No. 785,276. PATENTED MAR. 21, 1905.

A. SLABY & G. G. ARCO.

SYSTEM OF WIRELESS TELEGRAPHY WITH TUNED MICROPHONE RECEIVERS.

APPLICATION FILED SEPT. 27, 1901.

2 SHEETS—SHEET 1.

Fig. 1.

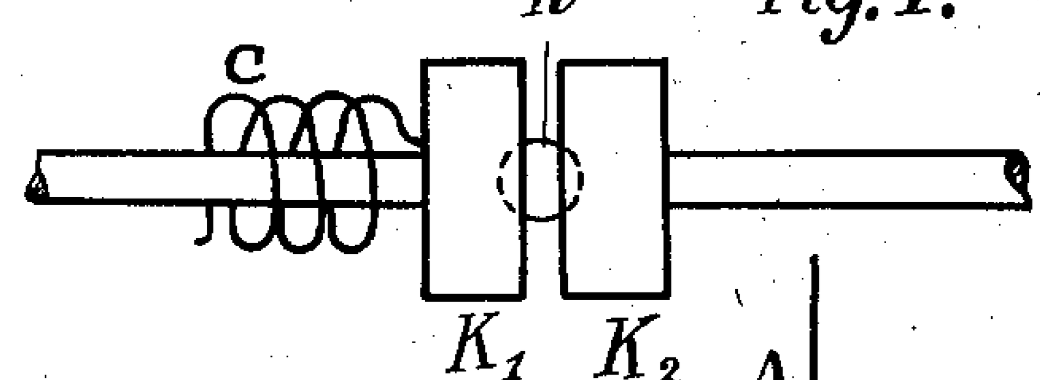


Fig. 2.

