No. 744,936. PATENTED NOV. 24, 1903.

A. PLECHER.

RECEIVER FOR WIRELESS TELEGRAPHS OR TELEPHONES.

APPLICATION FILED JAN. 17, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

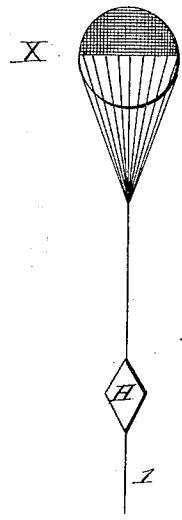
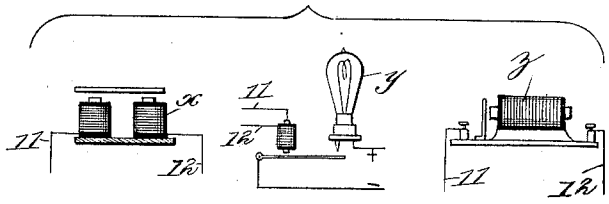
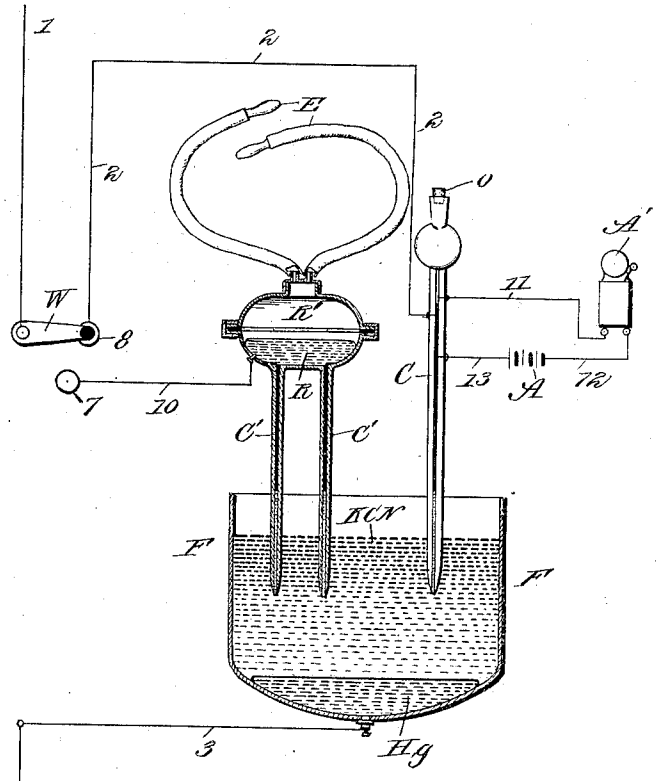


Fig. 1a.





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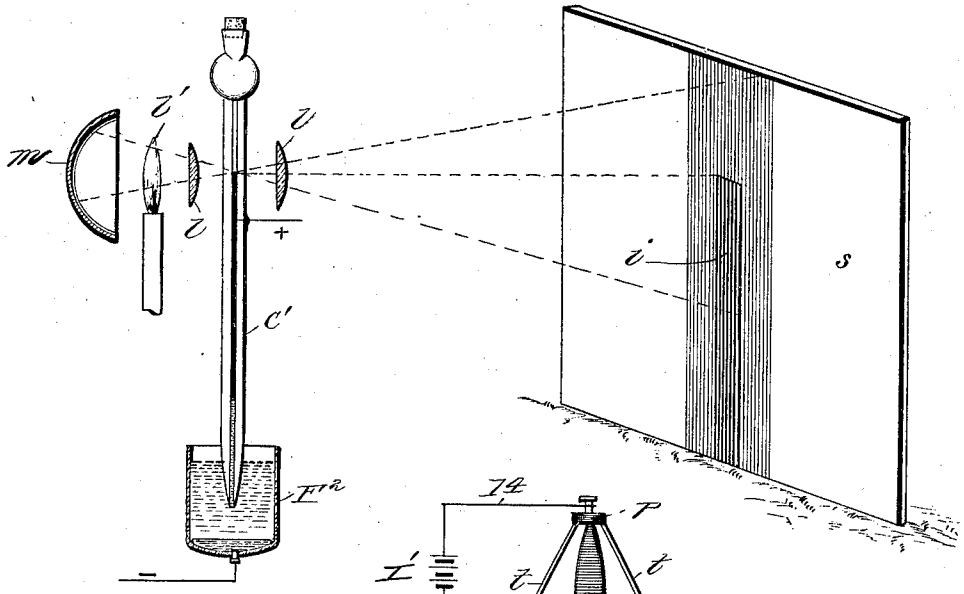
APPLICATION FILED JAN. 17, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



