R. H. RENDAHL.

RECEIVER FOR WIRELESS TELEGRAPHY.

APPLICATION FILED NOV. 1, 1906.

994,426.

Patented June 6, 1911.

Fig. 1.

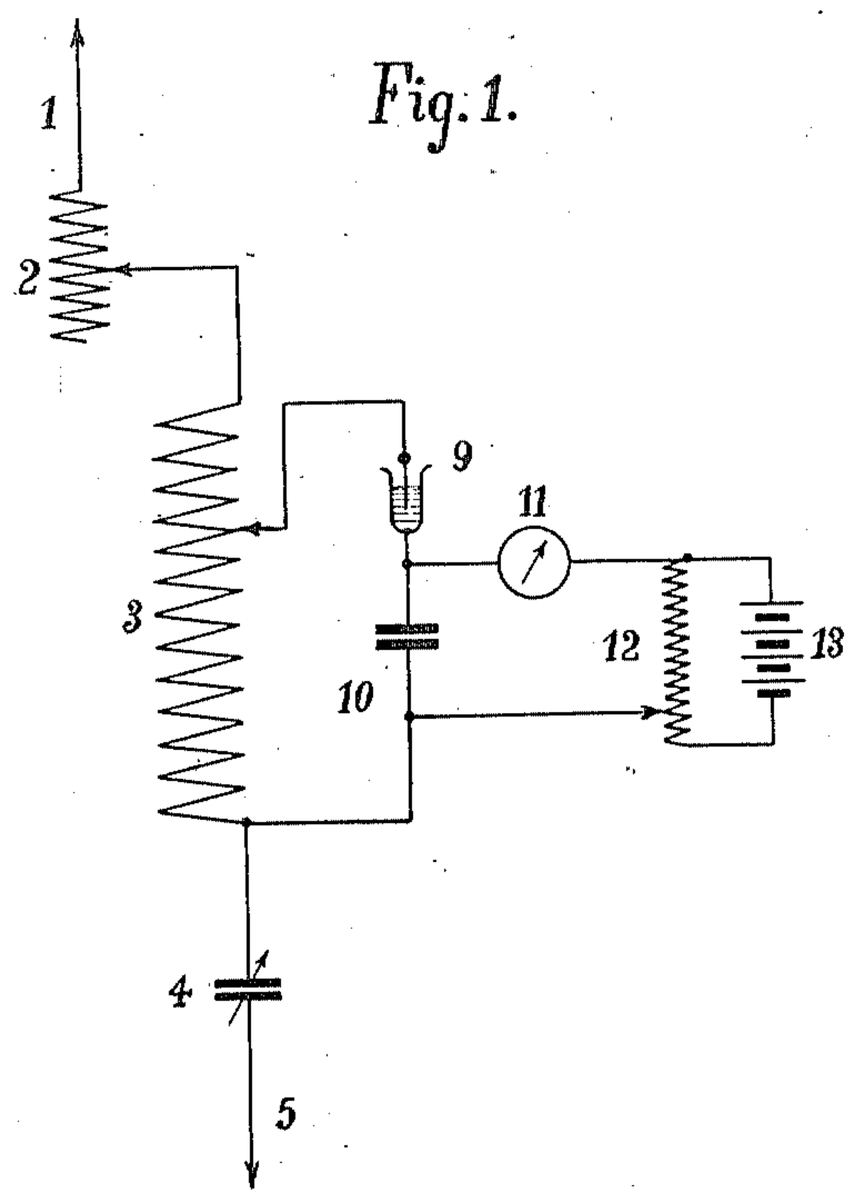


Fig. 2.

