[Second Edition.]

PATENT SPECIFICATION.

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PROVISIONAL SPECIFICATION.

Improvements in and relating to Improved Means for Utilizing Electro-magnetic Radiation and Atmospheric Electricity for Transmitting and Generating Power.

I, SERAFINO ORLANDO, O.D.C., subject of the King of Great Britain, of Birchircara, Malta, do hereby declare the nature of this invention to be as follows:—

We were accustomed to combine the idea of electricity with that of wire conductors, and everybody knew that for the transmission of electrical energy it was necessary to make an exclusive use of metallic wires. But at the present time it is no longer thought necessary to use these means for the transmission of electrical energy, so much so that both electrostatic and electro-magnetic inductions are actions which are transmitted through the air, and although their fields of action are very limited, nevertheless they are clear proof that electricity can be transmitted not only through wires, but also through the ether, which is to be found in the air, and, as a proof of this, we may adduce the phenomenon of wireless telegraphy. It is known that this phenomenon is due to electrical current most rapidly alternated produced by apparatuses in which oscillatory electrical discharges are produced.

These oscillatory discharges, which are the reciprocating motions of electricity, are not only limited to the system of the apparatuses in which they are produced, but, as the electrical spark causing them explodes in the air, they are a phenomenon which occurs in the ether met with in the air, consequently, wherever the spark occurs, it produces in the ether periodical motions which get spread spherically all round in all directions so far as they are not obstructed by some obstacle, and, therefore, it is inferred that the electrical waves are nothing but an electromotive force transmitted from one point to another by means of the ether.

Above all, it is clear that the action of these oscillations at a distance is bound to be greater, the greater the energy employed in this oscillatory motion happens to be.

We know that the quantity of electrical energy which can be communicated to a conductor or to a system of conductors depends on its capacity. The smaller the conductor is, the less is its capacity, and, therefore, the smaller is the energy of the oscillations which are produced in it when, after having been charged, it is discharged through the medium of the spark.

In fact the period of these electrical oscillations increases proportionately to the square root of the capacity of the oscillatory system.

Consequently the above consideration warns us to use a system of conductors of great capacity in order to obtain extremely long waves, for the latter set in motion a quantity of energy greatly superior to that induced by short waves.

Now as these waves are propagated spherically all round in space in all directions, however much one tries to render the apparatuses powerful, it always remains true that the electrical energy transmitted in space is an electromotive force dispersed in all directions, in a similar way to the luminous waves issuing from a lighted splinter, which spread through the ether in all directions, and in the same way as these, their intensity decreases as the distance increases, and, however great the energy sent forth by the generating station of wireless telegraphy to the receiving station may be, only a very slight

fraction of the transmitted energy reaches it; first on account of the loss of intensity due to the distance from the source, and, secondly, because the electrical energy employed in these apparatuses is due to a pure phenomenon of resonance.

The same thing happens here as when a tuning fork, tuned to A (1^a) pitch, is sounded in the vicinity of a pianoforte note having the same A sound, when the latter in its turn is caused to vibrate and emit sound.

Nobody, of course, refuses to recognise the great difference existing between the intensity of sound emitted by the tuning fork and that felt by vibration.

Therefore in order to succeed in solving the problem of wireless traction, setting aside the apparatuses in which the phenomena of resonance are produced, it is necessary to have recourse to other contrivances, having the property of intercepting, or of better absorbing, in great quantities, the electrical energy dispersed in space, causing it to flow in a desired direction, or to flow towards a required point, which amounts to saying that it is necessary to construct an invisible conductor in space which may serve as a path to these waves, and to concentrate them at any point that may be required. The possibility of constructing such an apparatus results from the scientific proofs I am about to submit whilst unfolding my idea.

Röntgen rays, among other marvellous properties, possess one which is of great physical interest, that is, these rays discharge very rapidly the electrified bodies they meet with.

In order to prove in a simple way this fact, it will suffice to use a gold-leaf electroscope whose leaves are electrified with an ebonite rod, or with rubbed glass. As soon as the Röntgen rays are produced in its vicinity, the gold leaves, at first ready to diverge and retain this position, now instantaneously fall down, which is a sure proof that the air loses its insulation properties and becomes a conductor.

