PATENT SPECIFICATION

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157,263

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Complete Accepted: July 10, 1922.

COMPLETE SPECIFICATION.

Process and Apparatus for Converting Static Atmospheric Electrical Energy into Dynamic Electrical Energy of any Suitable High Periodicity.

We, H. Otto Traun's Forschungslaboratorium G.m.b.H., of 14, Huxter, Hamburg, Germany, a German company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Static aerial electrical energy in the form of direct current can be converted by using spark gaps and with the assistance of oscillatory circuits into dynamic electrical wave energy of a high number of alternations of a more or less undamped nature and in such form—either direct or by means of a special kind of resonance or "condenser motors"—ready to be utilised for technical purposes as mechanical energy.

For small installations this system may be very well employed; about 100 horse power may be stated as practical limit. In constructions of larger aggregate difficulties as regards the spark gaps however increase considerably. Further it is desirable to convert the accumulated atmospheric electricity into alternating currents of from 100 to 1000 periods which may then be used for the ordinary types of alternating current machines instead of into electromagnetic waves of a high number of alternations.

In experimenting with "condenser motors" the construction of which forms the object of our copending Application No. 157,262 it was observed that the rotor, if one pole of the stator surface be connected with the aerials collecting aerial electricity and the other pole with the earth, not only could act as a motor, but if *vice versa* the rotor connection with the stator be interrupted and the rotor caused to rotate by means of another motor, that when the brushes supply an alternating current the periodicity of which is dependent on the number of the poles and the revolutions of the rotor. Such an apparatus may therefore be regarded as a transformer of static into dynamic electrical energy.

The invention is more particularly described with reference to the accompanying diagrams in which:—

In Fig. 1 A is a strong accumulator battery, 1 and 2 are the outer poles of the transformer, consisting of simple metallic plates or are as shown in Figs. 8—11, made of wire coils without an electromagnet being present. Between these poles an armature is revolubly mounted on a shaft, which armature also consists of two similar cylindrically curved plates 3 and 4. These are metallically connected with two collector rings 5 and 6 on which two brushes 8 and 7 freely run which again are short circuited with one another over a primary coil 9. 10 is the secondary coil with the free ends 11 and 12. If through the accumulator battery the stator plate 1 is charged with positive electricity, it induces a charge of reverse sign on the rotor surface 3 which is connected by the brushes 7 and 8 over the primary coil 9 with the second rotor surface 4. This latter is therefore charged with positive electricity, which in turn induces negative electricity on the stator surface 2. Up to this moment everything takes place in the same way as if two condensers were connected one behind the other in the current circuit A. If however, by means of mechanical power, this rotor be caused to rotate, the surface conditions are altered. After a

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quarter revolution the rotor plates are between the stator plates and therefore no condenser surface faces another. By this means however, the capacity of the entire system is reduced to a minimum and a change of current will also result in the main 9. Now if the rotor be turned further through 90° by mechanical energy the rotor plate 3 comes opposite the stator plate 2 and the rotor plate 4 opposite the stator plate 1, so that then the rotor plates are in a field of reverse sign. A fresh charge of current in the reverse direction now runs through the primary coil 9. After a further half revolution the same action is repeated so that after a full revolution the initial condition is again produced. The result of such a revolution is an alternating current the periodicity of which is equal to the number of the revolutions. In practice of course not two poles but as many poles as possible would be employed because thereby the number of alternations would be considerably increased. The primary alternating current thus obtained induces in the secondary circuit an alternating current the potential of which is dependent on the winding of the coil. Fig. 7 shows a multipolar machine.

If the stator surface 1, instead of being connected with the battery be connected with a collecting aerial network and the other stator surface 2 be directly earthed, but the rotor which is otherwise constructed as hereinbefore, be rotated by a separate motor a much stronger alternating current results which is to be ascribed to the circumstance that a much higher potential can be charged on the pole surfaces of the stator by reason of the higher pressure of the static electricity than where accumulators are employed. By this means the transformer has of course much larger quantities of energy supplied to it.

Fig. 2 shows a mode of connections. The stator surface 1 is connected with the aerial antennæ which is connected through the safety spark gap F to earth at E_1. The stator surface 2 is directly earthed at E_2. The inner revoluble rotor surfaces 3 and 4 are interconnected by means of an induction coil which is constructed directly in the motor. The current is taken as in Fig. 1 up to collector rings by means of brushes, which are not shown for the sake of clearness, and further conveyed through the conductors 11 and 12. Between these a condenser 5 may be inserted. There is thereby formed a short oscillatory oscillation circuit free from spark gaps, which circuit consists of the induction coil 9 and condenser 5 and is fed by the periodic charging current impulse. By this means the possibility is afforded of obtaining a kind of current which is characterised by longer periods and is undamped and oscillatory. Of course a simple alternating current may be obtained by cutting out the condenser.