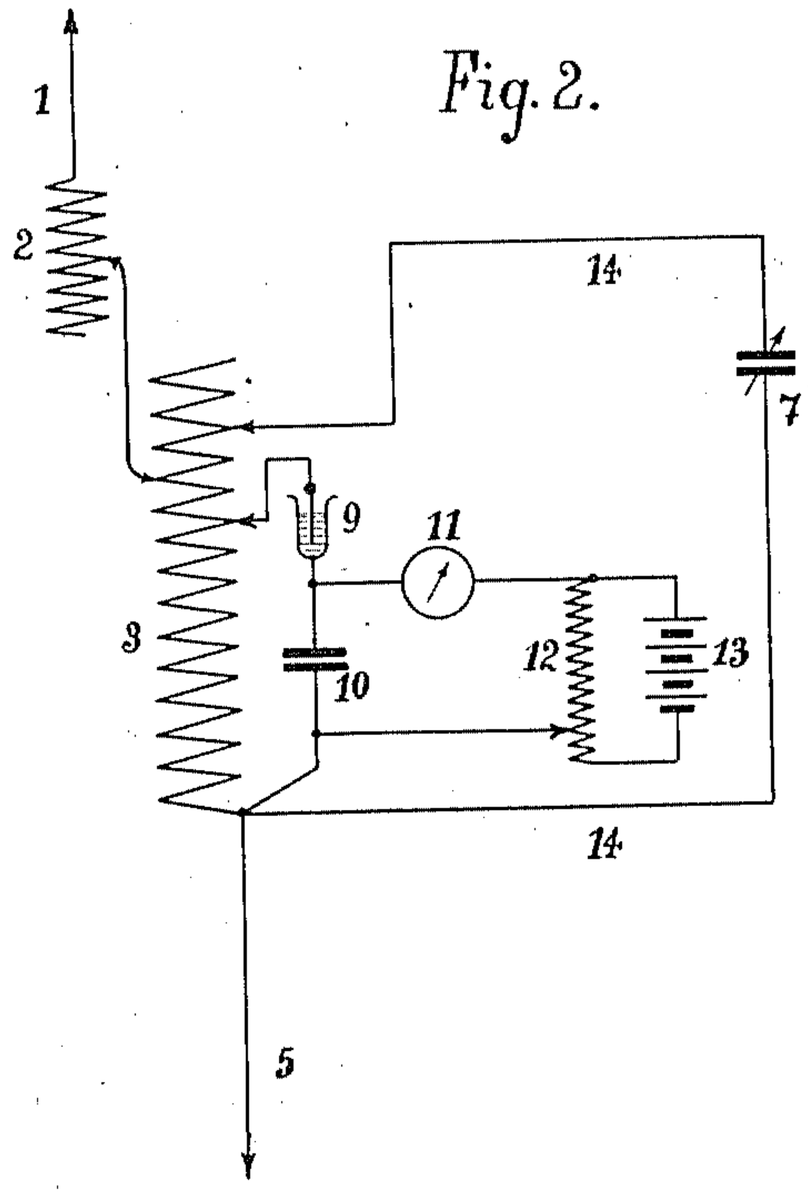


Fig. 3.