The fact that the air traversed by these rays becomes a conductor, says Professor Grätz, is explained by admitting that owing to them, the molecules of air split up, giving origin to very small particles, some of which are charged positively, and others negatively. It is therefore asserted that the air is ionised by these rays; the free ions in the vicinity of a charged body can become united to this electricity, and, therefore, can discharge it, and, consequently, this ionised air possesses a certain conductivity in such a way that if from any cause there is a difference of potential existing between two points in the air, an electric current is bound to pass, same as happens in a saline solution. Another property of great importance was observed when it was rendered possible to conduct to the outer side of a Crookes' tube cathodal rays, the negative electrons, which in electrolytic phenomena are inseparable from matter, are freed from the latter and subsist free; from which reason, owing to the high tension obtained in Crookes' tubes, they depart from the cathode with a velocity of about $^1/_3$ that of light, and they act as if they carried away with them negative electricity, and, consequently, every body met with by the cathodal rays becomes electrified negatively.

The apparatus proposed by me to intercept, or rather absorb in great quantities, the electric waves and to profit by it in its application to electrical power generation, will consist of an assemblage of fine copper wires, in several layers, one inside the other, laid out in the form of a flat rhombus, of which one diagonal is remarkably greater than the other. The wires of the several layers, are relatively staggered. The two extremities of all these wires are placed in communication with the central main wire the latter to have such a section as to allow of a resistance which may correspond exactly to the one offered by all the wires, taken as a whole. Underneath in the centre of this apparatus, is placed a Crookes' tube capable of producing rays in great quantities. The position of this tube is determined so as to allow of the copper wires being traversed by the rays throughout all their extension. The superficies of the apparatus will be proportioned to the extent to which the rays are projected, which extension will depend on the form and size of the platinum cone existing at the centre of the tube.

The above-mentioned tube if of Thomson model, would be highly suited to the predetermined object; here the negative charge is transmitted to two diametrically opposed points, and, in the inner part, the cathodes are represented by two specular and concave aluminium conductors, whilst in the centre of the tube is to be found the anode formed by the platinum cone receiving the positive charge.

When the current is discharging towards the tube, the cathodal rays strike the platinum cone at their focus respectively on each side, and thus large

quantities of rays are projected in straight lines perpendicularly to the superficies of the tube.

The phenomena to be verified in this apparatus are the following:—

The rays emanating from the tube, when it is placed in the above-mentioned position, whilst they strike the surrounding air rendering it ionised and, consequently, conductive, must at the same time traverse the copper wires impregnating them with negative electricity. The extent of the layer of ionised air and the intensity of the negative charge will undoubtedly depend on the greater or lesser power of the apparatus in which the Röntgen and cathodal rays are generated.

The electric waves sent continually by the generating station with the rapidity of light in all directions, must, on their way through space, meet with the obstacle, so to say, wherever it may be, formed by the conductivity of the ionised air through the action of the Röntgen rays projected by the tube, and attracted and absorbed by this conductivity of the air, they produce in the space struck by the rays a true aerial conductor, which gets charged without interruption with electricity, for, as the air is a non-conductor, only the layer struck by the rays becomes charged with electricity, and the air which surrounds it must retain its insulating properties. With respect to electric waves absorbed by the ionised air, Professor Wimbledon Hill says:

"Electric waves suffer the least absorption when travelling through a non-conductor medium like ether. Marconi observed in 1902 that signals that carried 1500 or more miles at night-time, would not carry for about 700 miles in the day. The action of day-light is responsible for the greater absorption; sunlight produces partial ionisation of the atmosphere, and renders it conductive."

From what we have said before, it is inferred that the air ionised by the Röntgen rays should absorb electric waves in a greater quantity, as its conductivity is extraordinarily greater than when it is ionised through the action of solar rays. In fact it has been proved above that electrified bodies when discharged in the vicinity of the Röntgen rays, whilst this never happens through the action of solar rays, for if such a thing could occur, as the sun's rays strike all day long the atmosphere, the properties of the static electricity would not have been discovered, because we should never have been able to have a body charged with electricity.

