No. 667,144. Patented Jan. 29, 1901.

C. H. COOK.

STATIC ELECTRIC MACHINE.

(Application filed Jan. 2, 1900.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

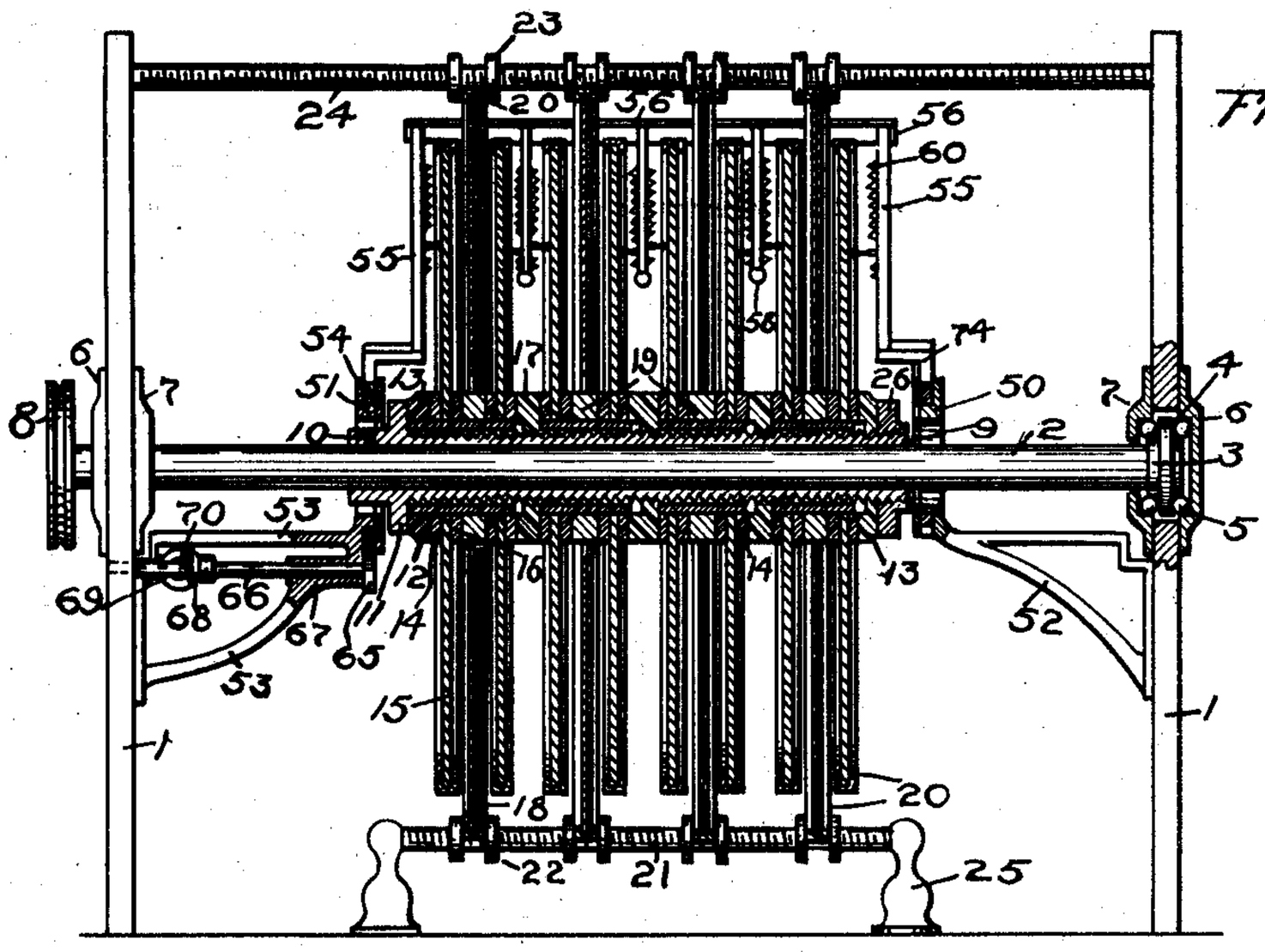

FIG. 2.