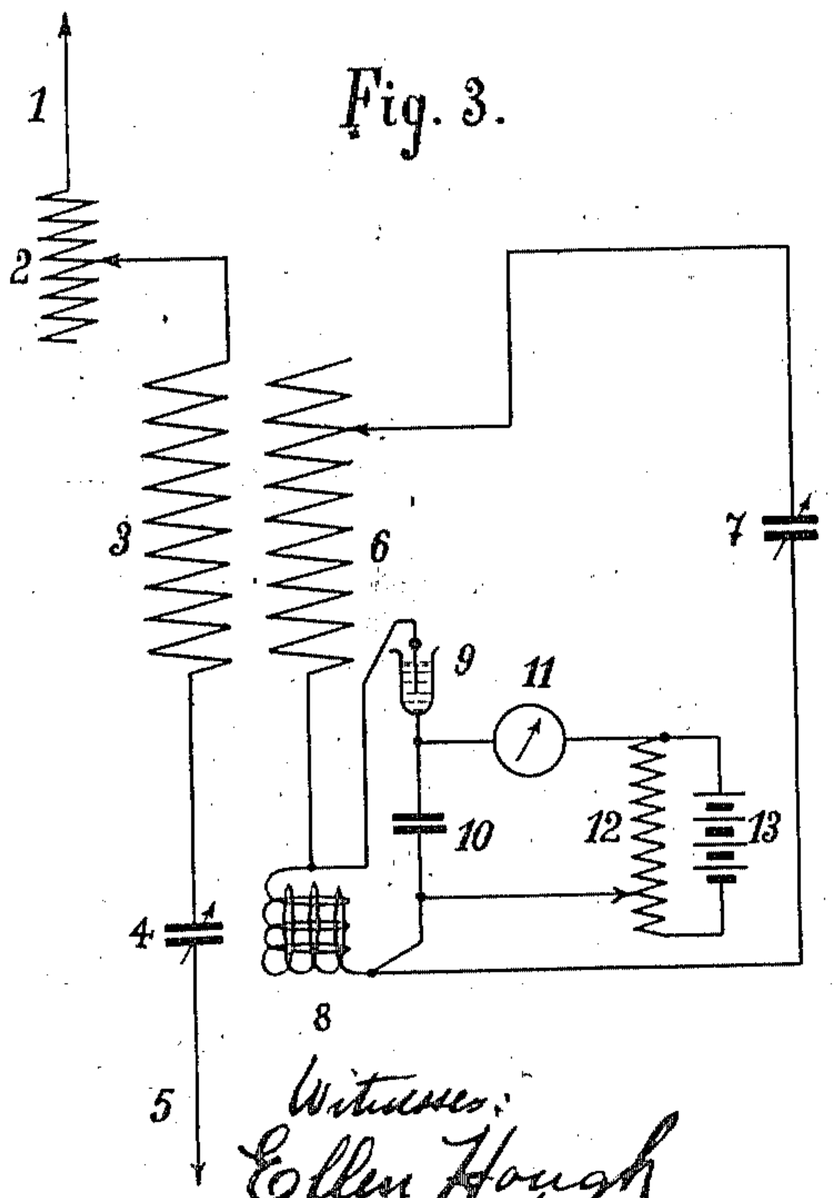
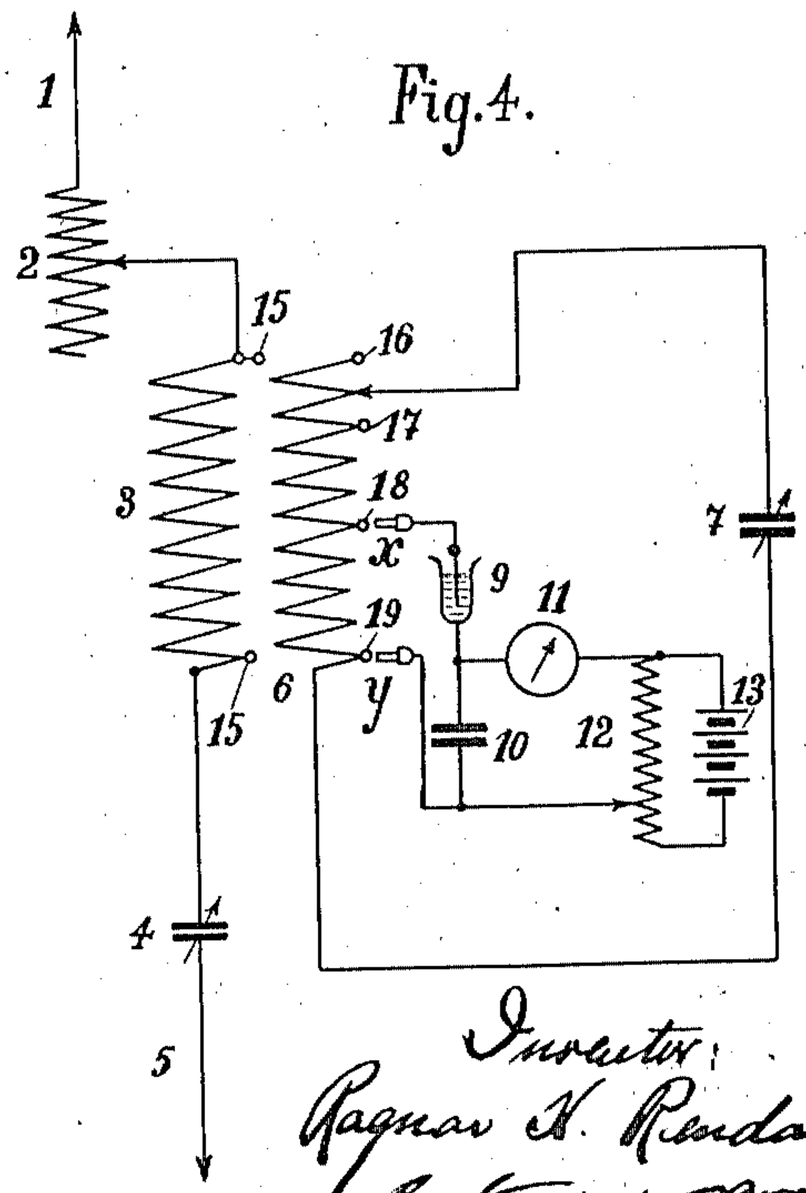


Fig. 4.



