

1,043,030.

T. H. PATEE, DEC'D.
M. J. PATEE, ADMINISTRATRIX.
STATIC ELECTRIC MACHINE.
APPLICATION FILED JAN. 31, 1908.

Patented Oct. 29, 1912.

4 SHEETS-SHEET 1.

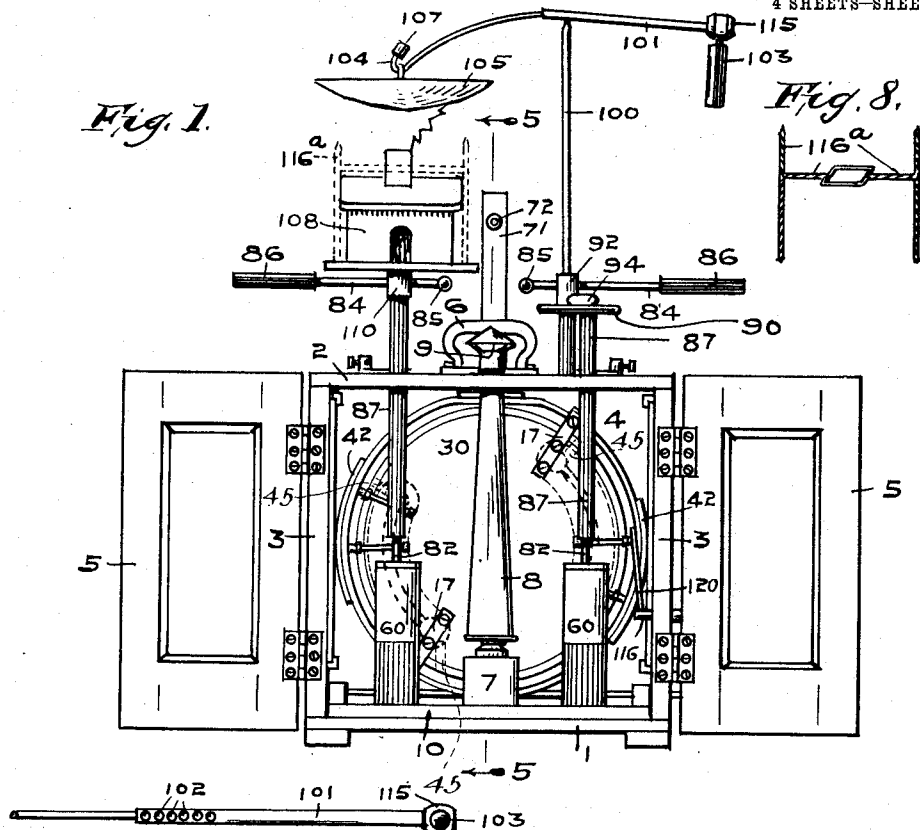


Fig. 1.

Fig. 8.

Fig. 14.

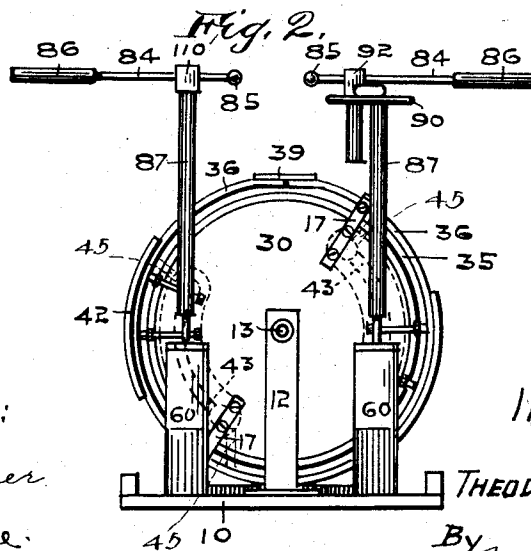


Fig. 2.

WITNESSES:

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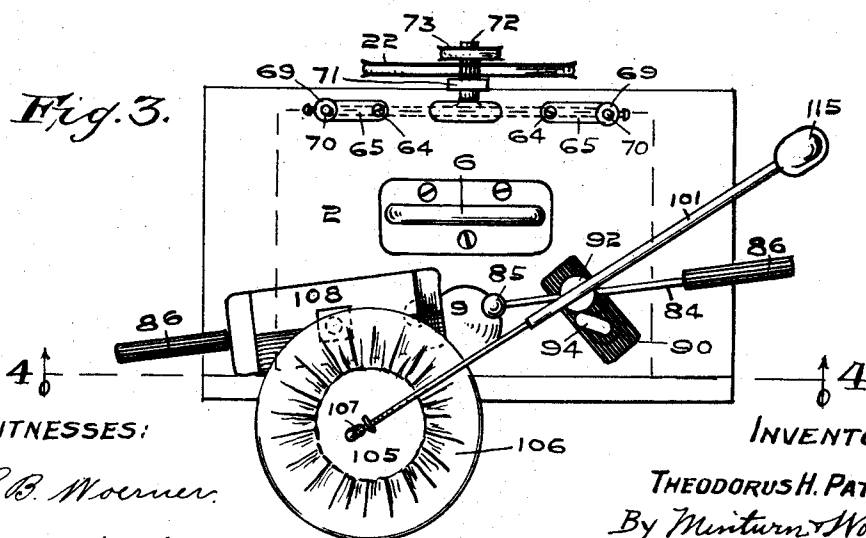
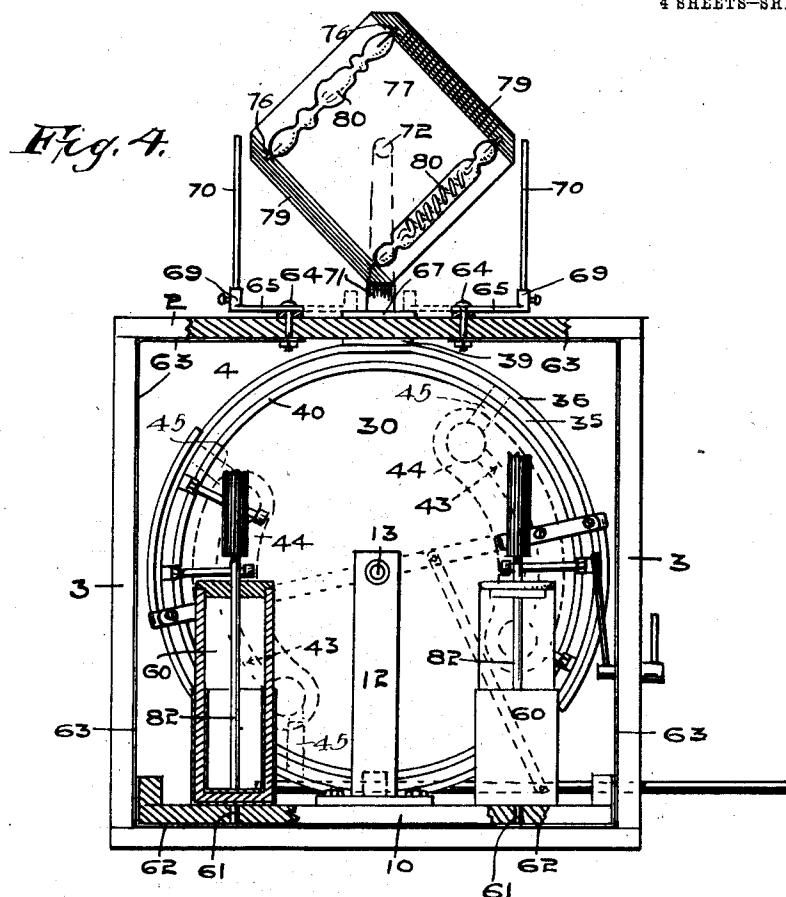
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4 SHEETS-SHEET 2.



WITNESSES:

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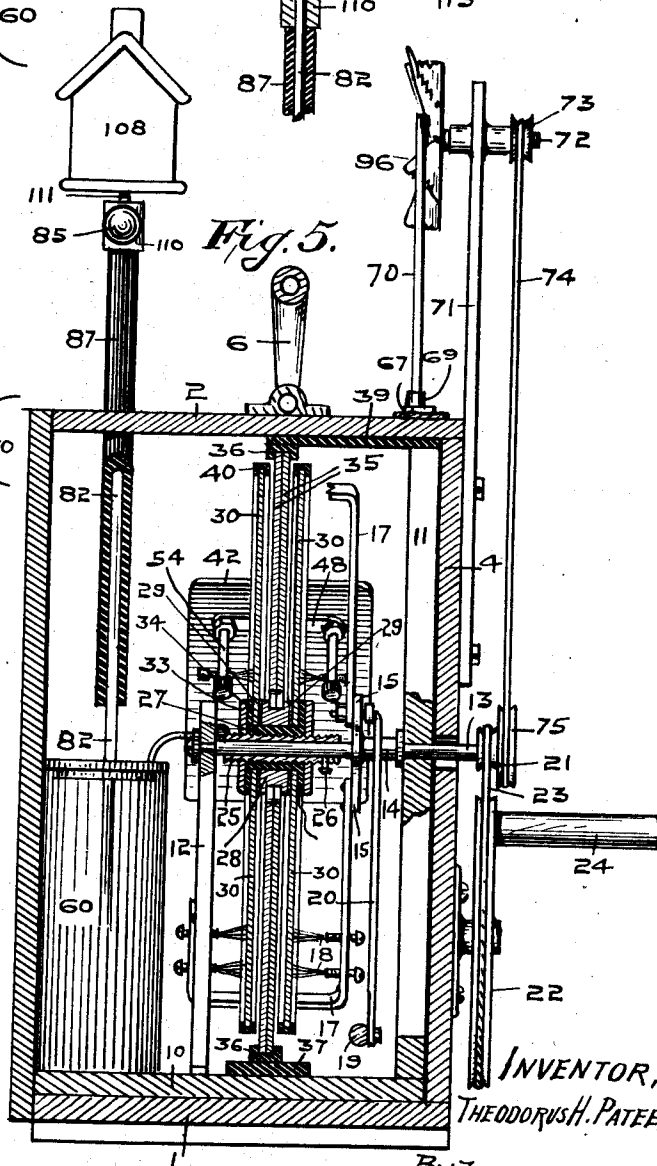
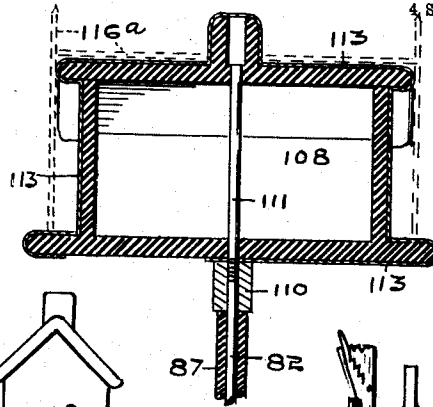
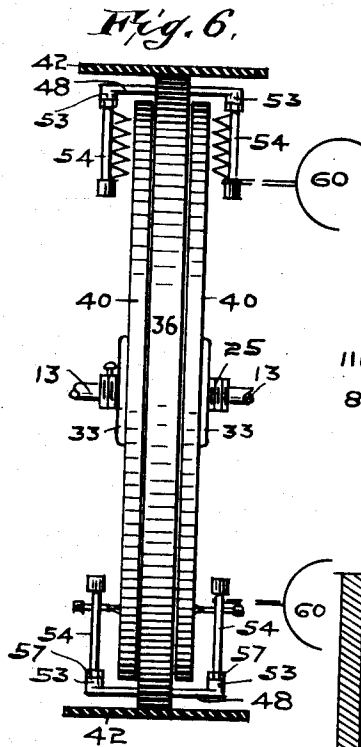
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4 SHEETS—SHEET 3.



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4 SHEETS—SHEET 4.

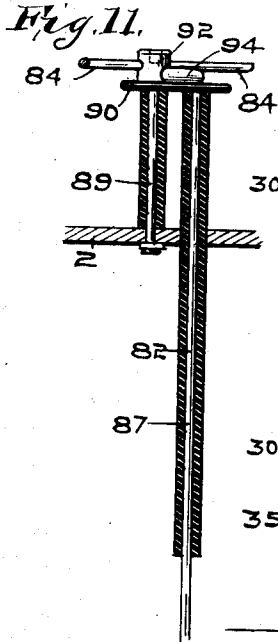
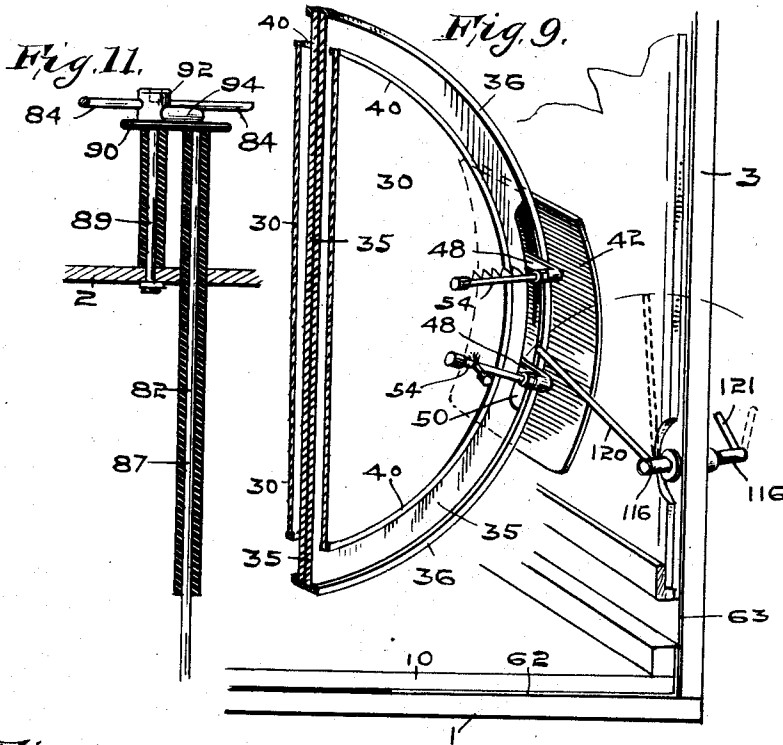
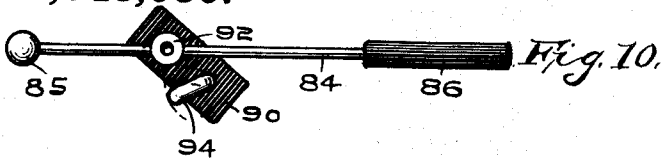
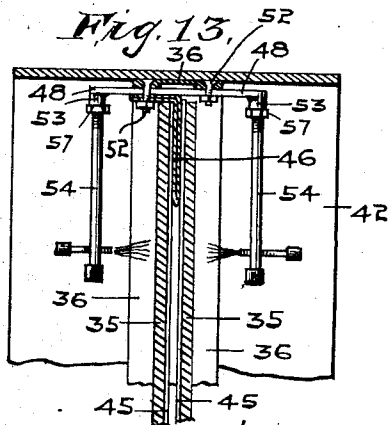
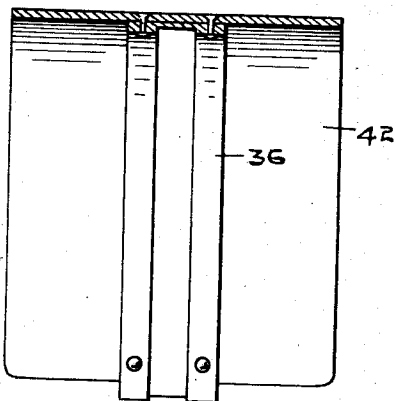