Instead of the induction coil the condenser may also be constructed in the rotor. This can be carried out in such a way that its ends serve directly as collector rings for taking current through the brushes. In Fig. 3 such a motor is sketched in perspective, 3 and 4 are the rotor surfaces, 5 and 6 are the condenser surfaces constructed to form part of the rotor consisting of two co-axial cylinders fitting one in the other in such a way that free room is left for the brushes 7 on one end of the condenser cylinder 6.

The condenser may be made in the form of a cylindrically wound spiral forming the capacity & reactance as shown in Fig. 4. A further type of transformer is shown in Fig. 5. The difference consists in the stator and rotor surfaces not only each assuming a quarter of the circuit but almost the half. By this means the space and the effective condenser surface is better utilised. Charge is produced only when the rotor surfaces face the full scope of the stator surfaces.

In addition a condition is obtained in which the stator surfaces are inductively connected by the rotor surfaces. The consequence of this is that an alternating current simultaneously results which, is produced without sparking otherwise the connection is as before.

Fig 6 shows the alternation of the rotor surfaces; the rotor here consists of two cylindrical condenser plates arranged concentrically, each divided into two halves & connected so that half the inner cylinder is connected to half the outer. Such a machine shows the more complete transformer action.

Fig. 7 shows a four polar transformer. It consists of a metal casing, the lower half of which is fastened with the foundation plates 17 to the support or foundation. The upper half, the cover, is connected by bolts 15 and 16 firmly with the under part. This upper sleeve or casing is insulated from the under part. Two rings 1 and 2 are cylindrically constructed in the casing. The ring 1 is metallically connected with the collector aerial and the ring 2 with the earth. On

both rings an equal number of stator surfaces are mounted side by side but well insulated from one another and thus form an electrostatic field similar to the electromagnetic in many alternating current machines. The rotor consists in similar manner of two rings 5 and 6 on which an equal number of rotor surfaces are fixed so that each stator surface faces a rotor surface. By the brushes 7 and 8 the alternating current formed is removed from the collector. The charge is conveyed by the conductor 14 to and by 13 away. If this rotor be then rotated by means of a motor the positive and negative fields precisely as in the case of magnetising will alter and thereby an alternating current is formed in the rotor, the periods of which are dependent on the number of the poles and the revolutions per second.

At the commencement it was thought that this apparatus could only be regarded as alternating current converters, but it was soon found that much more energy was necessary to rotate the rotor than might be necessary to overcome the friction. It was then found that the considerable expediture of energy for rotating the rotor was caused by a conductor being moved through strongly electrostatic fields since the electrostatic lines of force must be cut at right angles and that further in the conductors a stronger current arose than was otherwise to be expected. This apparatus must therefore not only be regarded as a transformer, but also as an energy producer, with the difference that the excitation here is obtained instead of by means of electromagnets, by static fields of high pressure. The entire system may, to some extent, be compared with a dynamo in which the excitation takes place by means of a fixed constant magnet. It was further ascertained that this way of using the atmospheric electricity produced a sort of suction on the collector network, and that thus suitably greater quantities of current could be obtained.

The effects which in this apparatus became evident are extremely interesting and open a prospect of being able to obtain here a great deal more. Merely that these transformers made it possible to transform suitable quantities of atmospheric electricity into alternating current of high or lower frequency (without the use of spark gaps) shows already the extreme utility of these apparatus. Should in future, the construction of larger aggregates be necessary the transformer installation may be constructed in such a way that motors which are fed by a current obtained from an installation with spark gaps produce a certain quantity of energy which may then be employed for producing current according to the last described system.

The results of the examinations made for this may be construed as follows.

(1) If solid electrodes (condenser surfaces, rotor and stator surfaces) are employed they become hot. This effect may be considerably reduced by cutting the electrodes in a ribbed form Fig. 8, but not entirely removed. This form allows the surface of the condenser plate to be enlarged or increased; the electrodes may be fastened in a simple manner on the under frame by perforations 1, 2, 3, 4, 5.

