No. 776,997. PATENTED DEC. 6, 1904.

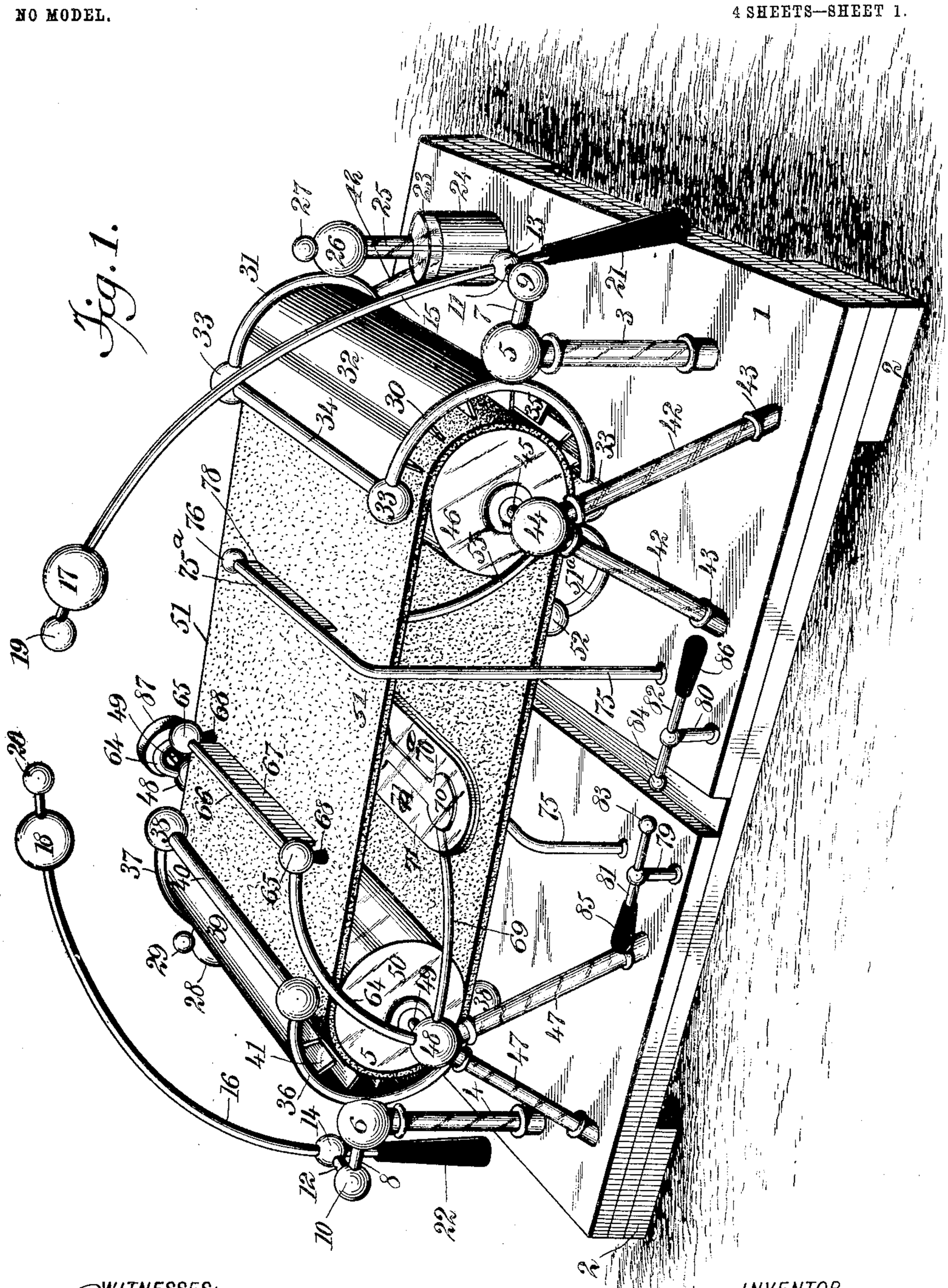
J. G. H. BURBOA.