Fig. 12.



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UNITED STATES PATENT OFFICE.

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STATIC ELECTRIC MACHINE.

1,043,030.

Specification of Letters Patent.

Patented Oct. 29, 1912.

Application filed January 31, 1908. Serial No. 413,618.

To all whom it may concern:

Be it known that I, THEODORUS H. PATEE, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Static Electric Machines, of which the following is a specification.

One object of my invention is to inclose the generating mechanism of a static electric machine within a case which will exclude air-currents and in a large measure protect said mechanism from the disturbing influence of external variations of temperature and humidity, but to so construct the various parts that the electric machine may be easily and readily removed from its case and operated outside and separate from the latter if desired.

Another object is to provide a heating device to be located within the case for the purpose of drying the interior and preventing the deleterious precipitation of moisture on the generators.

Another object is to provide a switch located on the outside of the case for making or breaking the induced electric current between Leyden jars or other electric accumulators, and to provide binding posts or other means for the support of removable electric appliances.

Another object is to provide means for exhibiting and supporting Geisler tubes, thunderstorm displays and various other devices for ornamental, educational, medical or other purposes.

Another object is to provide a more realistic device for demonstrating the phenomenon of a thunderstorm.

Another object of my invention is to provide a device for stimulating the electric current to extreme energy of action by means of a spark gap between a prime conductor and an electrode and a metallic switch for regulating the size of the spark gap or for closing same.

Another object of the invention is to provide a device the adjustable contact of which with the brush rod will produce an entire reversal of the machine polarity.

Another object is to provide means for distributing ozone generated by the machine for disinfecting and purifying purposes.

Other objects of my invention are to pro-

vide improved brush connectors and supports and comb and supports and an improved guard or shield to reduce electric leakage, and to simplify the construction and render the machine more efficient and durable and more economical and convenient in many ways such as will be hereinafter fully described and pointed out in the claims.

I accomplish the objects of the invention by the mechanism illustrated in the accompanying drawings, in which—

Figure 1, is a front view of my invention with the generators within a case, the doors of which are shown open, the view showing the thunderstorm apparatus in operative position. Fig. 2 is a like view of the generative mechanism as it appears when removed from the case. Fig. 3, is a top plan view of the device shown in Fig. 1, except that the doors are shown as closed in this view. Fig. 4, is a vertical section on the line 4—4, of Fig. 3. Fig. 5, is a vertical section on the line 5—5, of Fig. 1, with the addition of a fan for distributing ozone. Fig. 6 is a detail in plan view of the generating disks showing their attached shields in horizontal section. Fig. 7, is a longitudinal vertical section of the small house used in my thunderstorm display. Fig. 8, is a perspective view of wires to be applied as lighting rods to the house. Fig. 9 is a perspective view of the pole changer and parts operatively associated therewith. Fig. 10, is a top view of the electrode and switch in my spark gap apparatus. Fig. 11 is a vertical section of the spark-gap apparatus. Fig. 12 is a detail inside view of shield for preventing leakage. Fig. 13 is a sectional detail of shield, rims and generating plates and associated means for supporting the brush-rods, and 14 is a detail in under-side view of the rod which supports the device representing a cloud in my device representing a thunderstorm.