(2) If nicks or notches in spiral form as shown in Fig. 9 seen from the side end in Fig. 10 in section are employed, not only is the transformer effect greater but the poles yield also more current, but require greater quantities of energy for their movement than a simple commutator action would require.

(3) The greatest effect is obtained if the rotor and stator surfaces are wound in flat spiral form of suitably thick wire, and in such a way that the inductive effect combining with the capacity is calculated in suitable porportion and this result is adapted to a suitable periodicity. In practice this is preferably done by the wire bent in spiral form being inserted in a separate vulcanite or hard rubber mass (see Fig. 11) so that a smooth pole surface is formed similar to that in phase motors.

In Fig. 12 a further diagram is shown. Here the secondary alternating current, that is to say, the one produced on the rotor may act by induction on the charging current. By this means the inducing currents are strengthened and separate alternations having smaller amplitude are produced by the periodic curves of the alternating current produced in the alternations of lower frequency.

Regular undamped oscillations of a high frequency may however be produced if the converter be carried out in the manner shown in Fig. 13. The aerial wire L is metallically connected with the ring 20. To this two pole surfaces 1 and 2 are connected. The inductive earth pole is also connected with a second ring 10 from which again two, poles 1^a and 2^a are branched off. Of course in similar manner any suitable number of poles may be branched off. In similar manner there are in the rotor two poles fastened

to one another (3 and 4 & 3^a and 4^a) connected with separate collector rings. From these two rings the current is collected by means of two brushes. The induced alternating current is however directly metallically connected with an inductive earth stator conductor over an induction coil 9. Further a combined inductance & capacity 5 is inserted between the two wires 11 and 12 in parallel with the converter. By this means a sparkless oscillatory circuit is obtained which can act on the exciting current in the stator. This produces however, a periodic alteration of the charging quantities according to the oscillation curves of the rotor currents in consequence of which the stator charge also commences with resonance oscillations and if the stator and rotor surfaces are calculated to one another in such a way that they are adapted to form oscillations of waves of similar length the entire converter is caused to oscillate and furnishes undamped oscillations of a high number of alternations, but of periodically changed amplitude, the form of which is dependent on the amplitude of the main alternating current and is caused by the number of the poles and revolutions per second. Thus an alternating current of, for example, 100 periods is formed, the separate periods of which are formed by undamped oscillations of a higher number of alternations. In Figs. 14—16 four further diagrams of converters are illustrated, the object of which is not to produce usual alternating current, but oscillations of high frequency.

The main difference of these systems from those previously described is that the connection of the collecting aerials is made between the stator pole 1 (Fig. 14) and one pole 16 of the condenser 17 and the earth connection between a second stator pole 2 and the pole 18 of the condenser 19. The other poles of these condensers 17 and 19 are short circuited through a ring over two inductive primary coils 9 and 9^a with one another. The secondary coils form the rotor conductors 10 and 10^a. The rotor itself is constructed in the manner shown in Fig. 6 of two short circuited plate condensers which may be wound as shown in Fig. 11. In similar manner of course the stator surfaces may also be formed. The collector rings of the rotor with the two brushes for collecting current are here not shown in order to simplify the drawings. By the connection of the two condensers in the exciting circuit of the converter and also by the action of the alternating current produced in the rotor on the stator circuit, with a correct calculation of the capacity and the self induction coefficients a maximum action may be obtained. The kind of current produced will be similar to that described on page 9 (see Fig. 12).

The novelty of the converter illustrated in Fig. 15 consists mainly in that the current resulting in the rotor is not directly employed, but only serves as exciter of the primary coils 9^a, and 9^b. The working current is produced in the secondary coils 10 and 10^a and further conducted through the conductors 11 and 12. The stator current may be brought by the regulatable inductive resistance 9 to the same resonance as the rotor current.

In Fig. 16 a very similar system is shown to Fig. 14, The condenser 5 is however connected in parallel with the converter; and by the inductive resistance constructed in the rotor a short circuited oscillatory circuit is formed which gives extraordinarily good results and is simple in construction.

The inductive resistance 9 may also instead of being constructed in the rotor be constructed as primary coil employed outside the rotor and short circuit the oscillatory circuit over the stator surfaces (see Fig. 17).