STATIC ELECTRIC MACHINE.

APPLICATION FILED AUG. 13, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



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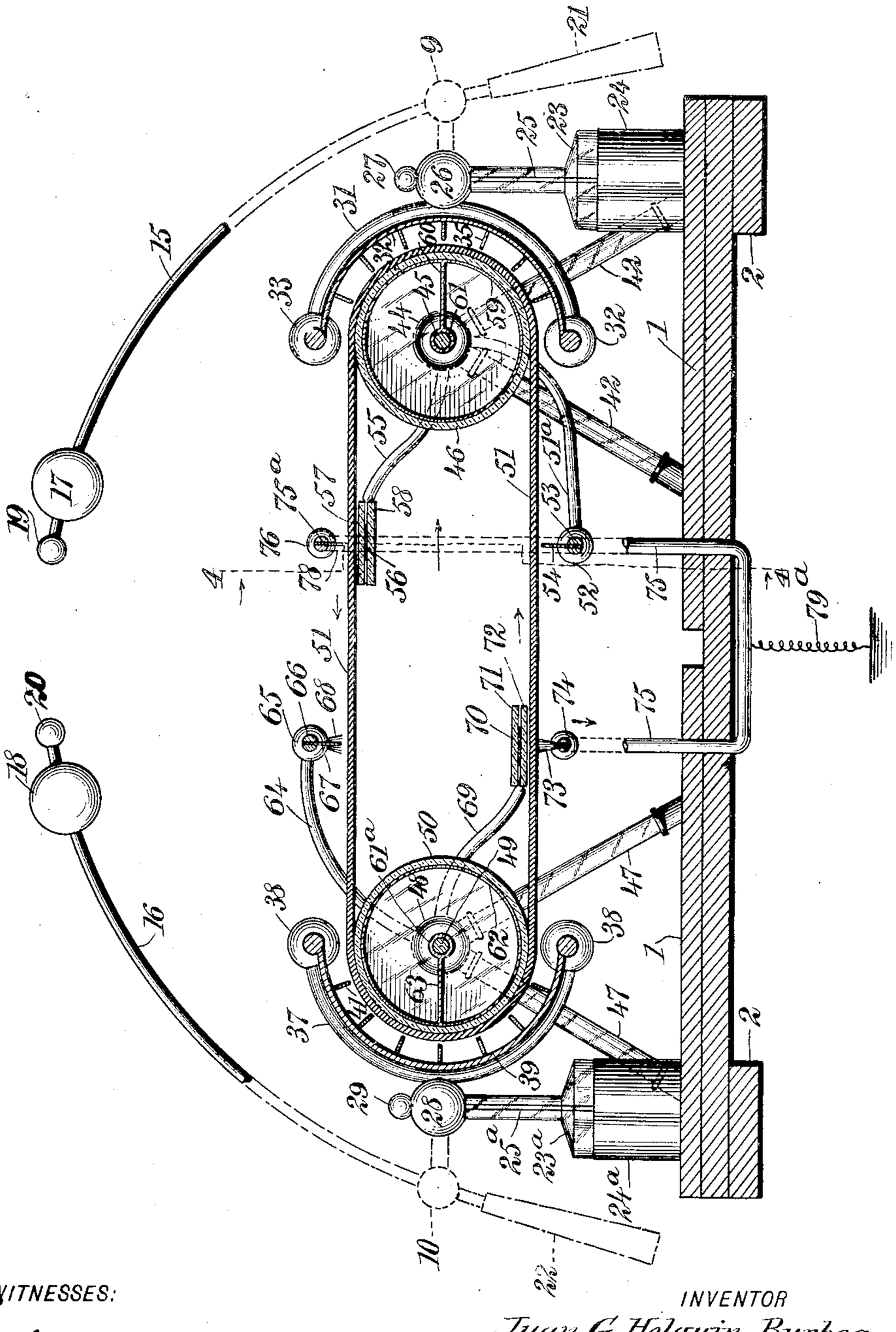
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