No. 796,800. PATENTED AUG. 8, 1905.

E. BRANLY.

RECEIVER FOR USE IN WIRELESS TELEGRAPHY.

APPLICATION FILED SEPT. 4, 1902.

2 SHEETS—SHEET 1.

Fig. 1.

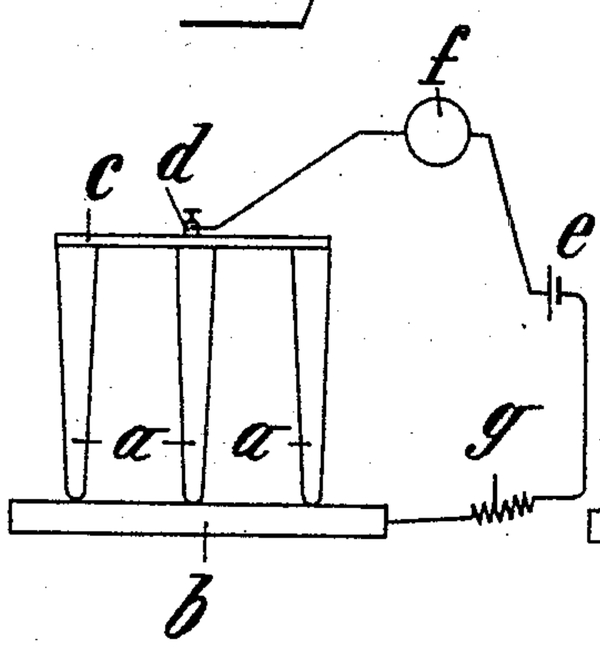


Fig. 2.