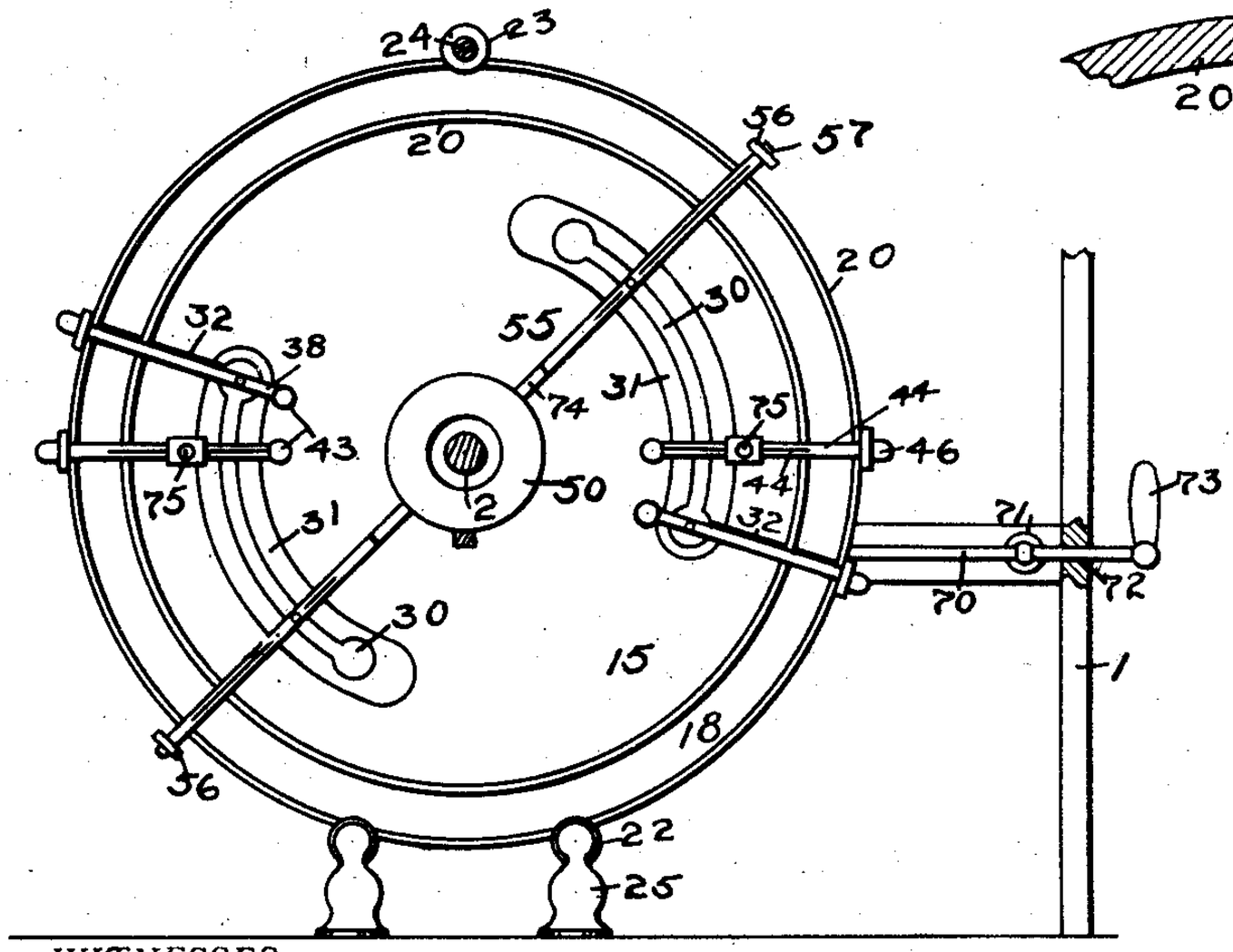

FIG. 3.