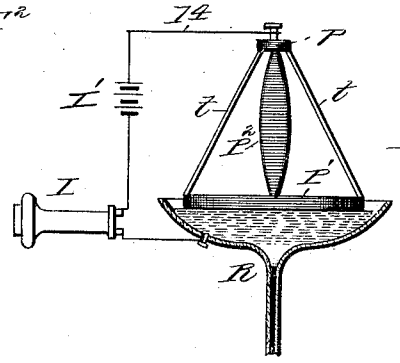
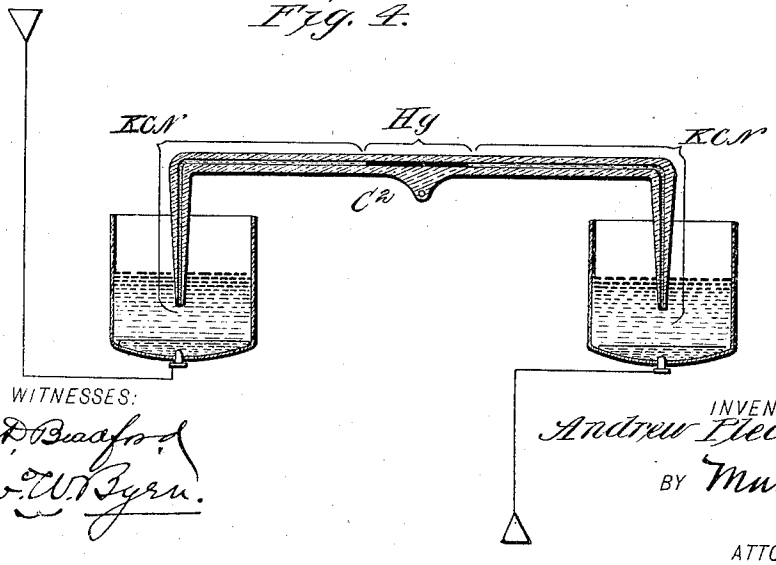


Fig. 3.

Fig. 4.



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No. 744,936. Patented November 24, 1903.

UNITED STATES PATENT OFFICE.

ANDREW PLECHER, OF BRISTOW, VIRGINIA.

RECEIVER FOR WIRELESS TELEGRAPHS OR TELEPHONES.

SPECIFICATION forming part of Letters Patent No. 744,936, dated November 24, 1903.

Application filed January 17, 1903. Serial No. 139,434. (No model.)

To all whom it may concern:

Be it known that I, ANDREW PLECHER, of Bristow, in the county of Prince William and State of Virginia, have invented a new and useful Improvement in Receivers for Wireless Telegraphs and Telephones, of which the following is a specification.

My invention is in the nature of an improvement in receivers for wireless telegraphs and telephones; and it consists in interposing in the circuit between the air-terminal and the earth connection a capillary electrometer, the rise and fall of whose mercury column from the passage of the Hertzian waves therethrough is made the means of announcing the call and also of interpreting the message. I preferably employ one capillary electrometer to receive the call and another of specially sensitive design to receive the message, a switch being so combined with the two as to throw either of them into the circuit between the air-terminal and the earth, all as hereinafter more fully described with reference to the drawings, in which—

Figure 1 is a partly-diagrammatic and partly-mechanical view of my invention. Fig. 1ª represents several modifications of the call device. Fig. 2 represents a modification which may be used either for the call-signal or the receiving device. Fig. 3 represents a modification of the message-receiving device in which a microphone is used, and Fig. 4 is a detail of another modification.

In the drawings, Fig. 1, H represents an elevated air-terminal plate of suitable size for receiving the Hertzian waves, which terminal is preferably suspended by a captive balloon X, by which greater altitude for the air-terminal may be secured. The air-terminal is connected by wire 1 with a switch W, which when placed upon the point 8, as shown, leads to the call device and when placed on the point 7 leads to the message-receiving instrument.