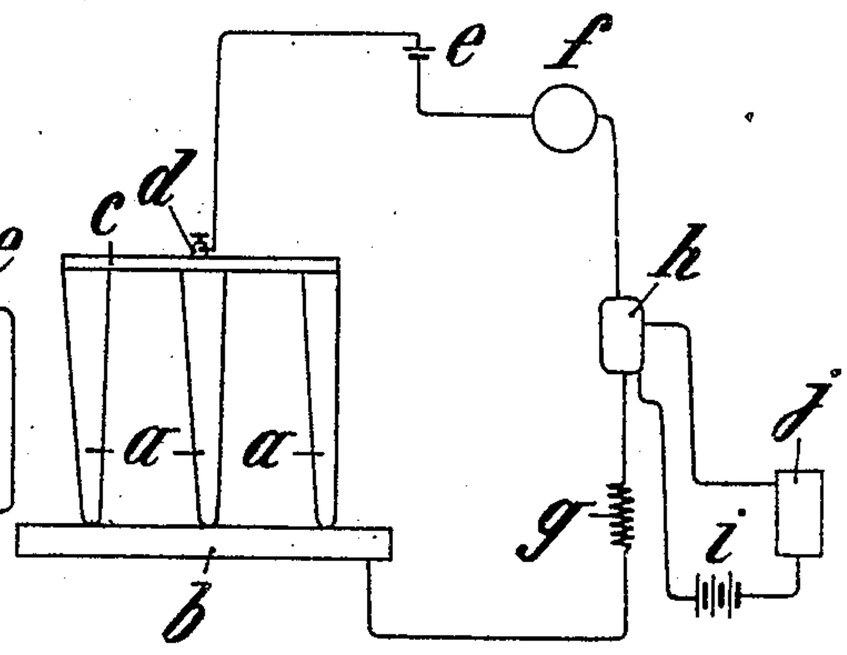
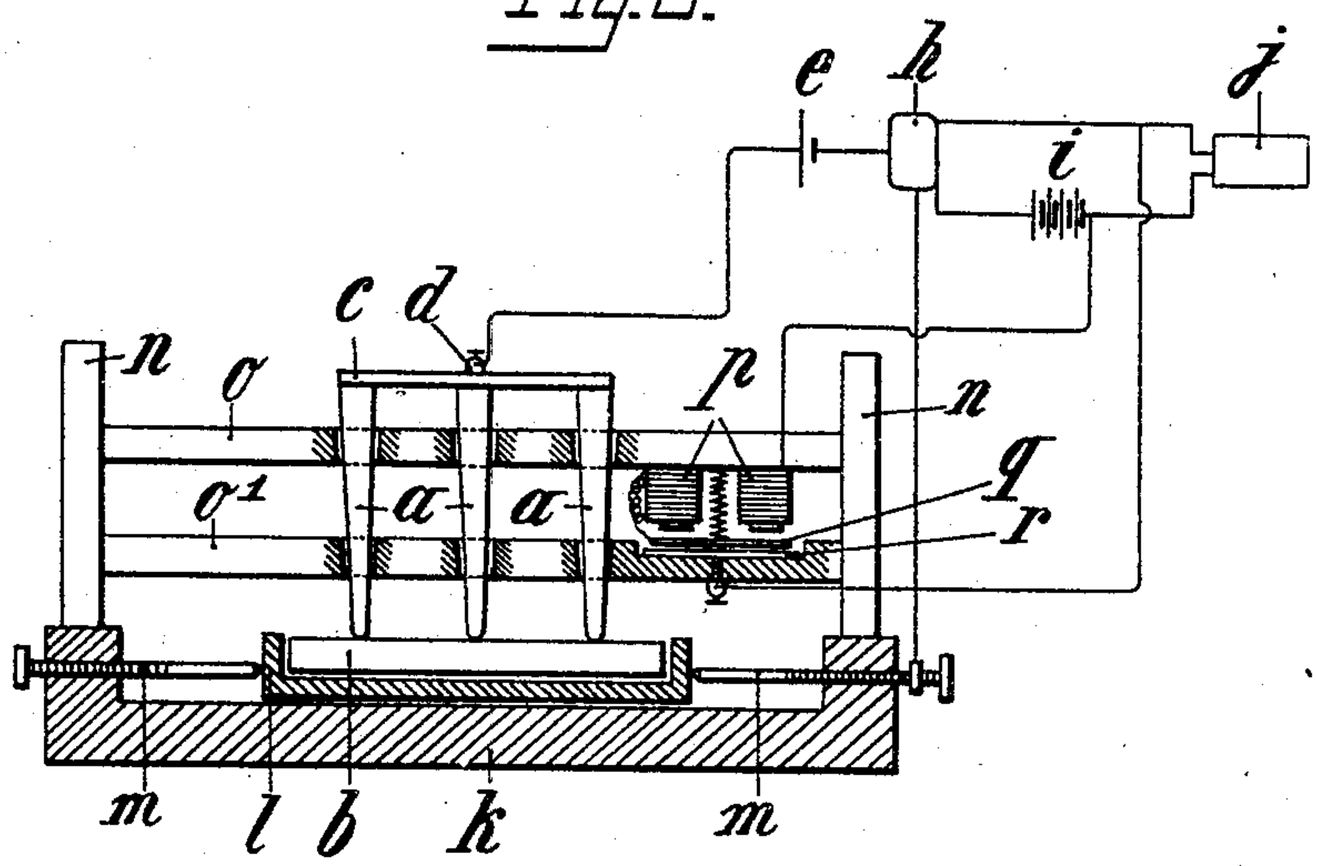


Fig. 3.



WITNESSES:
W. M. Avery
Walton Harrison

INVENTOR
Edouard Branly
BY
Munn & Co
ATTORNEYS.