The rays projected by the tube, in lines perpendicular to the superficies of the tube, present to our sight the form and size of the invisible conductor produced by the ionisation of the air which attracts and absorbs continually the electric energy; this electric energy, being bound to follow the course formed in the air by the projection of the rays, must necessarily come into contact with the wires charged negatively through the action of the rays themselves, and here then takes place the meeting of the two conductors charged with two kinds of electricity, for it is laid down as a law that two different conductors have always different potentials, namely a positive and a negative potential. The difference of potential causes the negative electrons of the ionised air to be urged on towards the positive conductor, whilst the positive ions are attracted by the negative conductor. In contact with the two conductors they give up their charges, thus originating the electric current.

The magnitude of this current will depend on the greater or lesser ionisation of the air. The greater the difference of potential between the two conductors, the quicker the electrons and ions will be displaced, thus communicating for each unit of time greater charges to the two conductors.

In the apparatus, the positive or highest potential corresponding to an excess of electricity ought to be found in the invisible conductor formed by the ionised air, because the potential of a conductor is inferred from the relation between the capacity of the conductor and the quantity of electricity it possesses, and therefore it follows as a consequence that the negative or lower potential corresponding to a deficiency of electricity ought to be found in the bundle of wires.

A difference of potential between two charged conductors has as a consequence that when these two conductors are put into communication a flow of electricity is produced through the bodies joining together the two points of different potential, that is, an electric current is produced, or rather, an electromotive force from the higher potential to the lower; therefore, according to this other law, the electricity found in the conducting air, which is at the highest potential, should pass over the metallic conductors of the apparatus, which are at the lower potential.

It has also been said that the current is produced through the wires uniting

together the two points at different potentials. In this apparatus, owing to the nature or one of the conductors, such as the ionised air, this joining wire is not required, because air by itself, as can very easily be understood, supplies this defect, as the electricity which it possesses is in continuous contact with the other electricity produced continually in the wire; therefore, as electricity flows with greater ease through metallic conductors, than through any other conductor, then the recombining of the two electricities, one of the ionised air, and the other of the wire, cannot occur through the medium of the air, but runs over the bundle of the metallic wires, and generates in these an electric current; the greater the difference of potentials, the greater will be also the flow of electricity from one point to the other. So long as the difference of potentials is maintained always constant, a true electric current is produced in the conductors, as can be experimented with an electrostatic machine.

In fact, through the rotation of the machine, to one of the conductors is communicated positive electricity, and to the other negative electricity, that is, a difference of potential is constantly maintained between them, whence the two electricities flow continuously in the wire, or in the wires, and an electric current is produced.

In the apparatus the two electricities, namely that of the air and that of the wires, both produced without interruption, through the action of the rays projected by the tube, finding themselves in continual contact the one with the other, the difference of potential is maintained constant, and provokes, as already proved above, the passage of electricity through the wires, or else the electric current.

ATMOSPHERIC ELECTRICITY.

In addition besides the electric waves, also atmospheric electricity, for the same reason, ought to take part in the phenomenon, and be absorbed by the apparatus. In fact the atmosphere is in an electric state always and everywhere, so much so that the differences of potential even between localities not very far from one another is sometimes considerable. When it is fine weather, the air is usually electrified positively, and the earth, naturally, by induction, is electrified negatively. The free electricity of the atmosphere is in greater quantity in high regions. It undergoes variations of a relative periodicity during day-time and the seasons.

With regard to what I state, what is asserted by an American scientific journal, "Science and Invention," (May, 1921), is quite to the purpose.

"It is said that Dr. Plauson, a German scientist, has successfully demonstrated that if we send up metal surfaced balloons and tap the electrical energy from the atmosphere at a level of 1000 feet or more, we shall be able to realise an average of 200 h.p. per square metre, an area equivalent to 3.28 square feet. It is even claimed that in his latest experiments, as great a quantity of electrical energy as 400 to 500 h.p. has been realised per square metre. Under normal conditions, the potential gradient, as it is called, of the atmosphere increases with comparative regularity as we rise above the surface of the ground, the atmospheric potential per foot or per metre varies also, as may be well imagined, with the season of the year, and the potential or voltage has been found to average 100 volts per metre (3.28 square feet) in the summer months, while during the cold winter seasons the potential gradient rises to as high as 300 volts per metre. . . ."