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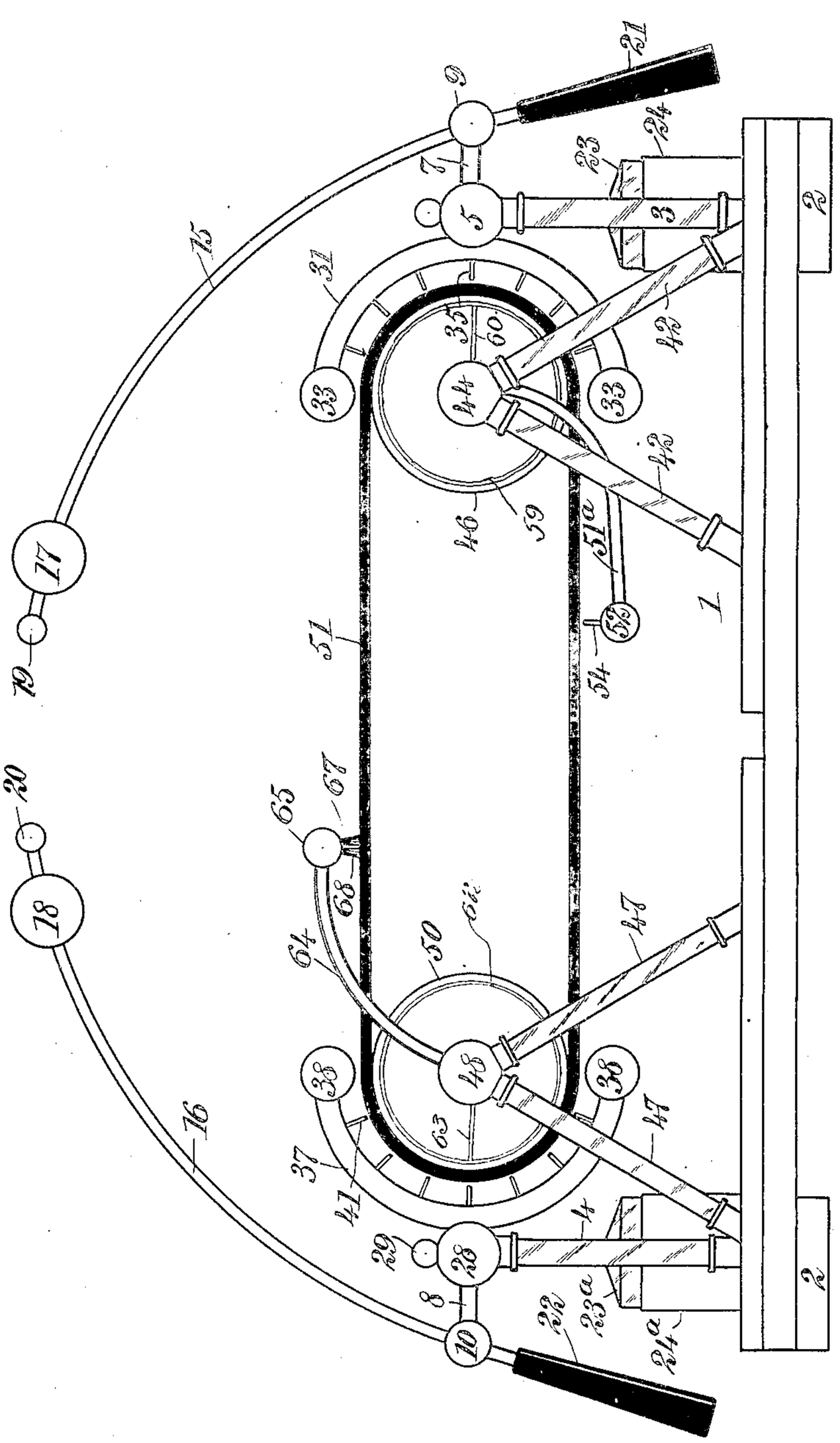
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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NO MODEL. 4 SHEETS—SHEET 4.