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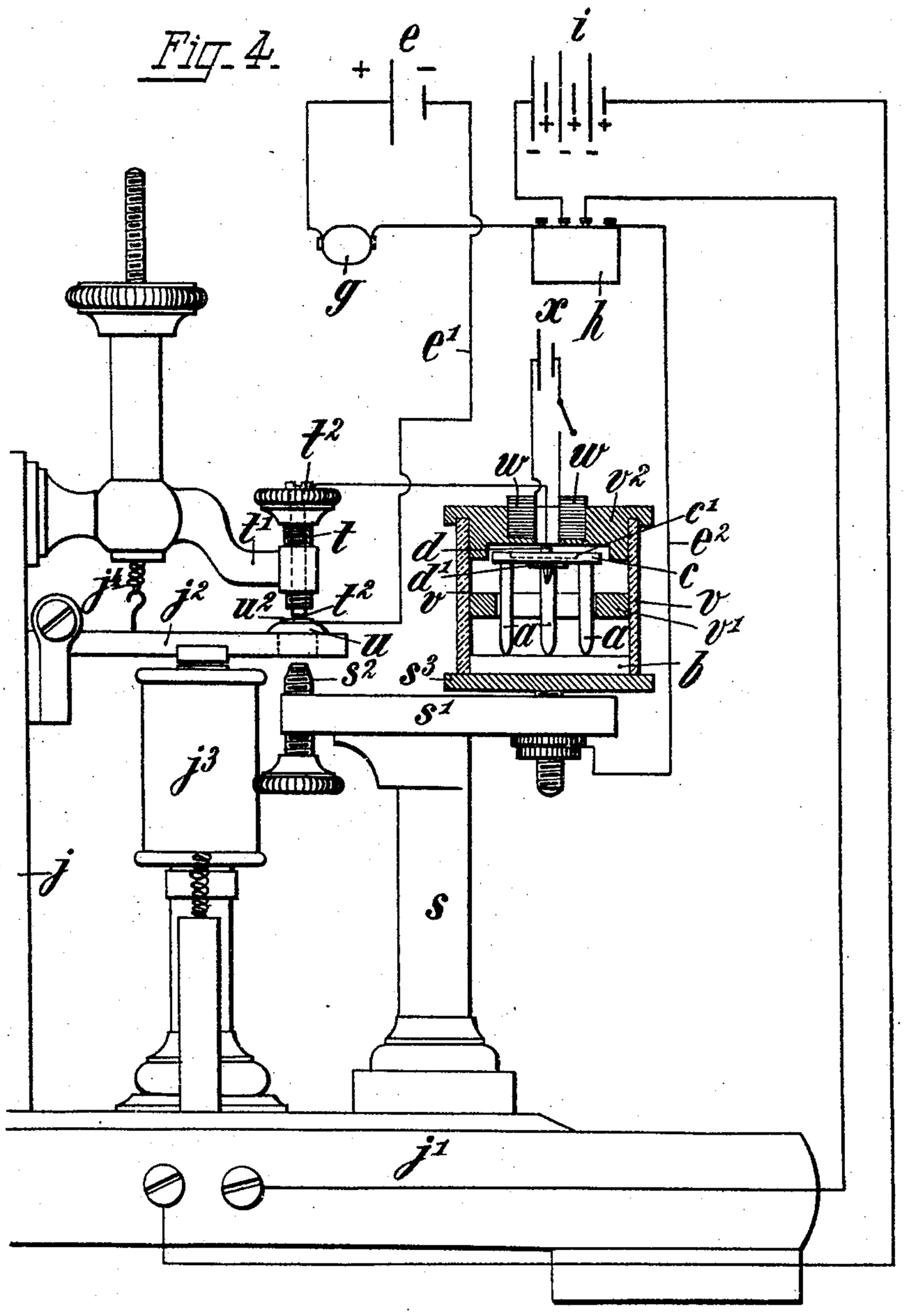
Fig. 4.



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UNITED STATES PATENT OFFICE.

EDOUARD BRANLY, OF PARIS, FRANCE, ASSIGNOR TO VICTOR POPP, OF PARIS, FRANCE.

RECEIVER FOR USE IN WIRELESS TELEGRAPHY.

No. 796,800. Specification of Letters Patent. Patented Aug. 8, 1905.

Application filed September 4, 1902. Serial No. 122,060.

To all whom it may concern:

Be it known that I, EDOUARD BRANLY, of 3 Rue Boursault, in the city of Paris, Republic of France, have invented an Improved Receiver for Use in Wireless Telegraphy, of which the following is a full, clear, and exact description.

This invention has for its object a system of receiver for electric waves specially adapted for application in wireless telegraphy.