The same scientific journal (March, 1922) makes the following remarks:—

"The amount of electrical power that resides in our atmosphere is astounding. Herr Plauson found in his experiments that a single balloon sent aloft at a height of 300 yards gave a constant current of 400 volts of 1.8 ampères, or, in 24 hours, over 17½ kilowats! By using two balloons in connexion with a special condenser battery, the power obtained was 81½ kilowats in 24 hours! The actual current delivered was 6.8 amperes at 500 volts. . . ."

Now it is well known that X rays are effective at a distance of almost thirty feet according to a statement by the French Academy of Arts and Sciences with the following words:—

"X rays produce electrons on their passage through the air; these electrons are definite entities, and as they leave atoms, they may traverse matter or pass through the air in a straight path, and by their coming in collision with the atoms of the air, they render it a conductor of electricity. It is true that screens of lead suffice to protect the operators from the evil effects of X rays, but operators are sometimes careless, and then the rays are effective at a distance of almost thirty feet."

Supposing, therefore, the air ionised by the rays to be five square metres, such an area at an altitude of 1000 feet,

according to the latest experiments by Dr. Plauson, should effect a force equivalent to $5 \times 200 = 100$ up to $5 \times 500 = 2500$ h.p. Therefore, whenever the apparatus at an altitude of several metres from the ground is capable of absorbing from an area of five square metres as much electric energy as is required to realise a force of 1% in comparison to that obtained at an altitude of 1000 feet from the earth, it should give a result of a force from 10 to 25 h.p.

INTENSITY OF ELECTRIC WAVES.

All physicists, among whom may be included Hertz and Faraday, admit that electric and luminous waves are identical, that is, oscillations of the ether of varying length. The luminous waves acting on sight, have a length varying from 4 to 7½ ten thousandth of a millimetre, according to the various colours, whilst the longer wave of 40.50 ten thousands of millimetres show themselves only for technical properties in apparatuses suited to this object.

Electric waves are much longer, for they measure from several centimetres, to thousands of metres, but the difference between these two kinds of waves is only in length.

Taking this for granted, we may state that electric waves before a very short duration of oscillation appear to us as light; while electric waves of a great duration of oscillation do not manifest themselves to us as light, but owing to their effects of induction show themselves as electric waves. If all this be true; (and all consequences therefrom can be verified) it can surely be possible to obtain by means of electric waves the same phenomena as with luminous waves, and the laws ruling the latter can be applied to the former.

And this Hertz proved by experiments.

Now physics teach us that the intensity of light is inversely proportional to the square of the distance from the source, that is to say, it decreases with the square of the distance from the source, that is from the distances . . . . 1, 2, 3, the intensity of light is proportional to the numbers . . . . 1, ¼, 1/9, *etc.*, and this occurs because light gets spread in all directions over spherical surfaces of a radius increasing with the distance. Spherical surfaces with rays . . . . 1, 2, 3 *etc.* have a magnitude proportional to the numbers . . . . 1, 4, 9 *etc.*, that is, spherical surfaces increase with the square of the rays.

Therefore as the intensity of the light has to be communicated to ether waves whose superficies increase at the square of the distance, each of them receives a part of the former (that is of light) whose magnitude decreases in the same measure.

Since luminous and electric waves, according to the above adduced proofs, are identical, the enunciated law of the intensity of light may be applied (taking into consideration the multiform variations of the atmosphere) to the intensity of electric waves.

Dated this 3rd day of January, 1924.

SERAFINO ORLANDO,
Birchircara, Malta.

COMPLETE SPECIFICATION.

Improvements in and relating to Improved Means for Utilizing Electro-magnetic Radiation and Atmospheric Electricity for Transmitting and Generating Power.

I, SERAFINO ORLANDO, of 47, Church Street, Kensington, W. 8, British subject, late of Birchircara, Malta, 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:—

My invention relates to an improved means of absorbing electro-magnetic energy from the ether.

The electro-magnetic energy may be of the form of electro-magnetic waves radiated from some radio transmitting station or from the electrostatic charge in the atmosphere.

According to my invention I provide an arrangement of metallic conductors, preferably in the form of a network beneath which I introduce a source of X-rays and from this source I project the rays upwards through the conductors.

It is known that a beam of X-rays causes the air penetrated by such rays to become ionised and consequently conducting for a distance dependent on the strength of the rays.

I am aware that in conjunction with

the X-rays emitted by the X-ray tube are certain other rays called cathodal rays which carry with them negatively charged electrons which cause all bodies they meet to become charged with negative electricity.