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RECEIVER FOR WIRELESS TELEGRAPHY.

994,426. Specification of Letters Patent. Patented June 6, 1911.

Application filed November 1, 1906. Serial No. 341,565.

To all whom it may concern:

Be it known that I, RAGNAR HAKAN RENDAHL, a subject of the King of Sweden, residing at Berlin, Germany, have invented certain new and useful Improvements in Receivers for Wireless Telegraphy, of which the following is a full, clear, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to those receivers for wireless telegraphy which work in conjunction with detectors, which even in a condition of repose have a certain ohmic resistance and respond to current intensities. To such detectors there belong, among others, the electrolytic cell, the microphone contact, the mercury vapor lamp, the bolometer and the like. Now in such receivers it is essential to make the proportion between the energy per oscillation conveyed to the detector and the energy of an oscillation produced in the resonance circuit of the receiver, easily variable, as experiments have shown that on the correct choice of this proportion, the sensitiveness of the receiver and also the sharpness of its tuning depend. Hitherto in such receivers the detector was inserted in parallel to a variable condenser and a direct current was conveyed to the detector by the intermediary of choking coils. By the electric connection thereby formed between the choking coil and the condenser a circuit was formed which on receiving electric oscillations might easily come into resonance, whereby a considerable weakening of the total intensity and under certain circumstances an interruption in the receiving, might arise. Another arrangement as heretofore used in practice is to connect the detector in an oscillation circuit. In this case the tuning of the receiving station to an unknown wave length represents a mutual adjustment of two unknown factors, owing to the connection of two tuned circuits which are independent of each other; because the detector responds only when both circuits are tuned to the unknown length of the waves emitted from the sending station. Thus the tuning operation may be considered in this particular case as a series of experiments which usually require a great amount of time. By this invention this drawback is removed and a connection of the detector with the resonance circuit of the receiver attained in a practical, advantageous manner.

The invention consists substantially in the detector being branched off from a self-induction coil lying in a resonance circuit of the receiver. It is essential in this that the part of the self-induction which is common to the detector and the resonance circuit should be variable and that the detector circuit is aperiodic. A condenser is preferably interpolated in the detector circuit with which an indicating instrument and the source of electromotive force are connected in parallel. The connection of the source of electromotive force with the detector is then preferably done by the intermediary of a potentiometer in order to be able to exactly regulate the extent of the electromotive force conveyed to the detector.

In case no condenser is in the detector circuit the condition that this circuit should be aperiodic is fulfilled without any further arrangement. If a condenser is inserted aperiodicity is obtained when the condenser is chosen sufficiently large as is the case when condensers are used, the principal purpose of which is to prevent the flowing of the direct current.

Various methods of carrying out the invention are shown diagrammatically in Figures 1–4 of the accompanying drawings.

Fig. 1 shows a simple receiver in which the receiving circuit is formed of an aerial conductor 1, a variable self-induction coil 2, a self-induction coil 3, a variable condenser 4 and a conductor 5 which is connected with the earth or a counter capacity. The tuning of this receiving circuit takes place by variation of the self-induction coil 2 and the condenser 4. From the self-induction coil 3 the detector circuit is branched off which contains a detector 9 and a condenser 10. In the present case an electrolytic cell is employed as detector. The source of electromotive force 13 is connected in parallel to the condenser by means of a potentiometer 12. The potentiometer conductor also contains an indicator 11 by means of which the alteration of the intensity in the detector circuit may be ascertained. In tuning the receiving conductor it is preferable to first branch off the detector circuit from the ends of the self-induction coil 3 and in this arrangement the tuning is effected by altering the tuning means in the receiving conductor until the

indicator 11 (telephone or the like) indicates the highest intensity. The detector thus lies at the points of the receiving conductor of comparatively high difference of potential, so that a major part of the total energy absorbed by the receiving conductor is conveyed to the detector. In this arrangement the receiving conductor has indeed a comparatively great damping which, however, allows of the receiving inductor being rapidly roughly tuned. With the object of finer tuning, the amount of the part of the self-induction coil 3, which part lies in the detector circuit, is gradually diminished and then the self-induction and capacity in the receiving conductor simultaneously afterward suitably regulated. A value of the self-induction lying in the detector circuit is thus attained, at which the sensitiveness of the receiver and the sharpness of the tuning are the greatest.