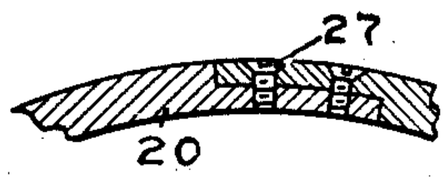

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FIG. 4

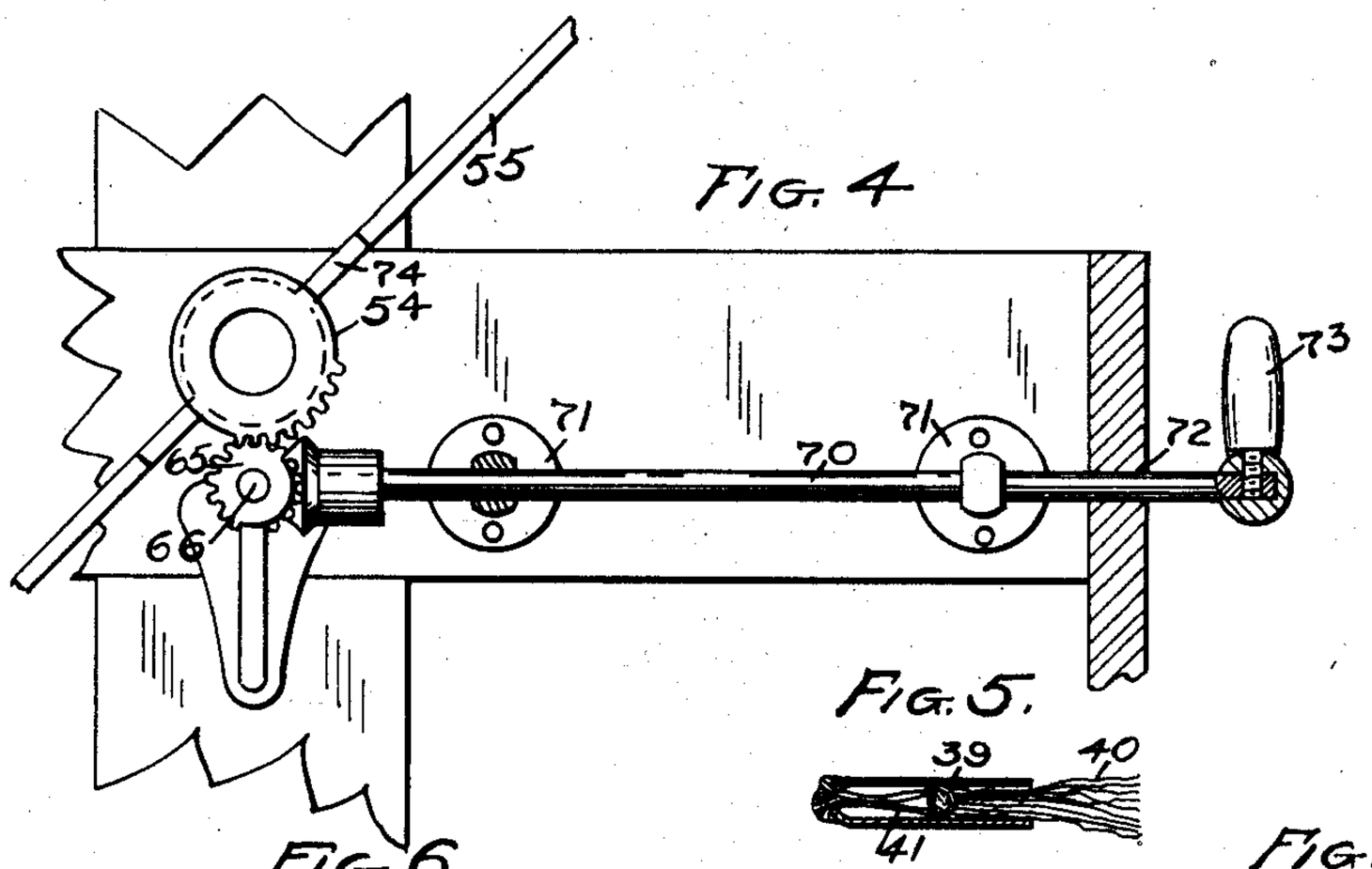


FIG. 5.

FIG. 6.