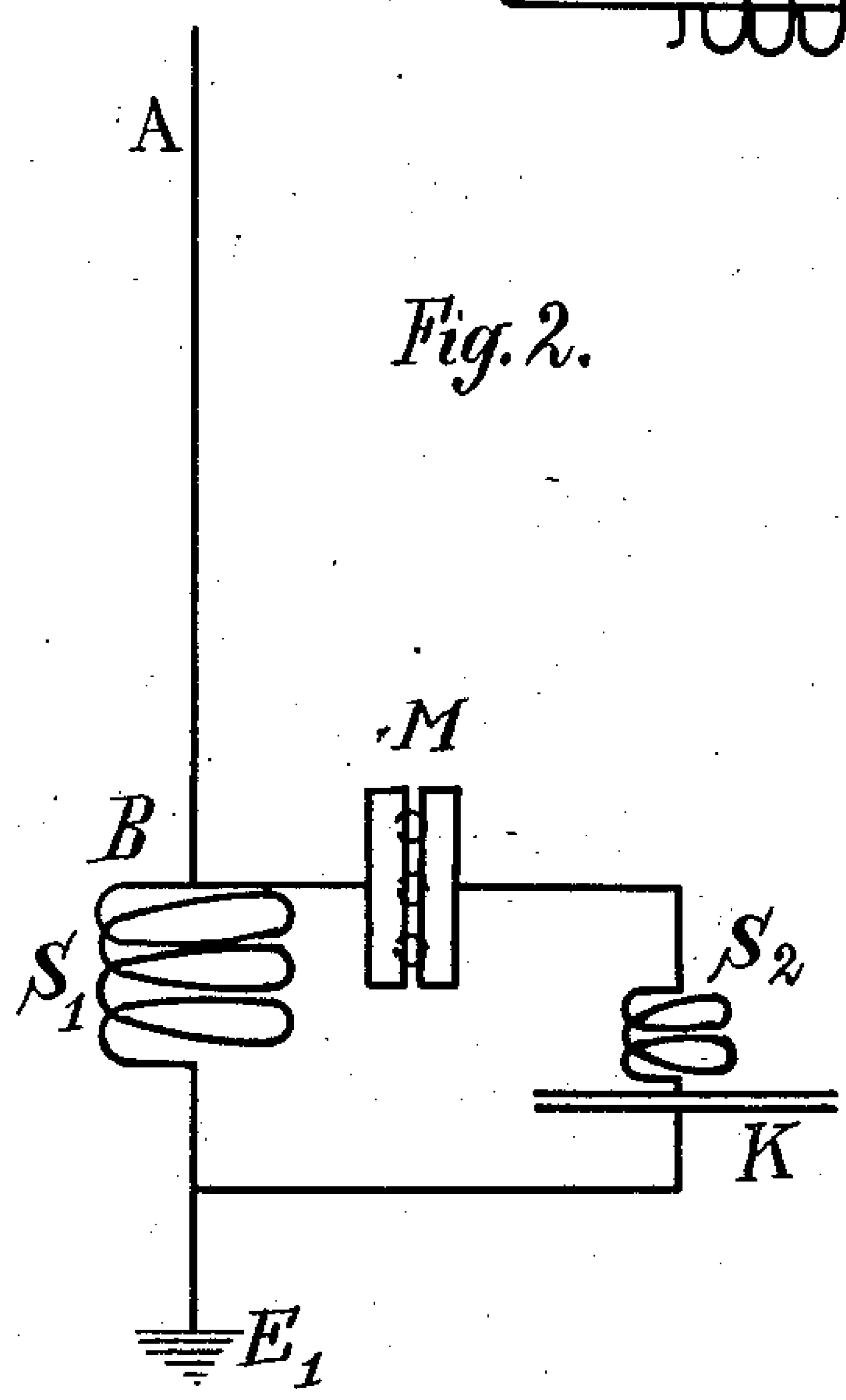


Fig. 3.