The last six types serve only for producing oscillations of a high number of alternations. If it be desired to obtain ordinary alternating current these complicated constructional arrangements are not required as the types illustrated in Figs. 1 to 11 suffice. It is self evident that these arrangements may be altered in various ways by means of different condenser surfaces in practice.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A process and apparatus for converting static atmospheric electricity into dynamic electricity of suitably high periodicity, in which the accumulated aerial electricity is converted into alternating currents of suitable periodicity by the use of rotating converters inserted in place of the working spark gaps which converters are protected by being connected in parallel with a safety spark gap and comprise multipolar condensers forming a rotor which is turned between similarly constructed stator surfaces by means of externally supplied energy

whereby a static alternating field is produced which in turn produces in the rotor current waves of suitable periodicity by the insertion of closed oscillatory circuits without spark gaps in the rotor itself or over the stator or outside the rotor, substantially as described.

2. Apparatus for converting static atmospheric electricity into high frequency current as claimed in Claim 1, in which the rotor surfaces of the converter consist of two or more plate or wound coil condensers arranged in annular form so that an outer condenser surface is always connected with the next inner one and *vice versa*, substantially as described.

3. A process and apparatus for converting static atmospheric electricity into dynamic electricity of suitable high periodicity, constructed and arranged to operate, substantially as described with reference to the accompanying drawings.

Dated this 8th day of January, 1921.

For the Applicants,
W. P. THOMPSON & Co.,
12, Church Street, Liverpool,
Chartered Patent Agents.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1922.

[This Drawing is a reproduction of the Original on a reduced scale]

Fig. 1

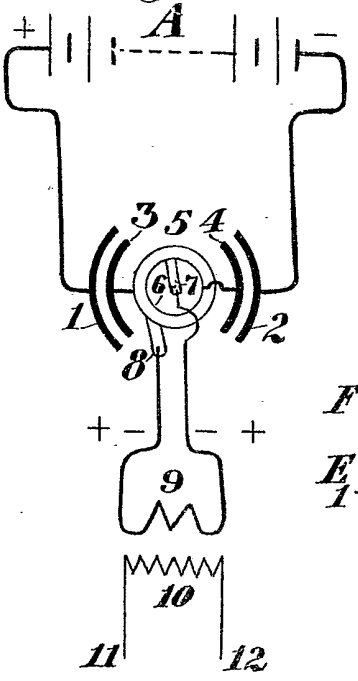

Fig. 3

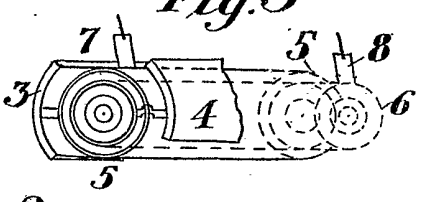

Fig. 2

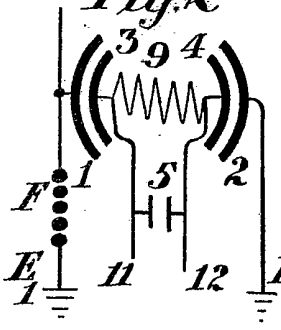

Fig. 4

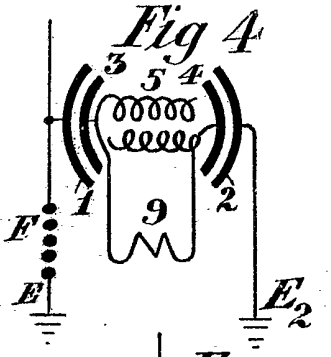

Fig. 5.

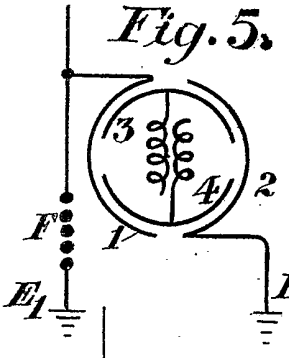

Fig. 6.

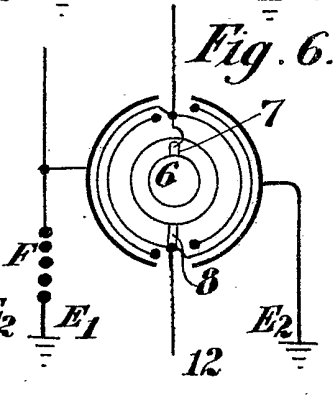

Fig. 7.