Fig. 2 shows a receiver in which the receiving conductor is conductively coupled with a closed resonance circuit. The resonance circuit is here again branched off from the self-induction coil 3 and is formed by this, the conductor 14 and the condenser 7. The detector circuit is branched off from the part of the self-induction coil 3 which belongs in common to the receiving conductor and the resonance circuit. The tuning of the receiving conductor takes place in the manner hereinbefore described, after which the tuning of the resonance circuit by altering the condenser 7 and eventually by varying the size of the part of the self-induction coil which part only lies in the resonance circuit, then takes place.

Figs. 3 and 4 are diagrams of the receiver connections, in which the receiving conductor acts in conjunction with the resonance circuit by means of a transformer. The self-induction coil 3 of the receiving conductor here forms the primary coil of the transformer, the secondary coil 6 of which, lies in the secondary circuit. In the connections shown in Fig. 3 this secondary resonance circuit contains in addition to the secondary coil 6 a variable condenser 7 and a self-induction coil 8 with variable self-induction. This coil consists of two parts acting inductively on one another, which are movably arranged to one another in such a way that, by altering their mutual position, the total self-induction of the coil is altered. From this variable self-induction-coil the detector 9 is branched off in series with the condenser 10. Otherwise the arrangement corresponds to that described with reference to Figs. 1 and 2.

The tuning of the receiving conductor takes place in similar manner to what was described with reference to Fig. 1, but the electric coupling between the primary and secondary coils is made initially, however, as tight as possible and the self-induction of the coil 8 as large as possible, so that as much energy as possible is thus conveyed to the detector from the receiving conductor. The sharper tuning then takes place under gradual loosening of the coupling between 3 and 6 and diminution of the self-induction of the coil 8. The tuning of the resonance circuit takes place by variation of the condenser 7 and the self-induction of the coil 6.

The receiver connections shown in Fig. 4 only substantially differ from those hereinbefore described by the detector circuit not being branched off a separate self-induction lying in the resonance circuit, but from a portion of the secondary coil. Further, this arrangement shows means for easily enabling the detector circuit to be branched off from certain points of the primary and secondary coils. For this object the ends of the conductors coming from the detector and the condenser 10 are provided with plugs *x y* which fit into switch bushes 15 on the ends of the primary coil and switch bushes 16, 17, 18, 19, of the secondary coil. For the purpose of tuning the receiving conductor, the two plugs are first switched into the bushes 15 on the receiving conductor and then the rough or crude tuning of the latter is effected. When this has been done the proportions in the transfer of energy to the detector may be gradually altered and brought to the desired value, the plug *y* being inserted in the bush 19 and the plug *x* successively in the bushes 16, 17, 18, after which the value may be further diminished by inserting the plugs *x* and *y* in the bushes 17, 18, and 16, 17, respectively.

Any suitable instrument of known kind such, for instance, as a galvanometer, a telephone or the like may be employed as indicator in the present invention.

Having explained my invention, what I do claim and desire to secure by Letters Patent is:

1. A receiver for wireless telegraphy comprising an oscillating circuit containing a self induction coil, an aperiodic circuit branched off from the self induction coil, a detector responding to current intensities and a condenser included in said aperiodic circuit, substantially as described.

2. A receiver for wireless telegraphy comprising an oscillating circuit containing a self induction coil, an aperiodic circuit branched off from the self induction coil, a detector responding to current intensities and a condenser included in said aperiodic circuit, and means for varying the self induction of the coil connecting the oscillating circuit with the aperiodic circuit, substantially as described.

3. A receiver for wireless telegraphy comprising an oscillating circuit, containing a self induction coil, an aperiodic circuit

branched off from the self induction coil, a detector responding to current intensities, a condenser included in said aperiodic circuit and an indicator parallel to the said condenser, substantially as described.

4. A receiver for wireless telegraphy comprising an oscillating circuit containing an induction coil, an aperiodic circuit branched off from said induction coil, a detector responding to current intensities, a condenser included in said aperiodic circuit, means for varying the self-induction of the coil connecting the oscillating circuit with the aperiodic circuit, and an indicator parallel to the said condenser, substantially as described.

In witness whereof, I hereunto subscribe my name this 10th day of September A. D. 1906.

RAGNAR HAKAN RENDAHL.

Witnesses:
E. BERAHTOLD,
ALBERT GEISBERGER.