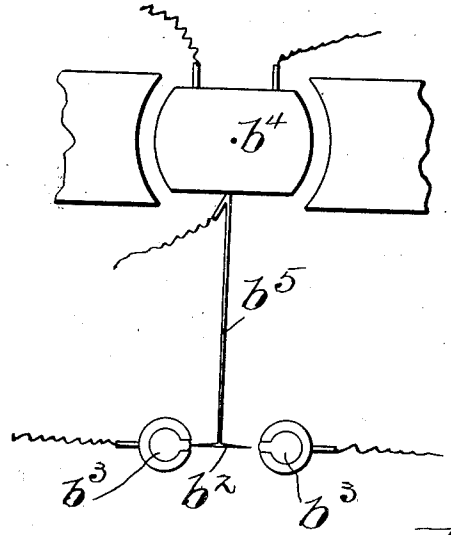


Fig. 3

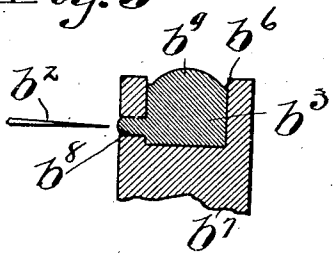


Fig. 4

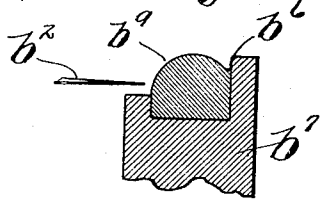


Fig. 5

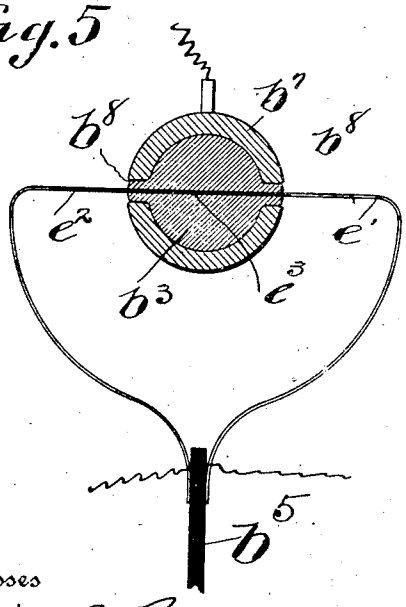
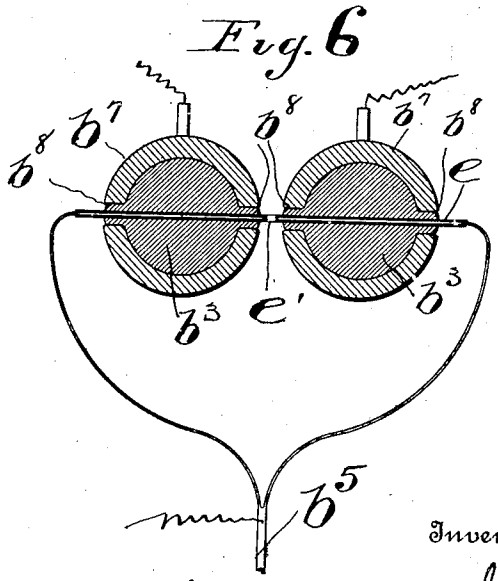


Fig. 6



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UNITED STATES PATENT OFFICE.

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TELEGRAPH APPARATUS.

1,289,637. Specification of Letters Patent. Patented Dec. 31, 1918.

Application filed March 29, 1915. Serial No. 17,809.

To all whom it may concern:

Be it known that I, WILLIAM M. BRUCE, Jr., a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Telegraph Apparatus, of which the following is a specification.

My invention relates to improvements in telegraph or similar apparatus and especially to apparatus employed in sub-marine telegraphy where conductors of high capacity and resistance are employed.

The object of my invention is to provide means for more effectively translating the currents received over lines of high capacity to operate local apparatus therefrom.

My invention consists in the constructions, combinations and circuits hereinafter described and set forth in the claims.

In the drawings:

Figure 1 is a diagram view embodying features of my invention.

Figs. 2, 3, 4, 5 and 6 are details of some of the parts and modifications thereof.

I have demonstrated that if impulses of opposite polarity are uniformly applied to one end of a conductor of high capacity that these impulses will be received at the other end and may be translated into characters such as dots and dashes of an ordinary telegraph code to operate a sounder or other form of receiving device. As the impulses of current which come through conductors of high capacity and resistance are delicate, some difficulty is experienced in repeating these impulses to local apparatus such as a sounder, recorder or other form of receiving device. It is to overcome these difficulties that my invention is especially directed.

One of the prevalent troubles to overcome is that of sufficient contact where a receiving relay is employed to repeat the impulses into local apparatus and this I have overcome by a novel arrangement and combination of contacting devices in which mercury is used as one element of a circuit maker and breaker.

Another prevalent trouble is sparking at the contacts and this I overcome by a novel arrangement of circuits involving a double wound magnet as a part of the translating device, one of the windings acting as a secondary and being short circuited to counteract the line of force set up in the main or primary winding.