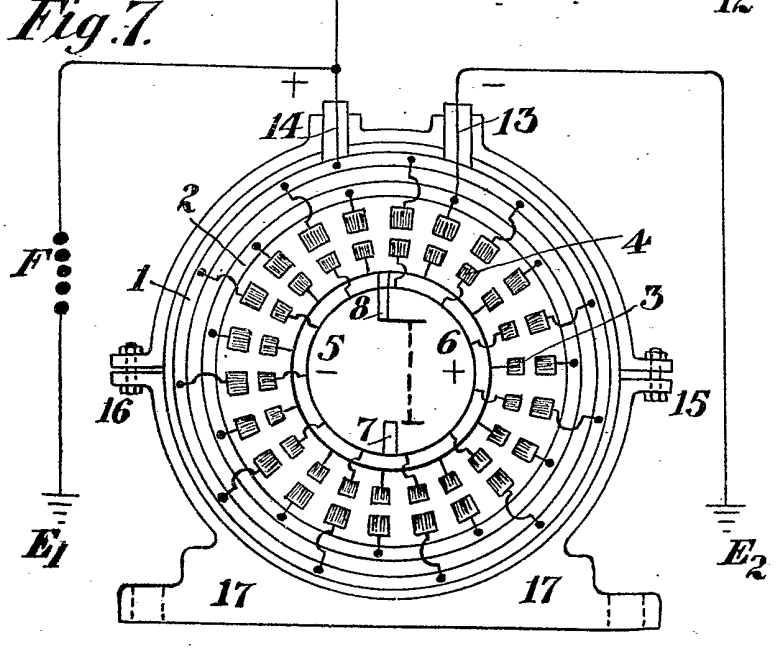

Fig. 8

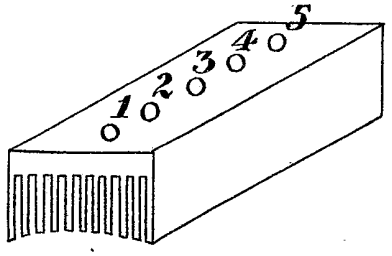

Fig. 10

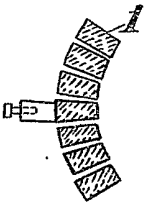

Fig. 9.

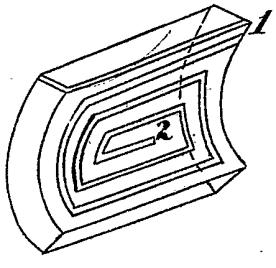

Fig. 11

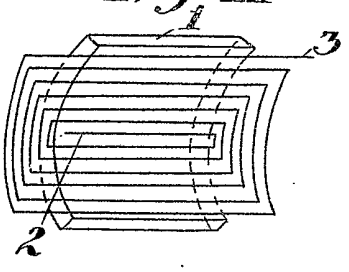

Fig. 12

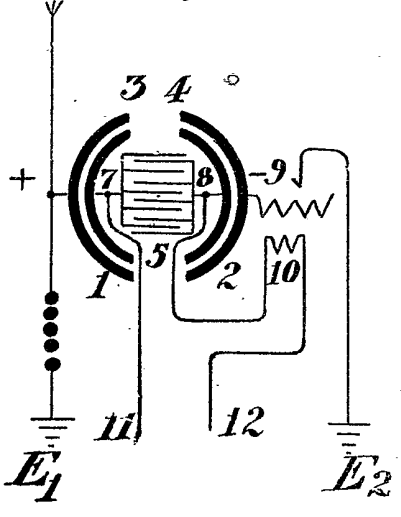

Fig. 13.