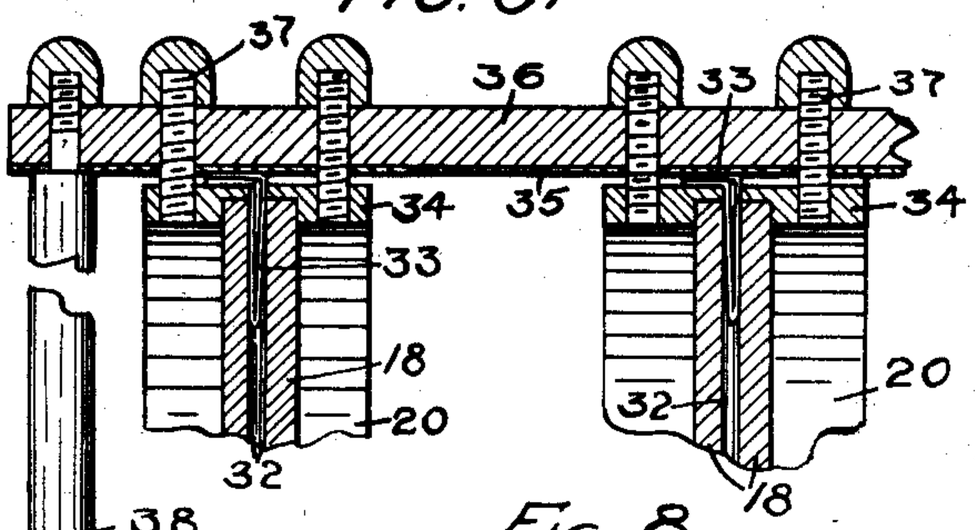


FIG. 7

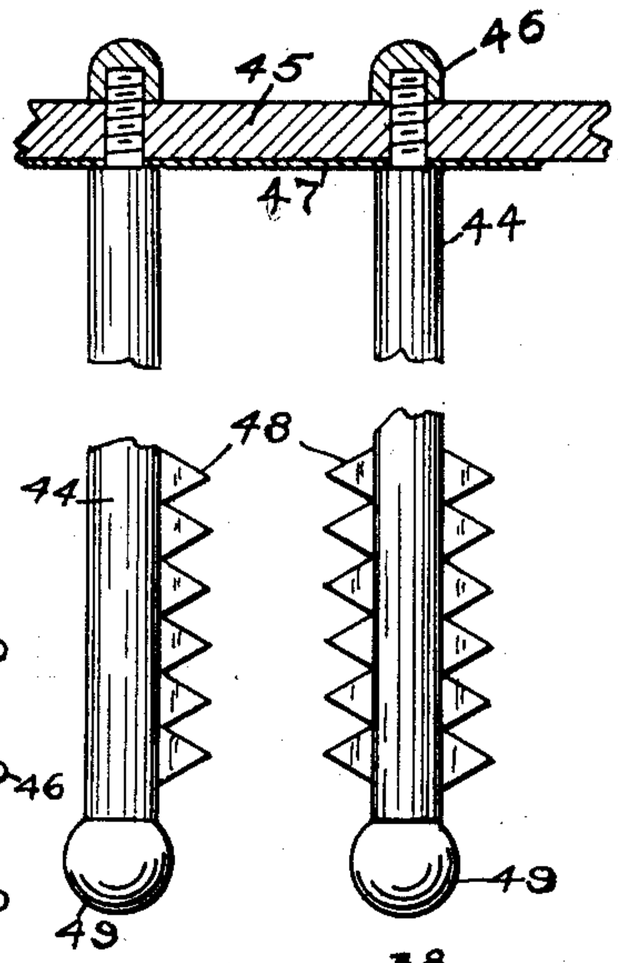


FIG. 8.

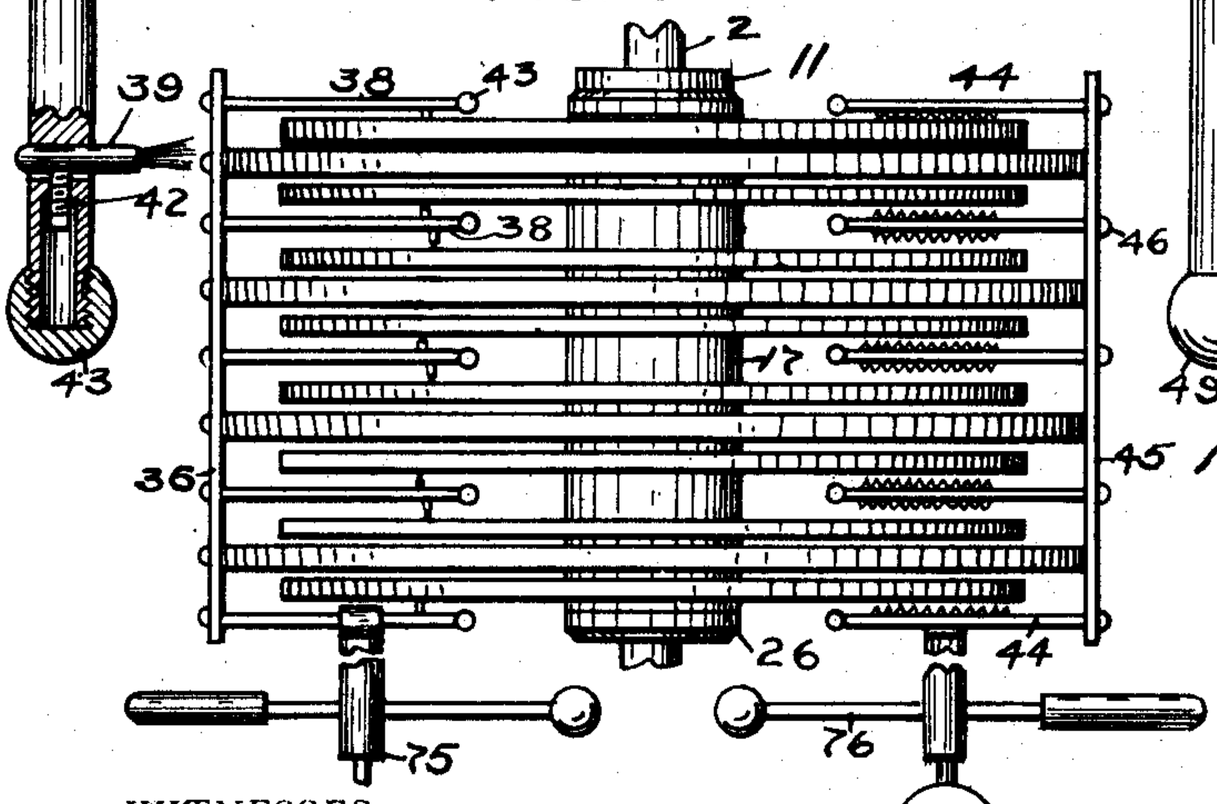
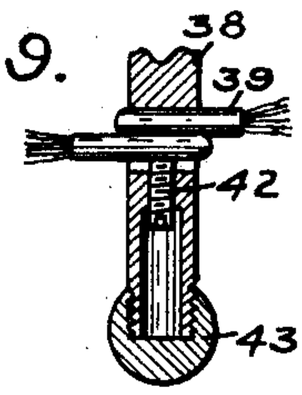