According to my invention I find that when electromagnetic waves strike the region of the ionised air enveloping the network of conductors, produced by the X-rays projected into the network, the arrangement is found to be equivalent to a conductor of great height, but when the source of ionisation is removed practically no absorption of energy takes place in the conductors.

The function of the ionisation being to increase the small superficial area of metal exposed for the purpose of absorbing electromagnetic energy by rendering the air surrounding the conductors conductive to the passage of electromagnetic energy from a source of X-rays or other rays capable of producing ionisation.

In this invention it is found desirable to arrange the size of network to suit the strength of the source of ionisation or conversely to arrange the strength of the source of ionisation to suit the size of network; it being desirable to fill the field of ionisation with conductors up to an intensity of ionisation which may be determined by experiment.

It is also found desirable in the case of X-rays to prevent the rays scattering by shaping the electrode and surrounding the tube by a metal vessel with an adjustable aperture.

Should it be found desirable, the cathodal rays previously referred to may be prevented from striking the network of conductors by deflecting them by the aid of a magnet.

The invention is illustrated by way of an example in the accompanying drawing in which:—

Fig. (1) shews the network of conductors in plan and elevation.

Fig. (2) shews the electrical circuit.

In carrying my invention into effect according to the apparatus illustrated; the network of conductors shewn in Fig. (1) consists of a number of fine copper wires (*a*) communicating with a central conductor (*b*).

In Fig. (2) a source of X-rays (*c*) is shewn beneath the arrangement of conductors (*a*) the details of which are shewn in Fig. (1).

These conductors (*a*) may for convenience be connected to a terminal (*d*) to which the apparatus to be actuated may be connected through another terminal (*e*) to earth.

The magnet (*m*) may be introduced for the purpose of deflecting the cathodal rays (*f*) previously referred to.

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

1. A conductor or network of conductors which has been surrounded by an ionised gas for the purpose of increasing the power of the conductor to receive electromagnetic energy.

2. A conductor or network of conductors which has been surrounded by an ionised gas for the purpose of increasing the power of the conductor to transmit electromagnetic energy.

3. A conductor or network of conductors which has been surrounded by an ionised gas for the purpose of increasing the power of the conductor to absorb electrostatic charges from the atmosphere.

4. A system of absorbing electromagnetic energy from the ether substantially as described with reference to the drawings.

Dated the 2nd day of March, 1925.

SERAFINO ORLANDO.

Abingdon: Printed for His Majesty's Stationery Office, by Burgess & Son.
[Wt. 33A.—50/3/1931.]

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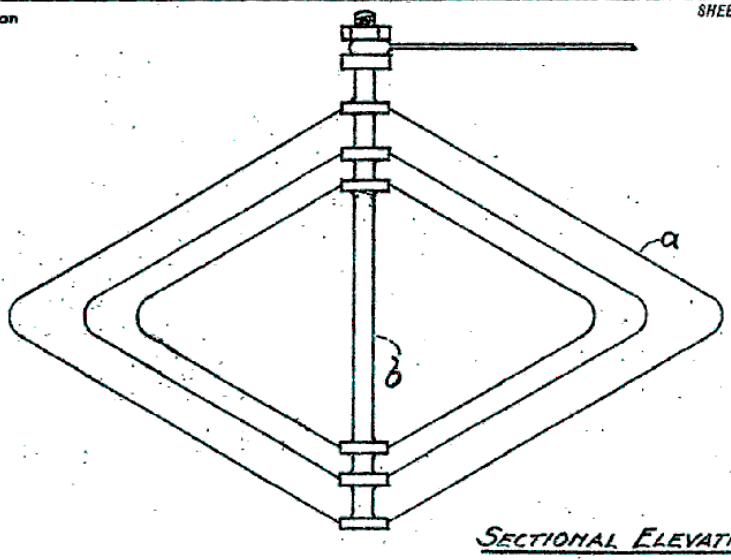
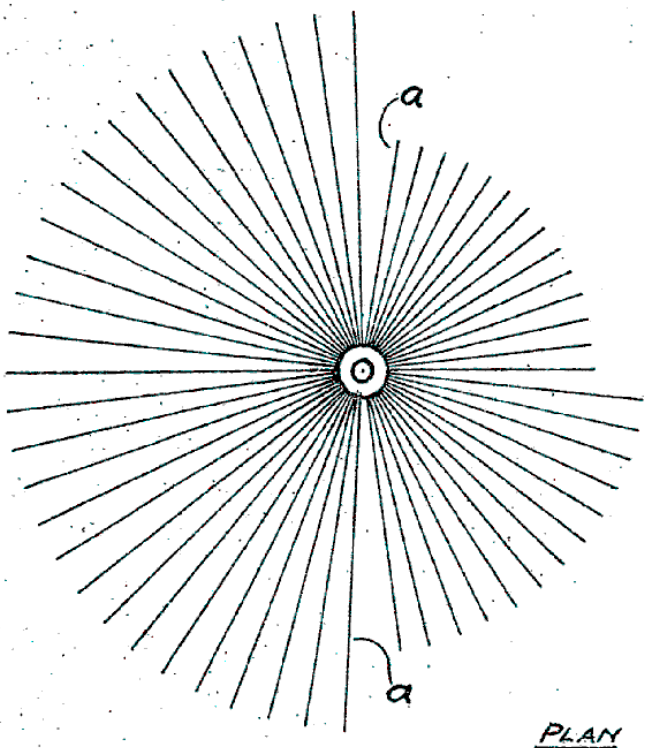
2nd Edition