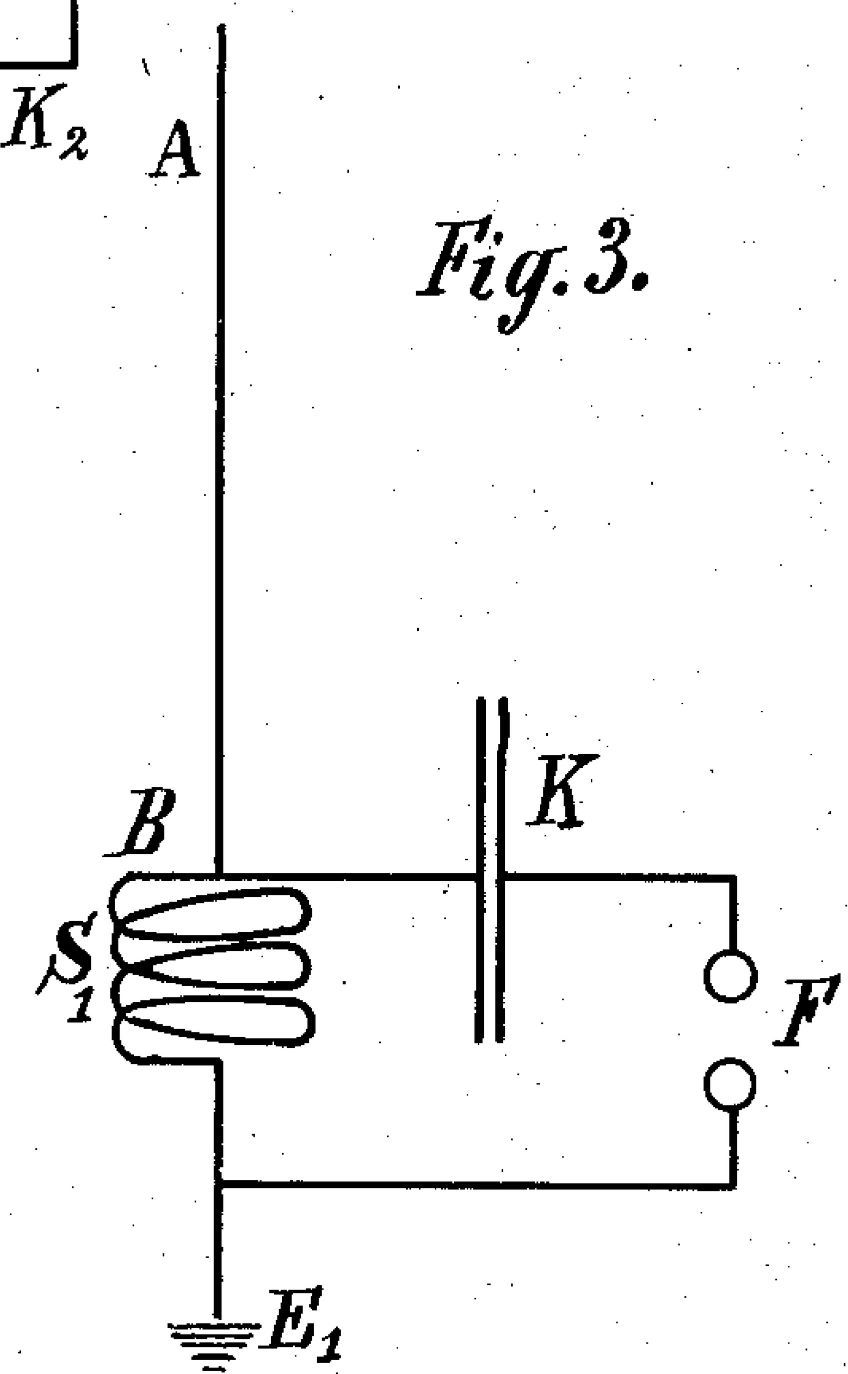
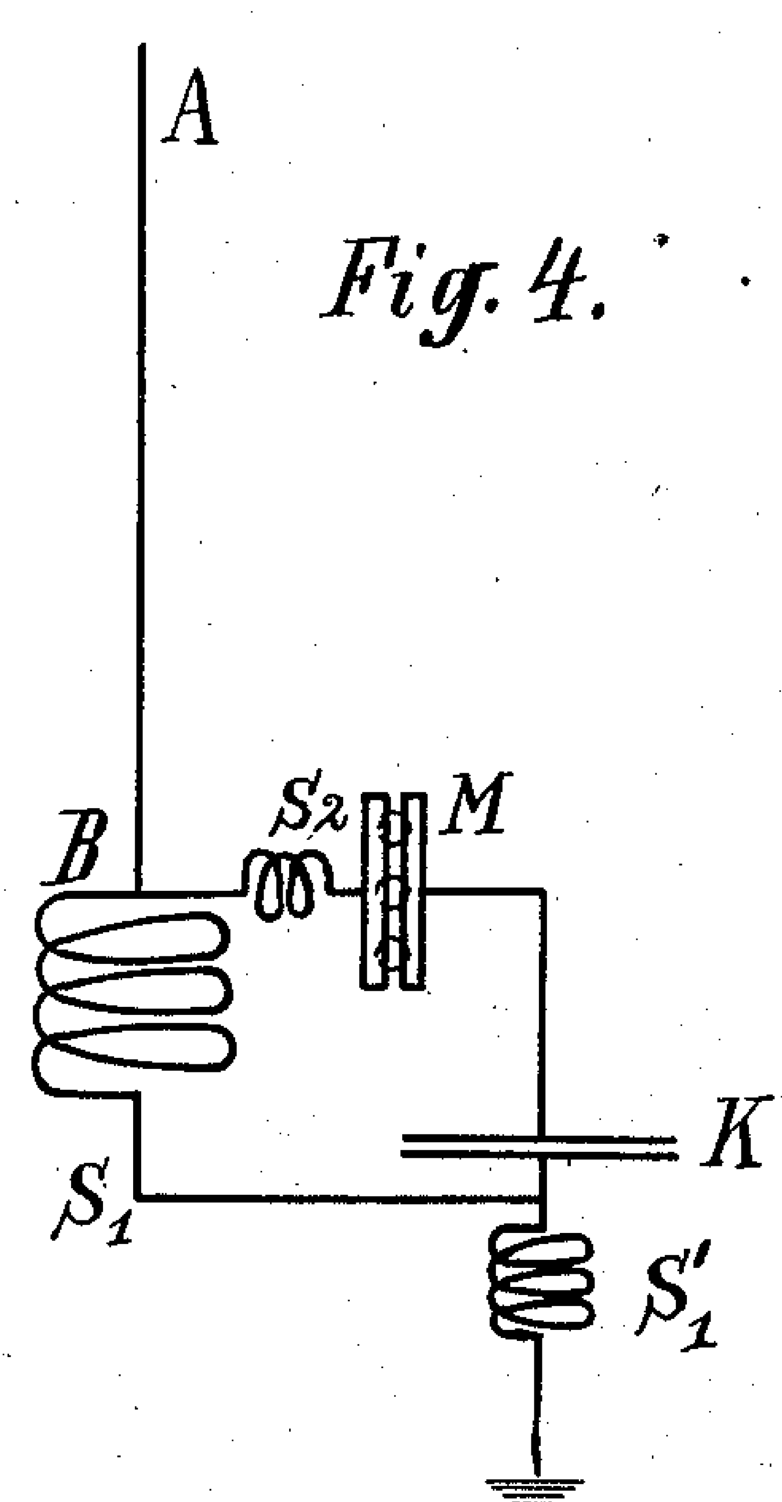