Like characters of reference indicate like parts throughout the several views of the drawings.

The drawings illustrate an apparatus small enough to be readily portable as the invention is particularly adapted for use by lightning rod agents in demonstrating the importance of rod protection to prospective customers and should be easily carried from

place to place for such use. The importance, for this use, of an inclosing case is also manifest as the apparatus will be required to operate at all times and under conditions of atmosphere perhaps unfavorable.

1 represents the bottom of the case or cabinet, 2 the top, 3 the ends, 4 the back and 5 the doors by means of which the front is closed. This case has a handle 6 by which it is carried. Preferably the doors and ends will contain panels of glass in order that a view of the interior may be readily obtained.

The cabinet or case here described is not sufficient to protect the generating plates against the condensation of moisture when the humidity of the atmosphere on the outside is excessive and I have therefore provided a lamp 7 adapted to be placed inside of the case in a lighted condition, after which the doors may be closed and thereupon the atmosphere contained within the case will be thoroughly dried. The lamp flue 8 extends to the outside through the top 2 and terminates with the cap 9, which cap will protect the lamp against interference by outside air currents or wind. The action of the lamp will be to draw the damp air in the case into the lamp and expel it from the case through the flue 8.

10 is the base of the static-electric generator proper and is adapted to be slid into the case above described, and to rest while in there, on the bottom 1. The glass plates, combs, brushes, Leyden jars and other parts required to make a practicable generator of static electricity are mounted on this base 10, whereby, upon the removal of the base from the case or cabinet the above parts coming with it will form a generative machine which is not inclosed, such as is shown in Fig. 2. This is desirable for educational purposes and other uses where the cabinet or case obstructs the view or interferes with free and close access from all points.

Mounted on the rear of the base 10 is the vertical standard 11, and at a suitable distance in front of it is the shorter standard 12. 13 is the main shaft of the machine and is supported by the two standards 11 and 12. 14 is a sleeve mounted on shaft 13 next to standard 11, and integral with this sleeve are the two diametrically opposite arms 15 to which the equalizer bars 17 are fastened. The bars 17 are bent around the glass plates in the manner shown in Fig. 5, and support the wire brushes 18. 19 is a horizontal rod capable of longitudinal movement only, and it is connected with one of the arms 15 by the link-bar 20. One end of the bar 19 extends outside of the base 10 and also of the cabinet when the machine is incased, for easy access by the operator, and by moving the rod 19 longitudinally the position of the equalizer bars 17 will be correspondingly changed. On the rear end of the shaft 13,

which end projects to the outside of the cabinet when the generative mechanism is inclosed, is the small pulley 21, and below it is the large pulley 22 which is connected with pulley 21, by belt 23. The pulley 22 has the handle or crank 24.

Mounted on the shaft 13, in front of the sleeve 14 is the externally screw-threaded sleeve 25 which is retained in fixed position on the shaft by set screw 26. Mounted upon the sleeve 25 is a shorter sleeve 27 of hard rubber and mounted midway of the ends of the rubber sleeve is the still shorter metal spacing ring 28, against the ends of which are the soft-rubber washers 29. Mounted on the sleeve 27, against each of the rubber washers 29, are the revoluble glass disks 30, two in number, separated by the spacing ring 28 and washers 29. 33 are metal nuts screwing on the threaded sleeve 25 and insulated from their respective adjacent glass disks 30 by washers 34 of soft rubber. The use of soft rubber, as specified, relieves the glass plates from jar and danger of breakage. The two revoluble disks 30 are set far enough apart to allow room for a pair of stationary glass disks 35, having large central opening whereby they do not touch the metal spacing ring 28.

The disks 35 are provided with a rim 36 which is supported at its lower part by the hard rubber footing 37 fastened to the base 10, and the top of the rim is fastened to a hard rubber strap 39 which in turn is fastened to the top of the standard 11. The strap is wide enough to form a joint or splice by which the ends of the rim are connected. The revoluble disks 30 both have rubber rims 40 to prevent leakage of electricity from the edge of the disk and also to strengthen and support the disk against breakage, which is the function also of rim 36.

There is a strong tendency for the static current to escape and equalize with surrounding objects, which tendency is magnified by the proximity of the sides of an inclosing cabinet. This is relieved to a large extent by the use of additional shields 42 of hard rubber which are riveted to the rims 36 and form supports for the latter and particularly to prevent leakage at the places of attachment of the brush and comb rods.