In Fig. 1, a represents a cable or conductor of high capacity, b a relay or receiving device connected thereto in a usual and well known manner. c is a relay in a local circuit with battery b', and contacts b^2 and b^3 of the receiving relay b. The receiving relay b is preferably of a polarized type with a suspended coil b^4 which is vibrated in opposite directions by current impulses of opposite polarity. The movable contact b^2 of this relay is supported by a slender arm b^5 from the suspended coil b^4 and the contact b^2 proper is formed from a metal having little or no affinity for mercury, a hardened steel needle having been used by me with very satisfactory results. This needle is arranged by the vibrations of the arm b^5 on the suspended coil b^4 to contact with a globule of mercury which is supported in proximity thereto and thus make and break the contact which will close and open the circuit for the relay c from battery b^1. The relay c controls the sounder d or other receiving device also in a local circuit with a battery d^1 and contacts c^3 and c^4 on the relay c. When sufficient battery is used to operate the relay c it is difficult to prevent destructive sparking at contacts b^2 and b^3, but I have found by constructing the relay c with a main winding c^1 and secondary winding c^2, which is short circuited, that all sparking is prevented, the short circuited secondary winding c^2 counteracts the lines of force set up by the primary coil c^1 so that there is no discharge from said coil and consequently no sparking at the contacts b^2 and b^3 as the circuit is opened and closed. For the contact b^3 I employ a globule of mercury and so arrange the contact b^2, (preferably of hardened steel and finely pointed) as to slightly enter the mercury at each vibration of the arm b^5. The mercury globule is preferably located in a chamber b^6 in the top of a post b^7 which is made of some material such as brass which has some affinity for mercury and with which the same will become slightly amalgamated. This chamber b^6 has a side opening b^8 into which the mercury will flow but owing to the size of the opening and the nature of the mercury in connection with the material of which the chamber is formed it will not pass through the said opening but will present a wall of mercury at the side orifice into which the contact b^2 can penetrate at each movement.

In Fig. 4 I have shown a slight modification in which the mercury b^9 is formed in globule projecting slightly above one side of the chamber b^6. In Figs. 5 and 6 I have shown different ways of making contact in which a continuous contacting strip e is made to pass through the mercury cups, the cups in this case being arranged with oppositely arranged openings b^8. In Fig. 5 a double contact arrangement is shown where two conductors e^1 and e^2 are connected by a strip of insulation e^3 which normally stands in the mercury cup. These conductors e^1 and e^2 are on the arm b^5 and adapted as the arm b^5 is operated in either direction to form a contact with the mercury.

In Fig. 6 a similar arrangement is shown except that two mercury cups are employed with a single conductor having a single contact e^1, the conductor being insulated, when it normally contacts with the mercury on each side of the contact e^1. The vibrations of the arm b^5 are adapted to bring the contact e^1 into one or the other of the mercury cups.

In Fig. 2 I have shown a large view of the coil b^4, the arm b^5 and the contacts b^2 at the end of said arm. In this case there is a double contact and two mercury cups.

Ordinarily I have used true reversals for each character, one at the beginning and one at the end of the character, consequently one contact is sufficient as the coil is vibrated in both directions for each character. It is obvious that the double arrangement shown in Figs. 2, 5 and 6 can be employed where it is desired to make and break a contact at each movement of the arm in either direction for sending polarized impulses or reversals for instance.

Having thus described my invention, I claim:

1. In a telegraph relay, the combination with a vibrating coil, a contact arm connected thereto so as to move therewith, a mercurial contact arranged adjacent to the movement of said contacting arm, a support for said mercurial contact with which said contact forms a globule to present a contacting wall with said arm.

2. In a telegraph relay, a vibrating coil, a contact arm moved thereby in response to current impulses passing through said coil, a mercurial globule supported so as to present a side wall of contact, and an electrical circuit passing through said arm and said mercurial globule.

3. In a telegraph relay, the combination of a vibrating needle point adapted to be moved in response to current impulses passing through said relay, a mercurial cup having a side orifice at which the mercury will be exposed without flowing out, said needle point being arranged to vibrate adjacent to and penetrate the mercurial wall and establish a local circuit from said relay for the purpose specified.

4. In a telegraph relay, a mercurial contact, a support for the same formed of metal with some affinity for mercury to cause the mercury to form a contact wall in the nature of a globule held in position by the affinity for its support, in combination with a movable contacting arm having little or no affinity for mercury adapted to be moved by current impulses in said relay to penetrate the mercurial wall, and a local circuit including said arm and mercury contact.

5. In a telegraph relay, a contacting arm adapted to be moved by current impulses in said relay, said arm having a contact point adapted to be moved to different positions by impulses passing through said relay, a mercurial contact in the line of movement of said contacting arm, a support for said mercurial contact having affinity for the mercury to cause the same to present a side wall to said contact arm and with which the same may contact as and for the purpose specified.

In testimony whereof, I have hereunto set my hand this 24th day of March, 1915.

WILLIAM M. BRUCE, JR.

Witnesses:
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CHAS. I. WELCH.