FIG. 9.



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UNITED STATES PATENT OFFICE.

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STATIC ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 667,144, dated January 29, 1901.

Application filed January 2, 1900. Serial No. 122. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. COOK, of Indianapolis, county of Marion, and State of Indiana, have invented a certain new and useful Static Electric Machine; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like letters refer to like parts.

This invention relates to certain new and useful improvements in means for generating static electricity, it being especially designed for the use of physicians and surgeons.

One object of this invention is to provide a machine that requires no exciter, and yet will start at once the generation of a powerful supply of electricity. In machines without exciters the starting of the machine has been exceedingly slow and unsatisfactory. With this invention a powerful supply of electricity is provided immediately after the machine is started.

Another object of the invention is to modify the distance between the equalizer and collectors, and thus quickly and powerfully modify the power of the current. Both of these objects are attained by providing an equalizer whose position can be instantly modified and adjusted by means extending outside the case.

These, with the other features of said invention, will be understood from the accompanying drawings and the description following of one form of device embodying said invention, and the scope of the invention will be understood from the claims following said description.

In the drawings, Figure 1 is a central vertical section of the machine through the shaft that carries the disks. Fig. 2 is a side elevation of one of the revolving disks and also the edge of one of the stationary disks behind it, with a part of the frame in section and the shaft and crank for actuating the equalizer in side elevation. Fig. 3 shows in detail the means for uniting the ends of the hard-rubber rims on the disks. Fig. 4 is a side elevation of the means for adjusting the position of the equalizer, the framework being broken away. Fig. 5 is a longitudinal section of the brush. Fig. 6 is a horizontal section of two pairs of stationary disks and the connection between them and one brush, the brush-rod in plan. Fig. 7 is a plan of two electrical collectors and the means for connecting and supporting them, parts being broken away. Fig. 8 is a plan of the disks, the central shaft, and accompanying parts. Fig. 9 is a detail of a brush-rod with two brushes in it, parts being in section.

Referring now to the details of construction of the form of device herein shown for the purpose of illustrating this invention a suitable rectangular frame is provided of wood or any other suitable material in which the parts are mounted. The whole of this frame is not shown, as it constitutes no part of this invention, and may be made in any desirable way. In the center of this frame there are the two uprights 1, as shown in Fig. 1, in which the bearings for the disk-shaft 2 are mounted. Said upright is cut out, as shown in the right-hand end of Fig. 1, to receive the shaft and its bearing-cone 3, that is secured thereon, and provided with a central rib or rim 4, with a ball-race on each side for the balls 5. Two bearing-plates 6 and 7 are secured to the frame-piece 1 for inclosing the end of the shaft 2 and its bearing-cone 3. Said bearing-plates 6 and 7 are provided with ball-races for the balls 5, and the plate 7 is centrally apertured to receive the shaft 2. This construction of bearing is rendered valuable, because in this machine exactness of position of the shaft 2 and its absolute positivity of movement and position in order that the parts may operate properly is a necessity. Any change of temperature or other change will operate alike on both bearing-plates 6 and 7, and a firm bearing therefore is maintained, as well as its freedom from unnecessary friction. The shaft 2 is driven from a hand-wheel (not shown) or any other suitable source of power through a cord, belt, or other means running over the pulley 8. On said shaft 2 there is mounted a long sleeve 9, which is externally threaded throughout, excepting at one end, where it is secured on the shaft by the screw 10. At that end also the sleeve is provided with a collar 11. On said sleeve the disks are mounted in groups, as follows: On the shaft 2 for each group of disks there is a brass sleeve 12, loosely placed