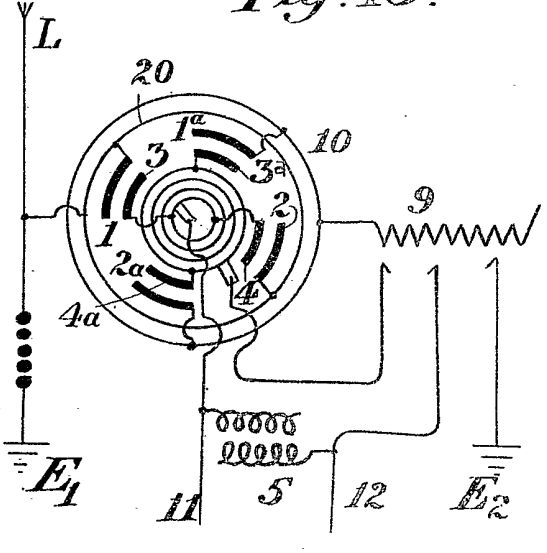

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Fig. 14

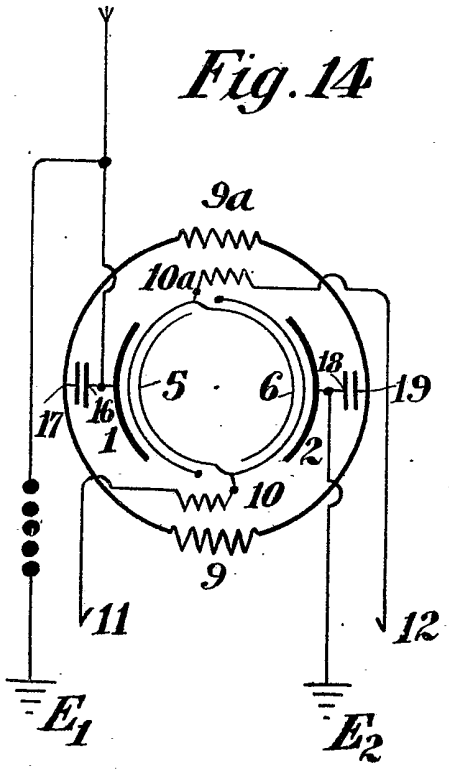


Fig. 16

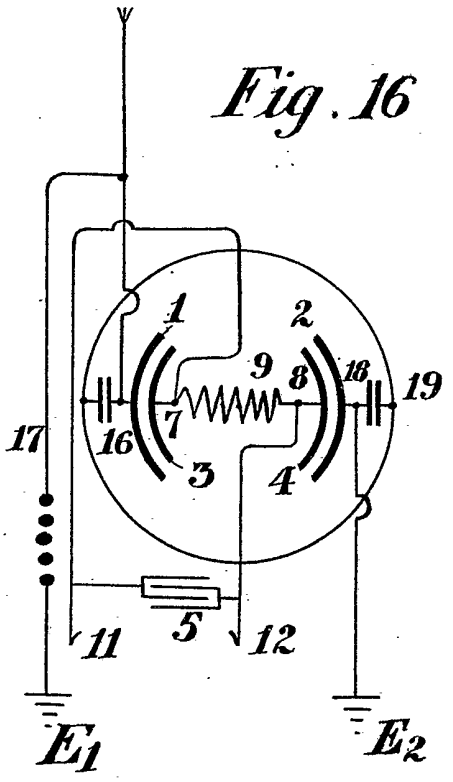


Fig. 15

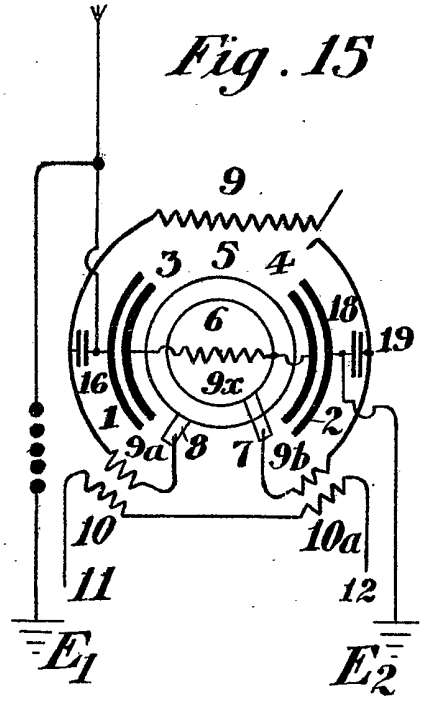
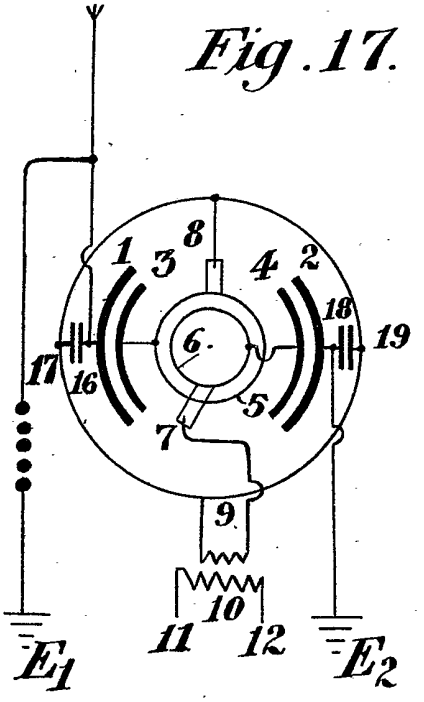


Fig. 17.



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