FIG. 4.

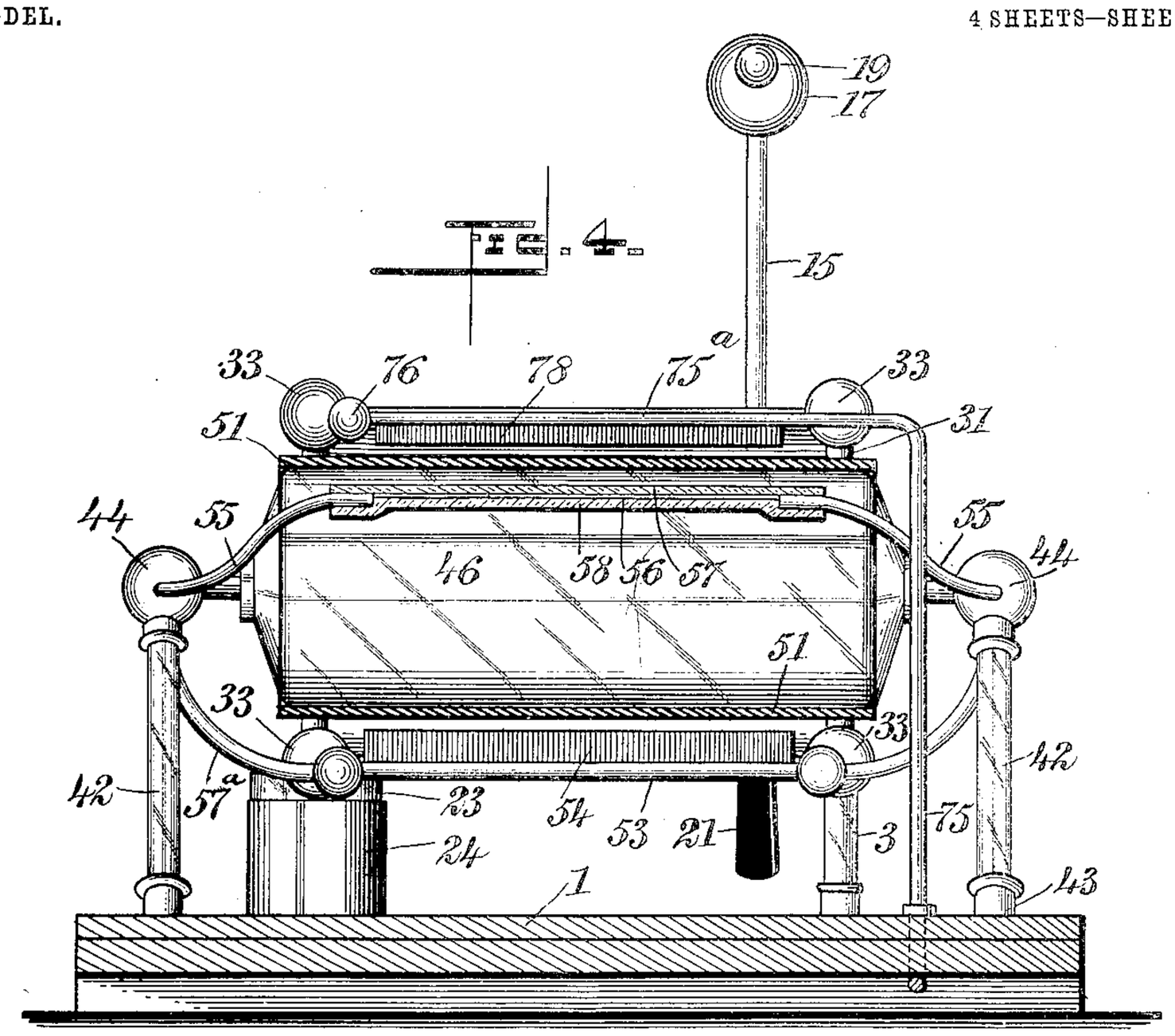
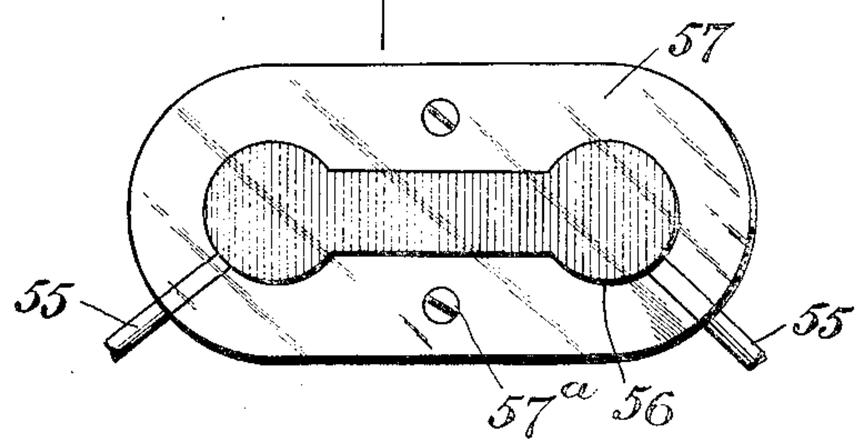