SHEET 1



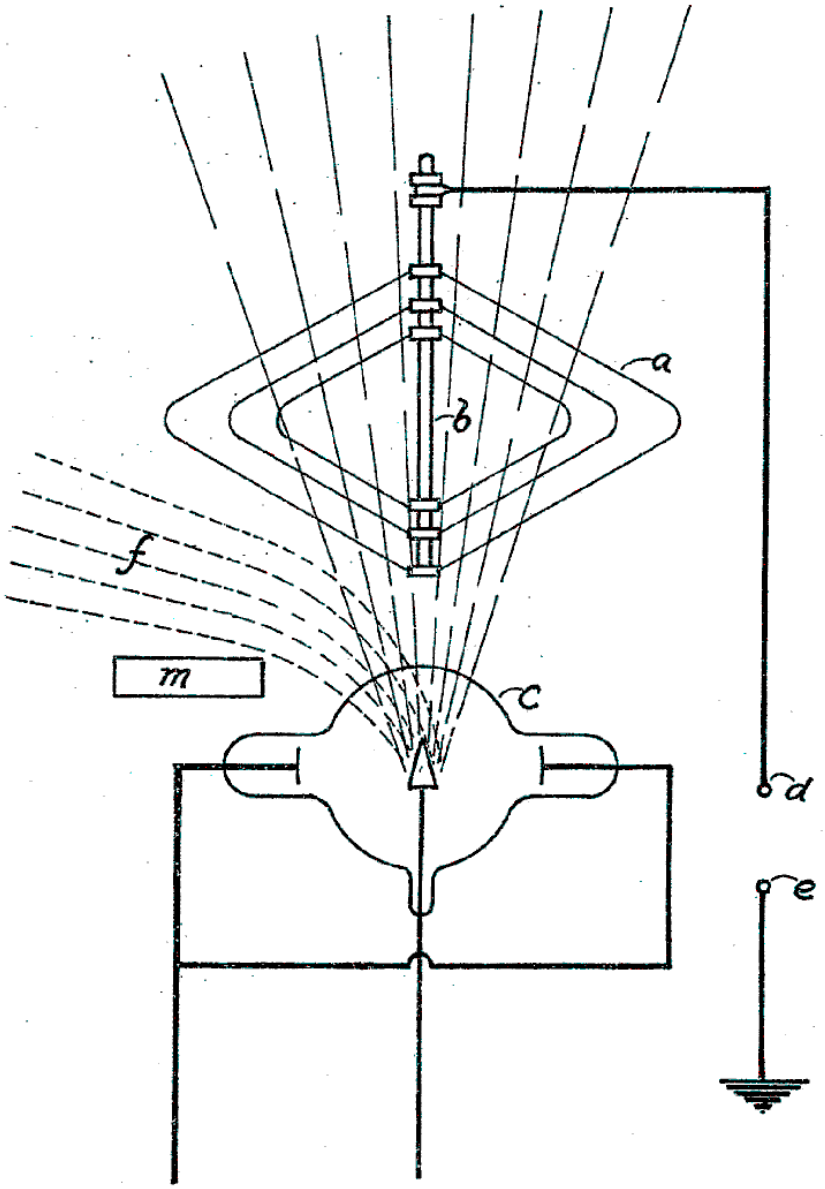
SECTIONAL ELEVATION



PLAN

FIG. 1.