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 1a.

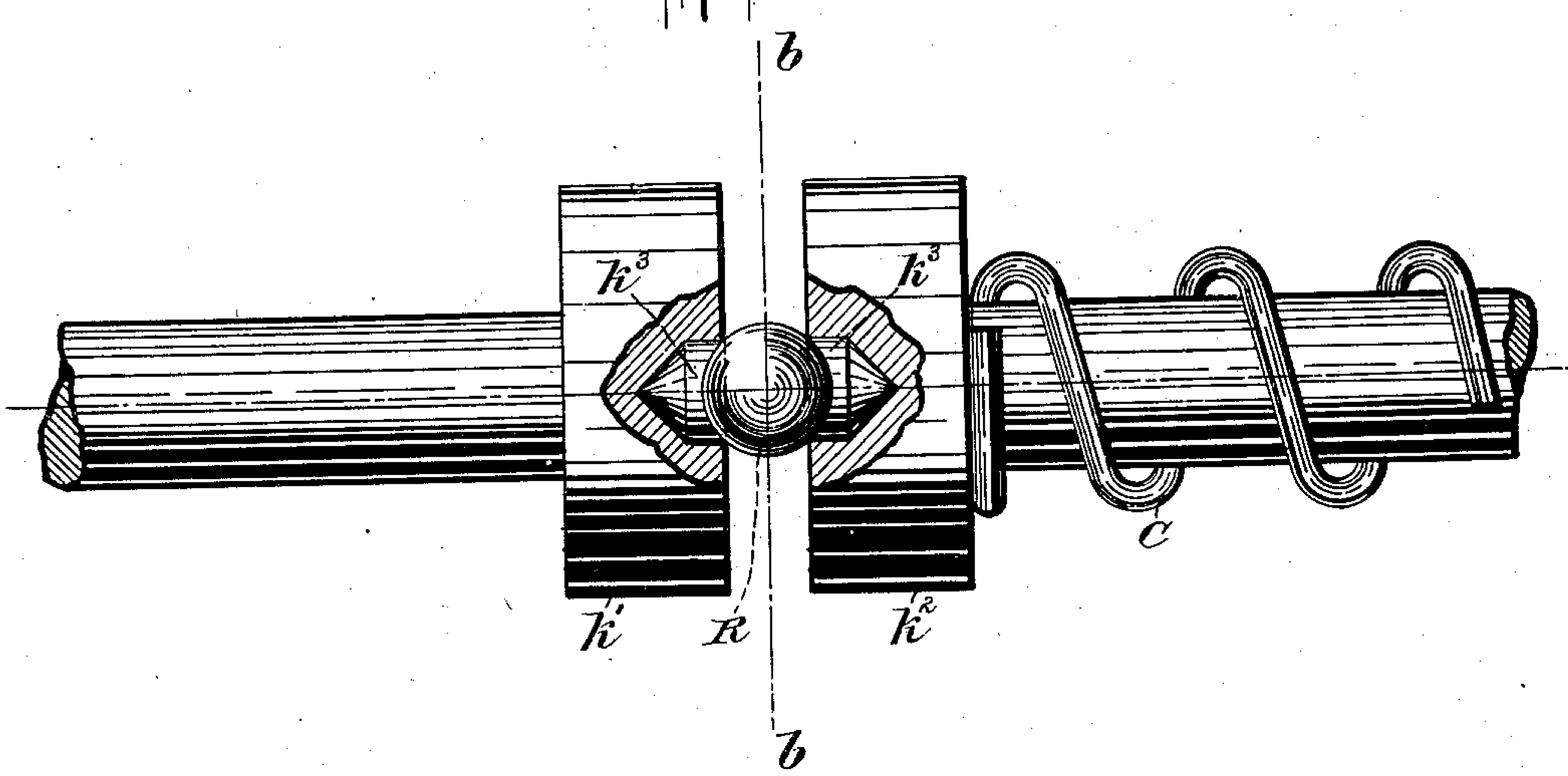
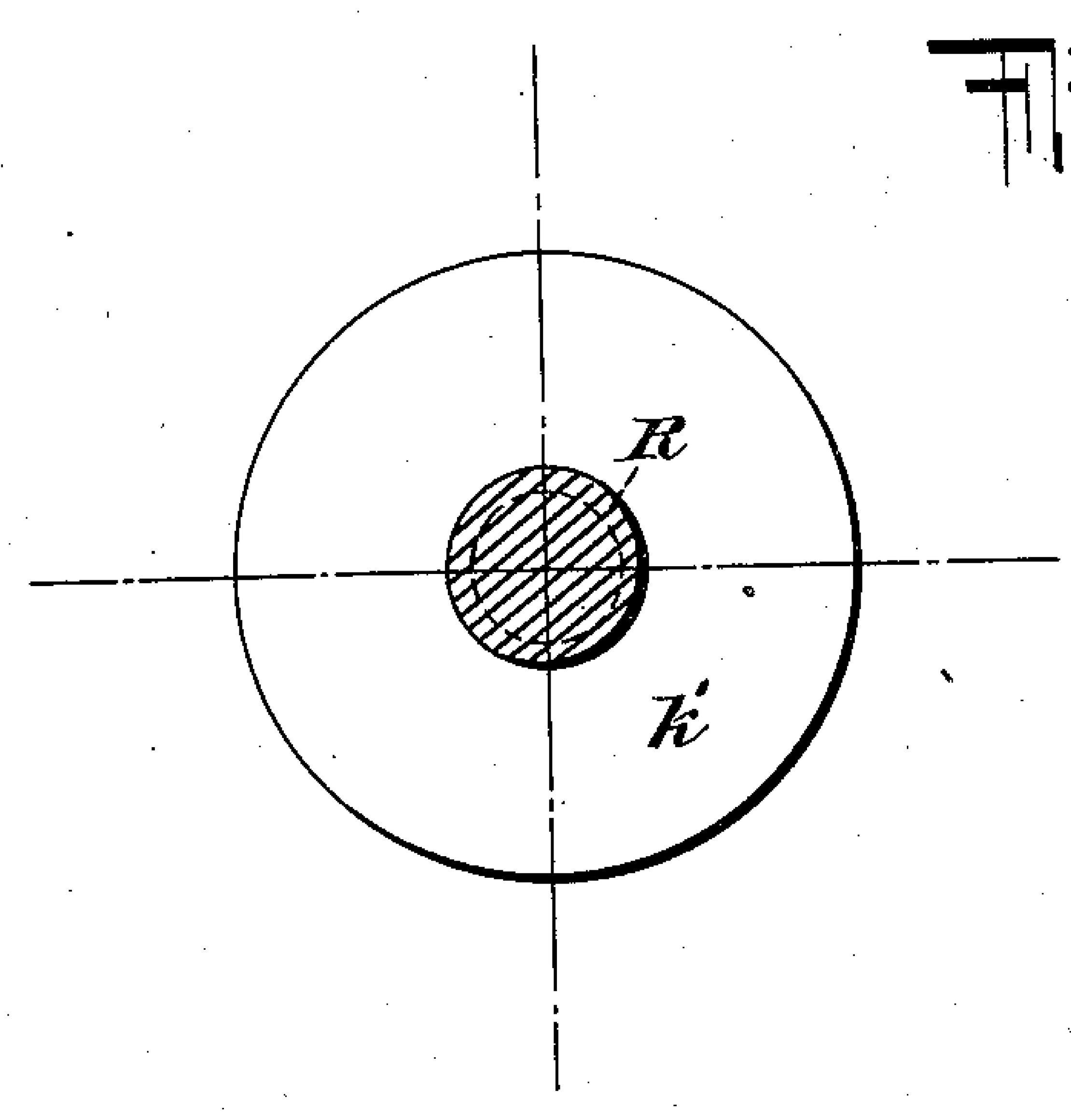


Fig. 1b.