FIG. 5.



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No. 776,997. Patented December 6, 1904.

UNITED STATES PATENT OFFICE.

JUAN G. HOLGUIN BURBOA, OF CHIHUAHUA, MEXICO, ASSIGNOR OF ONE-THIRD TO CHRISTOBAL M. ORTIZ, OF CHIHUAHUA, MEXICO.

STATIC ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 776,997, dated December 6, 1904.

Application filed August 13, 1903. Serial No. 169,326. (No model.)

To all whom it may concern:

Be it known that I, JUAN G. HOLGUIN BURBOA, a citizen of the Republic of Mexico, and a resident of Chihuahua, Mexico, have invented a new and Improved Static Electric Machine, of which the following is a full, clear, and exact description.

My invention relates to means for generating static electricity, and more particularly to the production of a simple, compact, efficient, and reliable form of machine of the so-called "induction" type.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a perspective view showing my machine complete. Fig. 2 is a central vertical section through the same, and Fig. 3 is a section somewhat similar to Fig. 2 and showing the machine as sometimes used with certain parts removed. Fig. 4 is a vertical section upon the line 4 4 of Fig. 2 looking in the direction of the arrow. Fig. 5 is a fragmentary plan in the inductor-plate 56 and the insulating-plates 57 58 disposed one upon each side of the same.

A platform 1 is provided, with supporting-feet 2 and with suitably-mounted stems 3 4, of insulating material, preferably glass, upon the tops of which are spherical collectors 5 6, pins 7 8, and knobs 9 10, and to these knobs are secured pins 11 12, supporting spherical bearings 13 14, carrying dischargers 15 16. These dischargers are preferably provided with spherical knobs 17 18 19 20 and with handles 21 22. The spherical bearings 13 14 are capable of turning upon the pins 11 12, so that the dischargers may be adjusted into any desired relative position. Leyden jars 23 23^a are each provided with coatings 24 24^a in the usual manner and with rods 25 25^a, which connect the inner coating with knobs 26 27 or 28 29, as indicated in Fig. 1. The sphere 5, mounted upon the insulating-rod 3, is provided with a semicircular conductor 30, rigidly connected thereto. The knob 26 of the Leyden jar is somewhat similarly provided with a semicircular conductor 31, and these two conductors are connected with a semicylindrical sheet 32 of metal. The ends of the conductors 30 31 are provided with knobs 33, and these knobs are in turn connected by rods 34, which engage the edges of the metallic sheet 32.