Each stationary disk 35 is provided with oppositely-located strips of tin-foil 43 curved concentric with the disk as shown in Figs. 1, 2, and 4. These are placed on said stationary disks on the adjacent sides of the latter so as to be between the pair of disks. The tin-foil is placed on the disk and is overlaid with paper 44. The strips are correspondingly placed on the two adjacent faces of the stationary disks. From the ends of the strips 43 of tin-foil there is another tin-foil strip 45 (see Fig. 13) extending to

the disk periphery. The outer end of tin-foil strip 45 extends flush to the edge of the glass disk and the two strips of tin-foil for the adjacent sides of each pair of stationary disks have between them a copper strip 46. Said copper strip has its ends turned laterally and clamped against the horizontal bar 48. The bar 48 passes between the rubber rim 36 and the edges of the pair of stationary glass disks, and to provide room for the passage of the bar without bending or weakening of the rim 36 which would result by notching or cutting the latter away to make room for the bar 48 I prefer to notch the periphery of the glass disks as shown at 50 in Fig. 9. The bar 48 is attached to rim 36 by means of the two bolts 52, Fig. 13. The ends of the bar 48 terminate with lugs 53 having screw threaded sockets to receive the rods 54. If this rod 54 is intended to carry a brush it will be constructed in the manner shown in Fig. 13, but if intended to support a comb it will differ from the brush rod by the omission of the brush and the addition of the combs as illustrated at the top of Fig. 6 and in the upper rod of Fig. 9. 57 are jam nuts on rods 54 to keep the latter from loosening by use.

60 represent Leyden jars the inner coating of each of which is connected with the comb or collector-rods of the machine (see Figs. 4 and 6), and the outer coatings of which are connected through a metal pin 61 with a metal sheet 62 on the bottom of base 10, the sheets for the two jars being separate and insulated from each other. The two plates 62 are electrically connected when the generative mechanism is in its cabinet, by means of the conductor 63. Located in the circuit of this conductor, preferably on top of the cabinet and adjacent to the back of the latter, is a switch, or rather a double switch, comprising a pair of metal bolts 64 which pass through the top of the cabinet and with the inner ends of which connection is made by the conductor 63. Secured to the top of the cabinet on the outside of the latter are the bars of metal 65 which have a swinging adjustment on bolts 64. Their free ends are adapted to be brought into electrical contact with a metal plate 67 secured to the top of the cabinet between the two bolts 64 so as to complete the electric circuit when thus in contact. The circuit through plate 67 will be broken by swinging either of the metal bars 65 out of contact with plate 67. Each free end of the two bars 65 is provided with a binding post 69 to receive a removable vertical extension 70.

Secured to the back of the cabinet is a standard 71 which extends above the cabinet-top in the manner as shown and provides a support for a short shaft 72.

Mounted on the rear end of shaft 72 is a pulley 73 which is connected by means of belt 74 with a pulley 75 on the main shaft 13 of the machine. The front end of the shaft 72 is to receive display devices such as that shown in Fig. 4 comprising a substantially square plate 77 adapted to rotate between the vertical extensions 70 when both switches are open. The plate 77 has its two opposite edges 79 covered with tin-foil or other conductor of electricity, and between these covered edges Geisler and other display tubes 80 are mounted and secured by the wire ties 76 so as to make electric connection between said conducting edges 79. When the plate 77 is rotated between the extensions 70 its corners will successively approach near enough to the extensions 70 to complete the electric circuit and cause intermittent displays in the tubes 80.

The inner coatings of the Leyden jars are connected by the metal rods 82 with the electrodes 84 located outside of and above the cabinet. The electrodes have the usual balls 85 at their adjacent or inner ends and handles 86 at their outer ends. The rods 82 I designate as the prime conductors and they will be protected from leakage by the rubber insulations or covering 87. I have found that by providing an air-gap in one of these prime conductors and a metal switch by which the size of the gap can be regulated and if desired entirely closed I am able to increase and regulate the force and materially add to the disruptive action. In carrying out this phase of my invention I provide a metal rod 89 which I secure to the top of the cabinet at a suitable position adjacent to the projecting end of rod 82 and support the upper end of both rods by a hard rubber plate 90, through which both rods are made to pass. Mounted on the end of rod 89 upon the rubber plate 90 is a metal enlargement or head 92 through which the electrode 84 is slidably passed. Secured to the projecting upper end of the rod 82, and resting on the rubber plate 90, is the laterally extended metallic arm 94, the free end of which is adapted to swing into contact with or into positions more or less remote from the head 92 whereby a spark-gap between the end of arm 94 and head 92 may be produced, the length of which will depend on the distance of the end of the arm from said head.

The flow of electric current from the combs would be incessant and continuous through the prime conductor 82 to the sliding electrode 84 if it were not for the obstruction of the primary spark-gap above described wherein the air acts as a nonconductor and as a dielectric similar to the action of the glass walls of a Leyden jar. If the primary current is positive it will induce

negative force to the nearest surface of the insulated metal support for the sliding ball 85 or other terminals, but this slight resistance of air space is easily broken down by the rush or pressure of the constantly generated current, and each slight accumulation and break causes a spark by air resistance and also causes a sudden increase in force, potential, and polarity of the induced and disruptive force accumulated by the insulated electrodes to such an extent as to materially enhance disruptive action.