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UNITED STATES PATENT OFFICE.

ADOLF SLABY, OF CHARLOTTENBURG, AND GEORG GRAF ARCO, OF BERLIN, GERMANY.

SYSTEM OF WIRELESS TELEGRAPHY WITH TUNED MICROPHONE-RECEIVERS.

SPECIFICATION forming part of Letters Patent No. 785,276, dated March 21, 1905.

Application filed September 27, 1901. Serial No. 76,813.

To all whom it may concern:

Be it known that we, ADOLF SLABY, residing at Sophienstrasse 4, Charlottenburg, and GEORG GRAF ARCO, residing at Cuxhavenerstrasse 2, Berlin, Germany, subjects of the German Emperor, have invented certain new and useful Improvements in Systems of Wireless Telegraphy with Tuned Microphone-Receivers, of which the following is a specification.

Hitherto two different kinds of wave-indicators have been used as receiving apparatus in connection with wireless telegraphy. The more usual of the two is the coherer. The peculiarity of the coherer is that its resistance (before it has been influenced) is infinite, and thus it represents a condenser of a capacity of about 0.0001 microfarad. After the instrument has been influenced the ohmic resistance varies between thirty and two thousand ohms. On account of the very considerable variation in the resistance it is possible through the medium of a relay to operate a Morse recording instrument. The return of the coherer's resistance to infinity is effected not automatically by the coherer, but by means of a mechanical tapper. The second kind of wave-indicators, which we have termed "microphone-receivers," are characterized by their possessing a relatively small resistance (thirty to fifty ohms) even before being influenced by the current, this resistance at starting being reduced about ten per cent., and after the effect of the electric impulses has ceased returning to the original state of resistance without any mechanical shock. By reason, as mentioned, of the very slight variation of resistance a relay cannot be operated, and it is necessary, as is well known, to use in connection with microphone-receivers telephone-receivers in which a sound is heard corresponding in pitch or in number of vibrations with the frequency of the primary stream of sparks.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a side elevation of the receiver we prefer to employ. Fig. 1^a is an enlarged view of the same with parts in section. Fig. 1^b is a sectional elevation on line *b b* of Fig. 1^a. Figs. 2 and 4 are two diagrams showing two ways of arranging the circuit at the receiving-station, and Fig. 3 is a diagram showing a way of arranging the circuit at the transmitting-station.

Among the many possible forms we have adopted that of the ball-microphone as the most effective. The ball-microphone, Figs. 1, 1^a, and 1^b, consists of two blocks K' K^2, furnished with cylindrical recesses K^3 and brought against one another by slight mechanical pressure, as by a spring C, and thus press along the circular edges of the recesses K^3 against a ball R, located between them. As the mechanical pressure is uniformly distributed over two circular lines, this pressure may be made fairly large without so increasing the specific pressure as to cause short-circuiting. The microphone, therefore, is not affected by mechanical shocks. As metals between which the contact takes place we have found steel to be suitable for the ball and aluminium for the blocks.

As stated at the beginning of this specification, a coherer normally interrupts the circuit, while a microphone-receiver preserves a permanently-closed circuit and merely varies the resistance in said circuit. In order, therefore, to tune the microphone receiving-circuit to a predetermined rate of oscillations, it becomes necessary to insert a condenser in the receiving-circuit. Furthermore, experiments have shown that a microphone-receiver responds to variations of the current and not to variations of potential. For this reason we have included in that part of the receiving-circuit which contains the microphone a device by means of which the tension or potential is diminished in the microphone-circuit with a corresponding increase of the current. This device we may call a "transformer;" but we desire it to be understood that this transformer need not embody two separate circuits, such as are used in ordinary transformers, but may operate by self-induction instead of by induction upon a neighboring circuit.