about which there is a hard-rubber ring 13, resting against the end collar 11, and next to it a soft-rubber washer 14, then a revolving glass disk 15, then another soft-rubber washer 16, like the washer 14, then a wooden ring 19, then another soft-rubber washer like 16, then another revolving glass disk like 15, then another soft-rubber washer like 14, and then the fiber nut 17, that is internally threaded and tightens up the parts just named and holds the group into place against the end collar 11. A pair of stationary glass disks 18 surround the wooden ring 19, but do not touch the same, said disks being provided with a rim 20, that is supported on the two rods 21 on the lower side between the rubber nuts 22 and held between the rubber nuts 23 on the upper side that screw on the threaded rod 24, which extends from one side of the casing to the other, being mounted in the uprights 1. The rods 21 are supported by the posts 25, and the rods 21 and 24 are threaded, so that the washers 22 and 23 may be moved in any direction to secure any desired adjustability in the position of the stationary disks. There are four of these groups of disks, each group consisting of two revolving disks 15 and between them two stationary disks 18, and all similarly mounted on the sleeve 9, and the whole series held tightly in place by the nut 26 at the end. Both classes of disks 15 and 18 have hard-rubber rims, whose width is considerably greater than the thickness of the disks. The ends of each rim are fastened together, as shown in Fig. 3, by splicing and hard-rubber screws 27, connecting the two splices. The means heretofore employed for making this connection has been to drill holes through the ends of the rim and tie the rim together by thread. The means herein set forth renders the connection secure and insulated.

Each stationary disk is provided with oppositely-located strips of tin-foil 30, that are curved concentric with the disk, as shown in Fig. 2, where they are to be seen through the revolving glass disk 15. These are placed on said stationary disks on the adjacent sides, so as to be between said disks. In the first place the tin-foil strip 30 is placed on the disk and over that a paper strip 31. The strips are correspondingly placed on the two adjacent faces of the stationary disks. This feature of construction, however, is old. From the end of the strips 30 of the tin-foil there is another tin-foil strip 32, extending to the periphery of the disks. This appears in Fig. 6. The outer end of the tin-foil strip 32 extends flush to the edge of the glass disk, and the two strips of tin-foil for the two adjacent sides of each pair of stationary disks have between them a copper strip 33. (Shown in Fig. 6.) Said copper strip has its end turned laterally and clamped between the rim 34 of the disk and the horizontal thin copper strip 35, that forms a kind of lining for the cross-bar 36, which latter is made of hard rubber. The strips 33 and 35 may be of any metal or conducting material, as they are to connect all of the stationary disks. The cross-strip of rubber 36 is held in place by being secured to the rims 34 of the stationary disks by the bolts 37, made of hard rubber. This cross-strip 36 also supports the brush-rods 38, as seen in Fig. 6, that extend in between the revolving disks 15 and also on the outside of the disks in the series. The rods 38 that are on the outside are formed as shown in Fig. 6 and carry one brush 39. The brush-rods between the disks carry two oppositely-extending brushes, as shown in Fig. 9, so that the outer face of each revolving disk is engaged by a brush at the diametrically opposite sides thereof, as seen in Figs. 2 and 8.

The construction of the brush 39 is shown in Fig. 5. It consists of a small tube with both ends open, but one end nearly closed. The fine brass wire 40 is bent in the middle over a larger wire 41, which likewise is bent and the two cut ends thereof inserted into the large end of the tube first and then through the small end, and by it the small brass wires 40 are drawn into the tube as far as desired. Then the ends of the wire 41 are soldered in place in the small end of the tube. This construction of brush renders it very durable and perfectly flexible. The brush is secured in a transverse hole in the rod 38 by clamping against it a screw 42, and a hard-rubber knob 43 is screwed over the end of the rod 38. Where two brushes are secured to one brush-rod, they are inserted in the same hole, but extend in opposite directions, and the tubes thereof overlap, and the rods are screwed down tightly against them. This arrangement permits the ready removal, and especially the easy adjustment, of the brushes. There are two of said rods diametrically oppositely located for each set of disks, as appears in Fig. 2. There are also two electrical collectors between each set of disks, consisting of the rod 44, secured to the cross-bar 45 by the nuts 46, as shown in Fig. 7. Said bar 45 is secured to the rims of the large stationary disks in the same manner as the bars 36. A copper strip 47 lines the inner face of said bar 45, which is made of hard rubber, in order to connect the collectors, and it is of the same character as the copper strip 35, that connects the brush-rods. The rods 44 of the collectors are longitudinally split, and in the split the combs 48 are inserted on the side adjacent to the disks. The comb is held in place by the hard-rubber knob 49, that screws over the end of the rod 44.