My receiver essentially comprises two metallic parts in contact, one of which is polished and the other oxidized, the contact of the oxidized with the polished surface possessing the property of preventing the passage of the current under normal conditions, but of immediately becoming conductive on the emission of an electric spark at a distance, and of instantly resuming its resistance under the action of a very slight shock. One of the parts is preferably constituted of metal rods, whose blunt points are oxidized and rest upon a polished metal plate, or conversely the plate may be oxidixed and the blunt points be polished. By means of this multiple-contact device the operation of the receiver is always insured, as there will be always at least one contact capable of being rendered conductive under the influence of electric waves.

In order that the invention may be readily understood, I have illustrated in the accompanying drawings an example of my receiver.

Figure 1 is a diagrammatic view of the receiver. Fig. 2 is a diagram illustrating the application of the receiver. Fig. 3 shows an arrangement of apparatus based on the above-mentioned principle. Fig. 4 shows the coherer as mounted directly upon the recording apparatus.

The same letters of reference denote like parts in the several figures.

My receiver comprises essentially three or more rods *a*, of polished steel or other metal, having blunt points and resting upon a metal plate *b*, of polished steel or other metal. The three rods *a* are carried by a plate *c*, of brass or other suitable metal provided with a binding-screw *d*, to which is attached one of the conducting-wires of the receiving electric circuit, of which the other conductor is connected to plate *b*. The ends of the rods *a* in contact with the plate *b* are oxidized, for the purpose of creating a resistance which normally prevents the passage of the current of a small battery *e*. The oxidation of the points of the rods may be effected by any suitable process, as for example by placing them for a certain time in a hot-air stove at the proper temperature, the degree of oxidation being capable of regulation by varying the temperature of the stove and the duration of the heating. The oxidation may also be produced by chemical action.

In the circuit of the battery *e*, to the poles of which the plates *c* and *b* are respectively connected, are interposed a galvanometer *f* and a resistance *g*. The circuit being thus completed the needle of the galvanometer *f* remains at zero, as the current from battery *e* does not flow, the circuit being cut by the contact of the polished plate *b* with the oxidized ends of rods *a*. But if a small spark be emitted at a certain distance between the two small balls of a Hertz vibrator, a deviation of the needle of the galvanometer *f* will immediately be observed. The contacts of rods *a* and plate *b* therefore become conductive under the influence of a spark at a distance. To destroy this conductivity and instantly restore the resistance of the contacts, it is only necessary to impart a very slight shock to the instrument, whereupon the needle of the galvanometer *f* will instantly return to zero.

In the circuit of the receiver is interposed as shown in Fig. 2, a relay *h*, which on the passage of the current through this circuit closes the circuit of a local battery *i* through a Morse instrument *j*.

Fig. 3 shows an apparatus arranged to work on this principle. The apparatus comprises a base-plate *k* of insulating material, upon which rests a conductive tray *l* held in position by adjusting-screws *m* and containing a polished plate *b*. Upon the base-plate *k* are mounted standards *n* united by cross-bars *o*, *o'* having holes for the passage of the rods *a*. The receiver is thus fixed except that the position of the points of contact of the rods *a* upon the plate *b* may be regulated by means of the adjusting-screws.

The decohering shock is produced by a tapper arranged in the following manner: Upon the upper cross-bar *o* is mounted an electromagnet *p*, whereof the armature is placed in a recess in the lower cross-bar *o'*, this armature being connected to one end of the wire wound on the spools of the electromagnet. Normally the armature *q* rests upon a conducting-plate *r*, the electromagnet *p* and the

plate r being connected respectively with the two poles of the local battery i. When electric waves are emitted at a distance the contact of rods a with plate b becoming conductive as hereinbefore described, the current from the small battery e flows and the relay h closes the circuit of the local battery i, and operates the Morse instrument j, but the current also flowing through the electromagnet p its armature q which acts as a trembler imparts a slight tap or shock to the receiver, the effect of which is to instantly restore the resistance to the contacts and immediately render the apparatus capable of receiving another signal.