The force as generated is sufficient to overcome and break the resistance of the air gap with great frequency and the impulsions of these breaks can be utilized for giving shocks for medical treatment and other uses where throbbing or disruptive effects are desirable.

When a spark is produced between the balls 85 of the electrodes 84 there is an attendant generation of ozone which if properly distributed throughout a room would act as a powerful disinfectant and with the purpose of distributing this ozone I provide a fan 96 which is mounted on the short shaft 72 in place of the plate 77. The action of the fan when rotated by the means shown in Fig. 5, creates a current of air across the electrode terminals which carries the ozone away from the machine and distributes it throughout the room.

I will now describe my apparatus for demonstrating the phenomenon of a thunder storm. In this demonstration both of the switches 65 will be closed and the extensions 70 removed from their binding posts, and the electrodes 84 will be separated to prevent sparking between them. The head 92 terminating the conductor rod 89 is provided with a threaded socket into which the lower end of the vertical extension or post 100 is screwed. The top end of this post is pointed.

101 represents a rod having a row of countersinks 102 to receive the pointed end of post 100. The rod 101 has a handle 103 at one end and it terminates at its other end in a hook 104. Suspended from this hooked end is a concave or cupped metallic plate 105, which plate is partially insulated by means of a cloth covering 106. The hooked end 104 of its supporting rod terminates with the rubber knob 107 to prevent electrical leakage. This cloth-covered plate 105 suspended as above described from rod 101 has free movement in all directions and represents a storm cloud and is suspended above the opposite electrode of the machine. In order to make the demonstration realistic this opposite electrode which represents the earth is provided with a miniature house 108, the details of which are clearly illustrated in Fig. 7. The head 110 which terminates the conductor 82 of this electrode is

provided with a threaded socket into which the end of rod 111 supporting the house is screwed. The upper end of rod 111 is insulated, but the lower end and the head 110 are in electric contact with tin-foil 113 which connects the chimney and roof of the house with head 110 and conductor 82. The proximity of the plate 105 or "cloud" to the house will depend on which of the holes 102 of rod 101 the pointed end of rod 100 enters. The "cloud" is on a balance with handle 103 and weight 115 at the handle-end of rod 101 and by changing the support 100 closer to the handle the "cloud" will be correspondingly lowered and by moving the support in the opposite direction it will be correspondingly raised. When the machine is in operation and properly electrified a spark illustrating a flash of lightning will pass from the "cloud" to the house. Should the spark pass from the house to the "cloud" it will be necessary to reverse the polarity of the machine, which will be done by mechanism hereinafter described.

By placing the rod 116 (shown in perspective removed from the house in Fig. 8 and in dotted lines on the house in Figs. 1 and 7) on the house there will be no spark but the electricity will be seen pouring continuously from the cloud to the tips of the rod.

The device for changing the polarity of the machine, or "pole-changer," so-called, is illustrated in Figs. 1, 4, and 9, and comprises a rock-shaft 116 electrically connected with the conductor 63 which conductor is connected through parts 61 and 62 with the outer coating of a Leyden jar. The rock-shaft carries the radial conductor-rod 120 which is adapted to be brought by rocking shaft 116, into contact with the brush-rod 54 having electrical connection around the glass generating plates. A handle 121 on the outer end of the rock-shaft facilitates the rocking of said shaft.

I have found by experience that whatever the polarity of the machine may be, it is invariably reversed by the lowering of the conductor-rod 120 into contact with the brush-rod 54.

It is believed that the operation of my invention will be so apparent to those skilled in the art, from what has already been said, that further explanation will be unnecessary. In connection, however, with the benefits to be derived from the use of the fan for hygienic purposes, the purification of the atmosphere does not depend on the chemical action of the ozone alone, for even when the atmosphere seems quite pure, close observation shows myriads of fine dust-like particles which, if inhaled are liable to prove deleterious to health. By the action of the fan these particles are agitated and currents established which brings them

within the influence of the machine whereby they are electrified and attracted to each other and to the machine and are deposited in the form of dust which may be removed leaving the atmosphere comparatively pure.

When it is desired to remove the static apparatus from its case the pulleys 21 and 75, which are secured to the shaft 13 by any well-known and suitable means (not shown), are removed; then the nut on the lower end of the rod 89 is removed which frees said rod and permits it and rod 82 and their insulating covers to be withdrawn vertically. In like manner the other rod 82 is withdrawn. The generator is then free and can be slid forward out of its case and thereupon the rods 82 are reassembled with their respective jars as shown in Fig. 2. The crank-wheel 22 is removed from its shaft on the case and is mounted on shaft 13 to provide means for manually operating the uncased generator.