Turning now to the details of construction of the equalizer there is shown on each side of the series of disks bearings 50 and 51. The bearing 50 surrounds the shaft 2 and is supported by and is preferably integral with the bracket 52, that is secured to the inside of the frame, and the bearing 51 is supported by the bracket 53 on the other side of the frame. Each of these bearings 50 and 51 has an inner bearing-face or annular recess in which the

bearing-rings 54 fit and oscillate. Integral with each of the bearing-rings 54 there is a pair of oppositely-extending arms 74 into which the equalizing-rods 55 are screwed, so that on each side of the series of disks the equalizing-rods extend diametrically across, as appears in Fig. 2, and their ends are connected by the brass cross-bars 56, secured in place by the screws 57. The rods 55 are also made of brass. From said cross-bars 56 a short equalizing-rod 58 extends between each set of disks, as appears in Fig. 1, there being two series of these diametrically opposite each other. Each of the equalizing-rods 55 and 58 is slotted for a portion of its length to receive the brass combs 60. There is one brass comb on each of said rods 55 adjacent to the disks and two oppositely-located brass combs on each of the inner rods 58. Each of said outer equalizing-rods has also a brush 39, and each of said inner rods 58 has two oppositely-extending brushes 39. The construction of these equalizing-rods and the arrangement of the combs and brushes therein are the same as that shown in Figs. 6 and 7 for the brush-rods and collectors. Therefore these equalizing-rods being all connected on the diametrically opposite sides of the series of disks to the cross-bars 56 form a united frame, and since said outside rods 55 are mounted on the bearing-rings 54 the equalizer can be oscillated away from the collectors 44 nearly ninety degrees. Said equalizer is oscillated by the following means: The bearing-ring 54 is provided with external teeth on a portion of its periphery, as seen in Fig. 4, that mesh with a pinion 65 on the short shaft 66, that is mounted in the long bearing 67 integral with the bracket 53. A bevel-gear 68 is secured on the shaft 66, that meshes with the corresponding bevel-gear 69 on the shaft 70, that extends horizontally from the gear 69 to a point outside the case. It is supported by the bearings 71 and 72. The shaft 70 is operated by a crank 73 outside the casing.

Projecting from the collectors 45 there are on each side rods 75, that extend through the casing of the machine to the outside and through which the electrodes 76 reciprocate, said electrodes having balls on their adjacent ends and suitable handles on their outer ends for moving the same.

When the machine is started by the means heretofore described, the equalizer is brought down close to the two series of collectors 44. This shortens the distance between the equalizer and said collectors, so that the passage of electricity from one to the other takes place immediately and without difficulty when the machine is started, and without any external exciter with these close together a large supply of electricity is at first not required to effect the interchange of the electric current between them that is necessary in the initial charge. The generation of electricity thus begins immediately, and with powerful rapidity it increases, and as it increases the equalizer can be moved away from the collectors 44 as far as desired, the position shown in Fig. 2 being a common position during the use of the machine after it is started. As the equalizer is moved away from the collectors the length of the spark and output of the machine are increased proportionately. When the machine is being started, the electrodes should be separated, for if together the current would pass through them instead of jumping from the collectors to the equalizer in order to initially excite the machine.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a static electric machine, an equalizer, and means extending outside of the machine for changing its position.

2. In a static electric machine, an equalizer rotatably mounted around the center shaft of the machine, and means extending from the outside of the machine for oscillating said equalizer.

3. In a static electric machine, an equalizer, a bearing-ring about the central shaft of the machine to which the equalizer is secured, a crank-driven rod extending into the machine, a suitable gear connection between said rod and the bearing-ring of the equalizer whereby the equalizer is oscillated.

4. In a static electric machine, a bracket secured to the framework of the machine near the central shaft thereof with a stationary bearing, a geared bearing-ring mounted on such stationary bearing, an equalizer secured to said bearing-ring, a shaft mounted in a bearing in said bracket, a pinion on the shaft to engage the bearing-ring of the equalizer, and means extending outside of the machine for actuating said shaft.