My receiver of electric waves presents great advantages resulting from the simplicity of its construction, and if placed in a dry situation its efficiency is unlimited, as its restoration is in any case instantaneous, and moreover it possesses a high degree of sensibility. The decohering tap or shock need only be very slight, if care be taken to vary the voltage of the battery to suit requirements; the motion of the tapper need be but of very slight extent, say half a millimeter, for example, hence the possibility of very rapid reception of the signals transmitted. The efficient working of the apparatus is always assured, as of the several contact-points there would always be at least one in working order. This regularity of working is due to the fact that the contacts are always perfectly established and constantly in the same conditions, the resistances present being exactly determined by the degree of oxidation and the degree of polish of the parts in contact are constant; conductivity is always obtained under the same influences and the resistance is instantly restored by shocks which may be easily produced since the surfaces in the contact remain constantly similar. The apparatus can therefore never lose its sensibility and no external vibration can influence it since by regulating the amount of resistance of the contacts the shock of the coherers may itself be regulated.

In order to protect the coherer from the oxidizing action of the moisture of the air and prevent any oxidation of the polished surfaces, the apparatus may be placed in a chamber exhausted of air or immersed in any suitable liquid medium such as petroleum, oil, &c., or in semiliquid fatty matter, &c., whereby the polished surfaces will be protected from oxidation and will permanently retain their polish, whatever may be the situation in which the apparatus is placed; the apparatus is thus capable of working for an indefinite period.

My coherer can be mounted directly upon the recording apparatus, as shown in Fig. 4. Mounted upon the base-board j' of the recorder j and insulated therefrom is a column s. This column supports a platform s' which is made of metal, preferably copper. Upon this platform is fixed a screw s^2 constituting the lower stop for the armature-lever j^2 of the electromagnet j^3. The platform s' also supports the base s^3 of the coherer. A screw t made of insulating material forms the upper stop for the armature-lever j^2. This screw passes through the support t' which is fixed upon the case containing the clockwork of the recorder. The armature-lever j^2 supports an insulating-block u which touches the screw s^2 when the armature-lever is attracted by the electromagnet, so that there can never be any electric communication between the lever j^2 and the platform s' at the moment when the armature is attracted by the electromagnet j^3. The insulating-block u is provided at the top with a metallic contact u' made preferably of platinum, and connected with a flexible conductor e' forming one of the terminals of a battery-cell e of low voltage. When the armature is released by the electromagnet j^3 and retracted by the spring j^4, the contact u' engages the end of the platinum screw t^2 which passes through the insulating-screw t, and which is electrically connected with one of the terminals of the coherer as explained below.

The plate b, made of polished steel or other suitable metal rests upon the support s^3, and upon this plate b rests the tripod consisting of a small plate c of brass or other conducting material and provided with three legs a made of polished steel or other suitable material, the extremities of these three legs at the point of contact with the plate b being oxidized. The oxidization normally prevents the passage of a current from the battery-cell e in the circuit of which the coherer is inserted, but when the coherer is excited by electric oscillations the conductivity of the imperfect contact thus formed is greatly increased. The plate c is in electrical connection with the platinum screw s^2 and therefore in commnnication with one of the terminals of the cell e whenever the lever j^2, being released by the electromagnet j^3, is retracted. The other pole of the cell e is connected by a wire e^2 with the metallic support s^3 upon which rests the polished steel plate b. Along this wire are inserted in series an adjustable resistance g and a relay h. The latter at the moment when a current passes through the circuit of the cell e closes the circuit of the local battery i, preferably of a potential of five or six volts, which sets in motion the recording apparatus j.

In order that the coherer may be shielded from the influence of external disturbances it is inclosed in a glass cylinder v. This cylinder is provided internally with a ring v' of insulating material, which is polished internally and serves to limit the lateral play of the tripod. The cylinder also supports a crown-piece v^2 made of insulating material, such as ivory. Upon this crown-piece rests an electromagnet w provided with a central

canal for the passage of the flexible conducting-wire connecting the tripod with the screw t^2. This electromagnet w inserted in the circuit of a small auxiliary battery x attracts the tripod and holds the same elevated slightly above the polished steel plate b whenever a current from the battery x is passing through the magnet. For this purpose a soft iron ring c' is embedded into the upper part of the platform c and serves as an armature. The conductor which is connected to the platform c consists preferably of a wire of annealed silver, fixed as shown in Figs. 4 and 5 by means of two semicylinders d between which it is pressed and upon which the nut d' is fitted.