C is the capillary electrometer of the calling-signal, and C′ C′ the capillary electrometer of the message-receiving instrument. I prefer to use separate capillary electrometers for the calling-signal and receiving-signals; but the same capillary electrometer may be used for both without departing from my invention, as hereinafter described. For the present I will describe the use of two capillary electrometers, one for receiving a call and the other for receiving the message, since this enables me to make the message-receiving electrometer of a fine sensitiveness and to utilize other desirable accessories for calling. Both electrometers, however, embody the same general construction and the same principles and mode of action. They each consist of a glass tube or tubes whose internal channel or bore is a little less than a millimeter in diameter and in which is held in suspension by capillary action a fine column of mercury which does not extend to the lower end of the tube. The lower end of the tube is open and is immersed in a solution of potassium cyanid, (KCN,) to which I prefer to add about one per cent. of silver cyanid and ten per cent. of potassium hydrate. This liquid extends up to and meets the lower end of the capillary column of mercury. I do not confine myself to the use of the potassium-cyanid solution, as dilute sulfuric or chromic acid or permanganic acid may be used in the place of the same. The solution is contained in a glass bowl F, in the bottom of which is contained a little mercury (Hg) for the purpose of making a better electrical connection with a circuit-wire 3, which enters the mercury through the glass bowl and connects with the wire 4, leading to the ground G.

From the switch-terminal 8 a wire 2 leads to the capillary electrometer C and entering its wall is in constant electrical contact with the upper portion of the capillary column of mercury, and when switch W is on point 8 it will be seen that the air-terminal is connected to ground through wire 2, the capillary column of mercury in C, the potassium-cyanid solution, the mercury in the bottom of the bowl, and wires 3 and 4, and whenever any electrical impulse passes over this route the capillary mercury column will in obedience to the action of a capillary electrometer instantly rise and immediately fall again when the electric impulse ceases or wanes, the capillary column acting in this way with great sensitiveness and rapidity. This variation in the level of the capillary column of mercury is in my invention utilized for receiving the call and interpreting the mes-

sage. For announcing the call I prefer to use an independent local battery A with circuit 11 12 13, containing a bell A′, the terminals of the local-circuit wires 11 and 13 being fused in the side walls of the capillary column, one below and the other above the level of the mercury column, so that when the mercury column rises it will close electrical connection between 11 and 13 and ring the bell. In the place of the bell any audible or visible signal may be used, as shown in Fig. 1ª, in which *x* represents a sounder, *y* an electric lamp, and *z* an induction-coil vibrator or buzzer.

The message-receiving instrument consists of a multiplicity of capillary electrometers of the same general construction and arrangement as shown at C and immersed in the solution in the same bowl. The capillary tubes are, however, unified at the top and expanded into a bowl R, and over the top of the bowl there is an air-chamber R′, hermetically sealed and provided with two ear-tubes E E. In the bowl R and in metallic contact with the capillary mercury columns is a quantity of mercury, and with this connects electrically the external circuit-wire 10, leading to the switch-point 7.

Now after a call has been received the switch W is placed upon the point 7, and the circuit from the air-terminal passes through wire 1, switch W, wire 10, the capillary electrometers C′ C′, the solution in the subjacent bowl F, and wires 3 and 4 to the ground, and so delicate is the response of the capillary columns of mercury under the varying influence of the Hertzian waves that the mercury in the bowl R acting upon the air in the chamber R′ translates the movement of the mercury into audible sound-waves, which are heard through the earpieces. The use of potassium cyanid in the bowl F in translating the movement into sound is particularly recommended in preference to the other reagents named. As a modification of this part of the message-receiving device I may substitute for the air-chamber R′ a carbon microphone floated on the surface of the mercury in the bowl. An example of this is seen in Fig. 3, in which carbon-plates P P′, with a pencil of carbon P^2 between them, are held by non-conducting uprights *t* so as to float on the mercury in the bowl. A local circuit 14 has its terminals connected one to the upper carbon-plate and the other to the mercury in the bowl, and in said local circuit is arranged a battery I′ and telephone-receiver I.

My receiving devices are applicable to and designed to be used with any of the ordinary transmitting devices used in wireless telegraphy, and from experiments made are believed to have value and efficiency as a receiving device in connection with a system of wireless telephony, which use I mean to be included within the scope of my claims.

For telegraphic purposes the same capillary electrometer may be used for both receiving a call and receiving the message. An example of this is shown in Fig. 2, in which the reception of messages is accomplished visually instead of audibly. In such case a light *l′*, with lenses *l l* and reflector *m*, is arranged at the level of the top of the capillary column of mercury, and the image of the mercury column is thrown onto a screen *s* and is made to appear at *i* on so large a scale and its amplitude or rise and fall so much extended as to make a very clear and practical reading of the message.