Having thus fully described my said invention, what I desire to secure by Letters Patent, is—

1. The combination with a static electric machine, having a case for inclosing the generator plates and other working parts of the machine, of a pair of vertical and parallel electrodes, a revoluble apparatus between said electrodes carrying display devices, and means for collecting the generated electric current and for transmitting it through said electrodes to the said display devices.

2. The combination with a static electric machine, having a case for inclosing the generator plates and other working parts of the machine, of a pair of vertical electrodes above the case, means for changing their distance from each other, and a revolving apparatus also above the case between the vertical electrodes operating in conjunction with said electrodes.

3. The combination with a static electric machine, having a case for inclosing the generator plates and other working parts of the machine, of a standard extending above the machine, a revolving axle supported by the standard, a revolving plate carrying display devices attached to and actuated by the axle, and means for collecting the electric current and for transmitting it to the revolving apparatus.

4. A machine for generating static electricity, a standard extending above the machine, an axle supported upon suitable bearings by said standard, means for revolving said axle, Geisler tubes, means for mounting said tubes on said axle for electrical display and conductors adjacent the path of the rotating tubes to transmit electricity thereto as the tubes pass the conductors.

5. In a machine for generating and utilizing static electricity, a metal bar, a brush

holder, a stationary electric-plate having an inductor with means for conducting the induced electricity to the periphery of the plate and from thence to a section of the brush holder, said section being rigidly and electrically connected with said metal bar which bar has electrical connection around the periphery of the plate with said inductor, approximately right angled members on said metal bar, said brush-holder held by said right angled members, and a brush in each holder in position to act inductively upon the inductor which faces the brush from opposite sides of said plate.

6. In a static electric machine, electric generator-plates having peripheral supporting bands of hard rubber, receiving combs, friction brushes, and additional and wider hard rubber guard-plates attached to the outside of said hard rubber band opposite said combs and brushes to additionally prevent loss of electric force by leakage.

7. In a static electric machine, the combination of electric generators comprising stationary and rotative plates, a conductor leading outside of the case, a receiving comb in operative proximity to the generators, means for electrically connecting the comb with said conductor, said receiving comb being supported by a transverse bar, said transverse bar, and a strip of hard rubber embracing the edge of the stationary plate of said generator to which strip said transverse bar is securely attached.

8. In a static electric machine, stationary generating plates, a hard rubber rim on said plates, a receiving comb comprising a metal bar securely fastened between the plates and rubber rim to said rim, comb-holding rods screwed into the ends of said bar, a Leyden jar, and electric conductors connecting the comb with the jar.

9. In combination with an electric machine, and Leyden jars, a movable conductor electrically connected with the outer coating of a Leyden jar which conductor by contact with the polarized parts of one side of the machine causes an entire reversal of the polarity of the machine.

10. In a static electric machine, the combination with the machine and electric accumulators, of a conducting medium electrically connected with the outer coating of one of said accumulators and adjustable into operative proximity with the polarized parts of one side of the machine thereby causing a sudden discharge and revulsion of the electric current and a reversal of the polarity of the machine.

11. In a static electric machine, accumulators and a pole changing device electrically connected with the outer coating of one of said accumulators and adjustably adapted to electrical connection with or separation from the polarized parts of the machine for

the purpose of reversing the polarity of the machine.

12. In a static electric machine, accumulators and a swinging conductor in electric connection with the outer coating of one of said accumulators for changing and reversing the polarity of the oppositely electrified parts of the static generator.

13. In a static electric machine, stationary generating plates having suitable conductors, a conductor having electrical connection around the edges of said plates, a pair of brushes supported on opposite sides of the plates by said conductor, brush-rods supporting said brushes, accumulators, a movable conductor adapted to connect one of said polarized brush-rods with the inductive coating of said accumulators differing in polarity or potential from its brush connection and thereby change and reverse the course and the polarity of current in the electrified parts of the machine.

14. In a static electric machine, a case, electric generators and electric accumulators in said case, means including a switch for making or breaking their induced elec-

tric current, said switch being located on the outside of the case and including a swinging switch-bar having a binding-post at its free end, a removable electrical conductor in said binding-post and a rotary conductor making and breaking contact at each revolution with said removable conductor.

15. In a static electric machine, a case, electric generators and electric accumulators in said case, and means including a double switch for making or breaking their induced electric current, said double switch being located on the outside of the case and comprising a pair of swinging bars each having a binding-post to support removable electrical appliances, and a fixed intermediate plate with which said switch bars make and break the circuit.

In witness whereof, I, have hereunto set my hand and seal at Indianapolis, Indiana, this 25th day of January, A. D. one thousand nine hundred and eight.

THEODORUS H. PATEE. [L. S.]

Witnesses:

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FRANK L. CREWS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."