The mode of operation of the device shown in Fig. 5 is as follows: When the apparatus is in a state of rest, the lever j^2 held by the spring j^4 presses the contact u^2 against the screw t^2 and the circuit of the cell e is kept open by the film of oxid upon the tips or bottoms of the legs a in contact with the plate b. If, now, Hertzian waves from a distance energize the aerial the imperfect contacts between the plate b and the legs a resting thereupon become temporarily conducting. The circuit of the cell e is thus virtually closed, the current from the cell traversing the relay h, thus causing the circuit of the local battery i to be closed. The current from the battery i energizes the electromagnet j^3, causing it to attract the armature j^2 and drawing the contact member u^2 away from the screw t^2, thus breaking the circuit of the cell e. Moreover, the lever j^2 in its motion due to the attraction of the magnet, strikes against the screw s^2 and gives the support s' a slight shock which causes decoherence of the imperfect contacts. The circuit of the cell e being thus broken, the relay h is no longer traversed by a current, and therefore the circuit of the local battery i is also broken. As a consequence there is no current through the magnet j^3, and the lever j^2 retracted by the spring j^4 returns to its original position, again pressing the contact u^2 against the screw t^2. As the coherer has been decohered through the shock of the lever j^2 against the screw s^2, the circuit of the cell e remains open until the imperfect contacts are again affected by the wave energy.

It will be noted that in my device the circuit of the cell e is broken before the shock takes place. The shock therefore ensues after all induced currents (such as arise in all bobbins, magnets, coils, &c. used in the Morse apparatus) have subsided, these currents being produced and given a chance to die down during the interval between the breaking of the circuit and the shock of decoherence. The closing of the circuit of the local battery i serves moreover, in the ordinary way to throw into action the recording instrument j'', which causes the enrolling of the paper band and the impression thereupon of the long and short signs representing dots and dashes of the Morse alphabet.

In my device there is comparatively small play given to the armature-lever, and in consequence a very rapid and certain transmission of signals is effected. When it is desired that the apparatus shall be operated in the immediate vicinity of an oscillator the circuit of the auxiliary battery x is first closed so as to permit a current to energize the electromagnet w, which thereupon attracts the tripod and thus holds it clear of the plate b. In this way it is possible to operate the receiver in the immediate vicinity of a transmitter throwing off Hertzian waves. On account of this feature it is not necessary to remove the coherer or to inclose it within a metal box in order to guard it against external influences. To restore the instrument to its receiving condition, all that is required is that the circuit of the battery x be broken so that the tripod immediately rests upon the polished steel plate b.

My improved apparatus may be varied in form and dimensions, and I reserve the right to modify the details of construction to suit the different applications.

I claim—

1. In a wireless-telegraph receiver, the combination of a contact-point and contact-plate, both electrically connected in the mast and receiver circuits, and means for shifting the relative positions of the contact-point and contact-plate, so as to change the point of engagement between the contact-plate and contact-point.

2. In a wireless-telegraph receiver, the combination of a contact-point, an oxidized contact-plate, both electrically connected in the mast and receiver circuits, and means for shifting the relative positions of the contact-point and contact-plate so as to change the point of engagement between the contact-plate and contact-point.

3. In a wireless-telegraph receiver the combination of an adjustable contact-point with a longitudinally-movable contact-plate, both electrically connected in the mast and receiver circuits.

4. A coherer, comprising a tray, means for adjusting the same, a plate of conducting material mounted within said tray, and a member forming an imperfect contact with said plate.

The foregoing specification of my improved receiver for use in wireless telegraphy signed by me this 22d day of August, 1902.

EDOUARD BRANLY.

Witnesses:
EDWARD P. MACLEAN,
MAURICE H. PIGUET.