It will be understood that in carrying out my invention many variations in the construction and arrangement of the details and the position of the parts may be made without departing from my invention as herein defined. Thus, for instance, instead of arranging the capillary electrometer vertically it may be arranged horizontally, as at C^2 in Fig. 4, in which the tube dips at each end into the potassium-cyanid solution, and the mercury column is in the middle and the tube itself is pivoted, so as to permit it to be adjusted to an exact level.

To regulate the normal height of the mercury in the capillary electrometer, a definite but variable air-pressure may be maintained above the level of the mercury column by means of a bulb having a stopper *o*, as seen in Fig. 1, and by maintaining the column of mercury at a definite level in relation to the contact-point of wire 11 the instrument may be made to close circuit from a sending-station at a predetermined distance and be inoperative for greater distances.

In defining my invention with greater clearness, I would state that I am aware that a capillary electrometer is not a new device, and I make no claim to such capillary electrometer alone. I am also aware of the electrocapillary relay of Arnol for wireless telegraphy, in which a progressive feed in one direction of the mercury column was employed and which apparatus necessarily exhausted itself in a little while, because the capillary column was not a permanent column acting under the influence of the electromagnetic waves to rise and fall or move back and forth, as in my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A signal-receiving device for wireless telegraphs and telephones, comprising a capillary electrometer containing a permanent liquid column combined with and interposed between an air-terminal and the earth connection, and means for noting the back-and-forth movement of the capillary column under the influence of the Hertzian waves substantially as and for the purpose described.

2. A signal-receiving device for wireless telegraphs and telephones, comprising two capillary electrometers containing permanent liquid columns, combined with and inter-

posed between an air-terminal and the earth connection, one of said electrometers being provided with means for announcing a call and the other being provided with message-receiving devices substantially as and for the purpose described.

3. A signal-receiving device for wireless telegraphs and telephones, comprising two capillary electrometers containing permanent liquid columns combined with and interposed between an air-terminal and the earth-terminal, one of said electrometers being provided with terminals for a local circuit arranged to be connected by the rise of the capillary column of the electrometer, a local circuit for the same having a call-signal located therein, and the other electrometer having message-receiving devices substantially as and for the purpose described.

4. A signal-receiving device for wireless telegraphs and telephones, comprising two capillary electrometers containing permanent liquid columns combined with and interposed between an air-terminal and the earth connection, one of said terminals being provided with means for announcing a call and the other being provided with message-receiving devices, and a switch arranged to connect alternately the two electrometers to the air-terminal substantially as and for the purpose described.

5. A signal-receiving device for wireless telegraphs and telephones, comprising a vertical capillary tube containing mercury, a subjacent vessel containing potassium cyanid or its described equivalent, submerging the lower end of the tube, an air-terminal connection for the mercury column in the tube and a ground connection for the contents of said subjacent vessel substantially as and for the purpose described.

6. A signal-receiving device for wireless telegraphs and telephones, comprising a capillary electrometer having an expanded bowl-shaped upper end containing mercury, an air-chamber with ear-tubes above said bowl-shaped end, said capillary electrometer being combined with and interposed between the air-terminal and earth connection substantially as and for the purpose described.

7. A signal-receiving device for wireless telegraphs and telephones, comprising a capillary electrometer, combined with and interposed between an air-terminal and the earth connection, a screen and means for magnifying and throwing the image of the capillary column of the electrometer upon the screen substantially as described.

8. A signal-receiving device for wireless telegraphs and telephones, comprising a bowl having in the bottom of the same a quantity of mercury and a ground connection for the same, and above the mercury a supernatant body of potassium cyanid or its described equivalent, a capillary tube having its lower end immersed in and in open communication with the potassium cyanid, and a capillary column of mercury within the tube, an electrical connection for said capillary column, and an air-terminal and means for connecting it electrically to the capillary column substantially as and for the purpose described.

9. A signal-receiving device for wireless telegraphs and telephones, comprising a capillary electrometer combined with and located between an air-terminal and an earth connection, said capillary electrometer consisting of a multiplicity of capillary tubes joined together at their upper ends, an air-chamber with earpieces located above the same, and a subjacent bowl with a solution of potassium cyanid, or its described equivalent, immersing the lower ends of the capillary tubes substantially as and for the purpose described.

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