5. In a static electric machine having suitable framework and a series of disks and a central shaft on which the disks are mounted, a bracket secured to the frame on each side of the disks supporting bearings surrounding the central shaft, an equalizer including a frame extending diametically about the series of disks, a bearing-ring on each side of the series of disks to which said equalizer-frame is secured and which turns on the stationary bearing on each side, one of said bearing-rings being provided with gear-teeth, and means extending from the outside for oscillating the bearing-ring having the gear-teeth, whereby the whole equalizer may be operated from one means.

6. In a static electric machine provided with suitable disks, center shaft and frame, the brackets 52 and 53 secured on the side of the disks, the cylindrical bearings 50 and 51 carried by said brackets and surrounding the central shaft with annular bearing-recesses therein, bearing-rings fitting in said recesses with one of said bearing-rings provided with external teeth, an equalizer including a frame diametrically surrounding the series of disks

and secured to said bearing-rings, the bearing 67 in one of the brackets, the shaft 66 mounted therein, the pinion 65 thereon meshing with said bearing-ring, the bevel-gear 68 on the shaft 66, the shaft 70 extending outside of the casing, the bevel-gear 69 on said shaft meshing with the bevel-gear 68, and a crank for actuating said shaft 70.

7. In a static electric machine, an equalizer including a rod extending diametrically across the disks, a laterally-extending cross-bar from each end of said rod near the periphery of said disks, short rods extending from said bars between the disks, and a metal brush secured to each of said rods so as to engage the surface of the disks.

8. In a static electric machine having a series of disks, an equalizer including side rods extending diametrically across the series of disks in said machine, cross-bars connecting the ends of said rods, short rods extending from said cross-bars between each series of disks, and a metal brush secured to each of said rods and short rods adjacent to the disks.

9. In a static electric machine, an equalizer comprising the two side rods 55, the conducting cross-bars 56 connecting the ends of said side rods, the short rods 58 extending from said cross-bars 56 between each series of disks on the opposite sides of the machine, slits made in said rods 56 and 58, suitable combs secured in said slits adjacent to the disks in the machine, and brushes secured in said rods that contact with said disks.

10. In a static electric machine, a collector consisting of a rod with a transverse hole through it near one end and a threaded hole extending longitudinally from the end to said transverse hole, a brush in said transverse hole, and a screw extending through the longitudinal hole in said rod for clamping the brush in place.

11. In a static electric machine, a collector consisting of a rod with a transverse hole through it near one end and a threaded hole extending longitudinally from the end to said transverse hole, a pair of brushes extending in opposite directions in said transverse hole, and a screw extending through the longitudinal hole in said rod for clamping the brushes in place.

12. In a static electric machine, a brush consisting of a tube open at one end and partly closed at the other end, a bundle of fine metal wire bent at the middle, and a wire bent about the middle of said bundle with its two ends drawn through the partly-closed end of the tube and secured.

13. In a static electric machine, a main shaft, a sleeve secured thereon externally threaded throughout its length, a series of groups of disks mounted on said sleeve, an auxiliary metal sleeve for each group of disks surrounding said main sleeve, suitable rings and washers around said auxiliary sleeve between the disks, and nuts between each group of disks and the auxiliary sleeves whereby they are held in place and can be readily adjusted.

14. In a static electric machine, a main shaft, a sleeve secured thereon with a collar at one end and externally threaded throughout, a series of auxiliary sleeves surrounding said main sleeve there being one auxiliary sleeve for each group of disks, suitable nuts between said auxiliary sleeves for holding them in proper place, a pair of revolving disks mounted on each auxiliary sleeve, and a pair of stationary disks between said revolving disks.

15. In a static electric machine, a frame, a main central shaft, a series of disks mounted thereon, double ball-bearings in each side of the frame for each end of said main shaft, an equalizer diametrically surrounding the series of disks, and means for mounting said equalizer on the frame.

16. In a static electric machine, a frame, a main central shaft, a series of disks mounted thereon, double ball-bearings in each side of the frame for each end of said main shaft, an equalizer diametrically surrounding the series of disks with rods extending between the disks, and means for mounting said equalizer on the frame.

17. In a static electric machine, a suitable glass disk, a hard-rubber rim around the same with its ends cut to overlap each other, and a hard-rubber screw extending through said overlapping ends for securing them together.

In witness whereof I have hereunto affixed my signature in the presence of the witnesses herein named.

CHARLES H. COOK.

Witnesses:
JAMES E. LONG,
M. C. BUCK.