A connection or circuit arrangement operating by self-induction is shown diagrammatically in Fig. 2. Suppose the vertical conductor A B S′ E′ to be tuned to the transmitter by means of an adjusting-coil S′. From B a secondary system branches off, which contains the microphone-receiver M, the small self-induction coil S^2, and the large condenser K. The coil S^2 is used for tuning the microphone-circuit to the same number of periods or oscillations as the vertical conductor A B E′. Since the current amplitude—that is, the variation of amperage in the branch circuit, which includes the microphone—remains approximately constant on account of the smallness of the coil S^2 relatively to the capacity of the condenser K, it is immaterial whether the microphone M be inserted between the point B and the coil S^2, as in Fig. 2, or between the coil S^2 and the condenser K, as in Fig. 4. By this connecting arrangement not only is the sensitiveness of the receiver considerably increased, but the atmospheric discharges, which otherwise have an exceedingly disturbing effect, especially in microphone-receivers, are entirely avoided. Since in this connecting arrangement the coil S′ is charged not only through the capacity of the air-conductor B A, but simultaneously through the condenser K, arranged in parallel thereto, if K be varied the oscillations of the vertical conductor also simultaneously vary, and if K be enlarged they are retarded. This presents the drawback that with a given number of oscillations of the transmitter the aerial conductor of the tuned receiver can only have a relatively small height. In order to prevent this, the connection shown in Fig. 4 is employed. According to this, the self-induction arrangement necessary for tuning the vertical conductor A B E′ is divided into two coils, and to the one S′ the tuned receiver system is connected, as in Fig. 2, while the other part, S'_1, is employed only for tuning the open oscillation-circuit. S′ and S'_1 have no field that is common to both. The same effect can, moreover, be secured if the secondary system, containing the microphone, is actuated not by charging, but by induction. In the latter case S′ S'_1 would be the primary coil of a transformer, the secondary coil of which would be connected with the terminals of the microphone. Thus in this case it would be possible to effect an increase of the current strength by induction.

In Fig. 3 we have shown diagrammatically the arrangement of parts that may be employed at the transmitting-station. In Fig. 3, A B S′ E′ indicate a transmitter of the same electrical quality as the receiver on which it is intended to act—that is, the transmitter should have such a self-induction and such a capacity that its rate of oscillation will be the same as that of the receiver. The exciting or energizing system by which oscillations are produced in the transmitting wire or conductor A B S′ E′ is located in a branch circuit or shunt, and may consist, for instance, as shown in Fig. 3, of a condenser K and a spark-gap F. This branch circuit should have the same rate of oscillation (that is the same product of self-induction and capacity) as the aerial conductor with which it is connected; but the self-induction of the branch circuit should be smaller than that of the aerial conductor and the capacity larger than that of the aerial conductor. With this arrangement we are enabled to supply a considerable amount of energy to the exciting system, and the vibrations of the aerial transmitting-wire will be damped but very slightly. In tuning the transmitter according to Fig. 3 the simplest plan is to insert the microphone in the exciting-circuit instead of connecting the spark-gap F to the receiver. The transmitter and the receiver are in this case absolutely congruent and exactly tuned. It will be understood that the coil S′ in Fig. 3 serves to regulate the rate of vibration of the transmitting-wire.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A microphone-receiver comprising two recessed conducting-bodies, and a conducting-ball located between said bodies and engaging them at their recesses.

2. A receiving system for wireless telegraphy which comprises an aerial conductor, adapted to receive the electrical impulses and connected to the earth, and a branch circuit connected with said aerial conductor, said branch circuit including a microphone and means for so transforming the energy received by the aerial conductor as to decrease the potential and increase the current.

3. A receiving system for wireless telegraphy, comprising an aerial conductor connected to the earth and a branch circuit connected with said aerial conductor and having a rate of oscillation equal to that of the aerial conductor, a microphone included in said branch circuit and means likewise included in the branch circuit, for so transforming the energy received from the aerial conductor as to diminish the tension and increase the strength of the current.

4. A transmitter for wireless telegraphy comprising a continuous aerial conductor connected with the earth, and an exciting branch circuit containing the spark-gap and connected with said aerial conductor and having the same product of self-induction and capacity as said conductor, the capacity of the branch circuit being larger than that of the aerial conductor and the self-induction of the branch circuit being correspondingly smaller.

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