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



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SHEET 1

2 SHEETS

SHEET. 2

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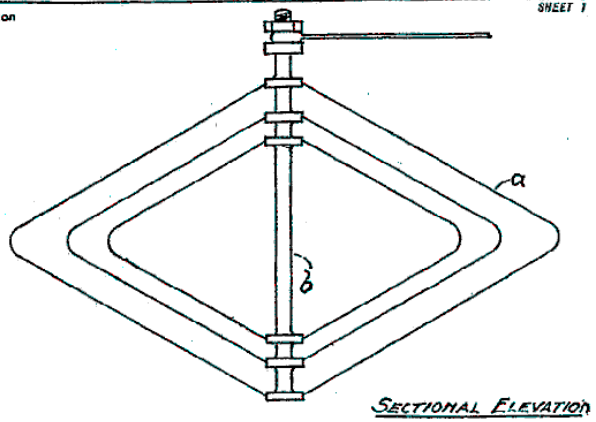

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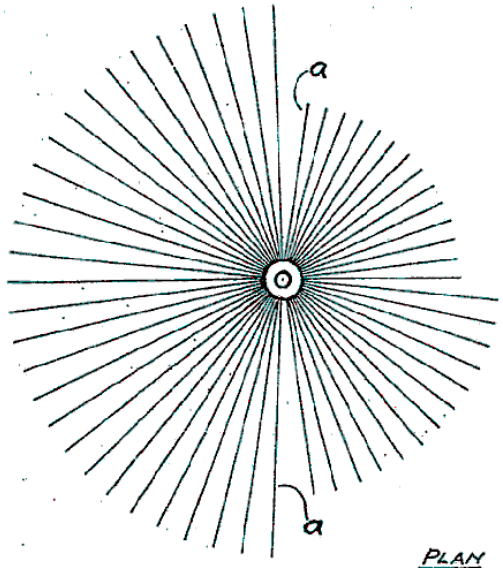
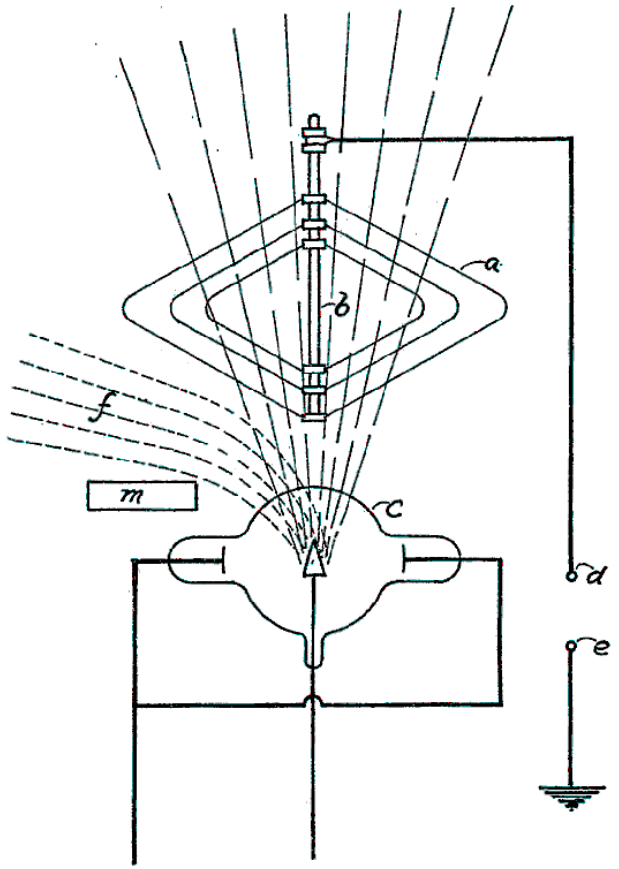


PLAN

FIG. 1.



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