Mounted within the metallic sheet 32 are radially-disposed plates 35, of conducting material. The metallic sheet 32, with its accompanying parts just described, constitutes a prime conductor for electricity of one sign. At the other end of the machine the arrangement is similar, semicircular conductors 36 37 being provided with knobs 38 and with a metallic sheet 39, the edges of which engage rods 40. Radially-disposed plates 41, of conducting material, are arranged on the sheet 39, as shown in Fig. 2.

Mounted upon the platform 1, by means of supporting-legs 42, of glass or other insulating material, are spherical bearings 44, which in turn support a revoluble shaft 45. Mounted rigidly upon this shaft and revoluble therewith is a cylinder 46, of insulating material, preferably glass. Similarly upon lugs 47 are mounted spherical bearings 48 for the purpose of supporting a revoluble shaft 49, having a cylinder 50, of insulating material, rigidly connected thereto and revoluble therewith. A flexible belt 51, of india-rubber or other insulating material, is mounted upon the cylinders 46 50 and is free to move in the manner that belts usually move over pulleys and in the direction indicated by the arrow. Rigidly connected with the spherical bearings 44 are conducting-rods 51^a, terminating in spherical knobs 52, these knobs being connected by a rod 53 and the rod being provided with a comb-like metallic collector 54. Conducting-rods 55 lead upward from the bearings 44 and are connected with the metallic plate 56, preferably of tin-foil, this plate being clamped between two plates 57 58, of insulating material, preferably glass, and secured together by screws 57^a.

The interior of the cylinder 46, of insulating material, is provided with a coating 59, of metal, preferably tin-foil. This coating is connected by a strip 60 of metal with a cylindrical coating 61, also of metal, preferably

tin-foil, which is mounted upon the shaft 45, which is also of metal. By this means the shaft 45 and all of its metallic connections are in electrical connection with the coating 59 within the glass cylinder 46. Similarly the glass cylinder 50 is provided internally with a coating 62, of metal, preferably tin-foil, and this coating is connected by a metallic strip 63 with the cylinder 61ª upon the shaft 49. Leading upward from the spherical bearings 49 are conductors 64, terminating in knobs 65, these knobs being connected by a rod 66. Depending from this rod is a comb-like conductor 67, of metal, disposed adjacent to the ends of which are metallic brushes 68. The comb-like conductor and metallic brushes are disposed immediately above the upper surface of the belt 51. By means of conductors 69, which lead downwardly from the spherical bearings 48, a plate 70, of tin-foil or other metal, is supported between glass plates 71 72. The lower glass plate 72 is disposed immediately above but out of contact with the inner surface of the lower run of the belt 51.

Disposed below the lower run of the belt and making contact therewith are metallic brushes 73, mounted upon a rod 75, this rod terminating in a spherical knob 74. This rod 75 bends downwardly, passes below the platform, and up through the same, as indicated in Fig. 2. The highest portion 75ª of the rod 75 is bent into horizontal position, as indicated in Fig. 1, and terminates in the spherical knob 76. From the portion 75ª the comb-like collector 78, of metal, depends into close proximity with the outer surface of the upper fold of the belt 51.

In the lower portion of Fig. 1 are shown two posts 79 80, mounted upon the platform 1. Upon these two posts are slidable rods 81 82, each provided with spherical terminals 83 84 and with handles 85 86, whereby the spherical terminals 83 84 may be adjusted relatively to each other. By this means the spark-gap can readily be adjusted to any length. The posts 79 80 have normally no metallic connection with any other metallic part of the machine, but may be connected up temporarily with the prime conductors 31 32 or the Leyden jar 23 by means of any well-known expedient, such as a chain, cord, wire, or jointed discharger. Power is applied to the shaft 49 by means of a pulley 87.

My invention is used as follows: The pulley 87 being rotated causes the belt 51 to travel in the direction indicated by the arrow. The metallic brushes 73, pressing gently against the under side of the lower run of the belt, cause the disengagement of static electricity, the positive fluid passing down the rod 75, which is connected with the wire 79ª and also with the comb 78. A negative charge is thus given to the lower run of the belt. As the belt travels in the direction indicated by the arrow a portion of this negative charge is gathered by the collector 54 and flows through the conductors 51ª to the inner coating 59 of the cylinder 46, thus electrifying this coating negatively.

As the capacity of the inner coating 59 and its metallic connections is quite small, these parts soon receive their maximum charge, and as the belt 51 continues to move the plates 35 collect large quantities of negative electricity, which of course charges the Leyden jar 23, the discharger 15, and all other metallic parts which may be in electrical communication with the metallic sheet 32 and other parts constituting the prime conductor at one end of the machine. The belt 51, by delivering its negative electricity to the prime conductor at the right of the machine, is rendered neutral at the point where it leaves the upper side of the cylinder 46, traveling toward the left from the view-point shown in Fig. 2. Inasmuch, however, as the coating 59 is in metallic communication with the plate 56, so that this plate 56 is negatively electrified, this plate being insulated from the upper run of the belt acts inductively thereupon and also acts inductively through the belt upon the comb 78. Now, as above observed, since the comb 78 is in metallic communication by means of the rod 75 with the brushes 73, and these brushes 73 are continually receiving positive electricity from the friction of the belt, it follows that the inductive action of the plate 56 upon the comb 78 is such as to cause a continuous supply of positive electricity to leave the comb 78 and electrify the upper portion of the belt 51 as the belt travels toward the left—that is to say, the plate 56 acts as an inductor and brings into reach of the belt 51 such electricity as is disengaged by the brushes 73 and conducted by the rod 75 to the comb 78, whence it is drawn down upon the upper surface of the belt. The portion of the belt 51 between the comb 78 and the comb 67 is thus electrified, and as the upper fold of the belt continues to move to the left the electricity upon the belt is gathered by the comb 67 and brushes 68 and is carried by the rods 64 to the shaft 48 and inner coating 62 of the cylinder 50. It will be seen, therefore, that the inner coating 62 of the cylinder 50 is charged with electricity of a different sign to that of the coating 59 of the cylinder 46. The electricity of the inner coating 62 charges the plate 70 with electricity of a sign different from that passing through the brushes 73, so that the plate 70 acts as an inductor and facilitates the disengagement of the electricity passing into the brushes 73.

The action of the machine is therefore continuous and the machine is double-acting. The rod 75 performs a function somewhat analogous to that of the well-known neutralizing-rod, but with this difference that in my machine the rod 75 instead of neutralizing electricity, as is usually done, causes the electric-

ity to be utilized. In other words, instead of merely destroying electricity for the purpose of getting rid of a portion of it, and thereby creating a difference of potential, my machine utilizes the portion of electricity thus removed in order to obtain the required difference in potential.

As above explained, the form shown in Fig. 2 is identical with that shown in the other figures; but in Fig. 3 the inductive plates 56 70, together with their immediate connections and the rod 75, are all removed. The action of the machine when used as indicated in Fig. 3 is quite simple. The brushes 68 are lowered into such position that they press upon the upper fold of the belt 51. The belt being in motion positive electricity passes through the conductor 64 to the coating 62 and metallic parts connected therewith. The charging of this coating with positive electricity renders negative a portion of the belt immediately adjacent to the cylinder 50, and the inductive action of the coating 62 upon the portion of the belt in contact with the cylinder 50 causes the belt to collect negative electricity from the plates 41, thereby positively charging the prime conductor of which the metallic sheet 39 and knobs 38 are constituent parts. This action is continuous, so that a stream of sparks may be drawn from the prime conductor at the left of Fig. 3. The action of the portion of the machine at the right of Fig. 3 is similar to that just described, with the exception that the bottom run of the belt in traveling toward the right continually feeds negative electricity through the comb 54 and rods 51^a to the coating 59, thus causing a flow of positive electricity from the prime conductor consisting of the metallic sheet 32, rods 31, knobs 33, &c. The result is that the prime conductor at the left of Fig. 3 is being continually charged with electricity of one sign, whereas the prime conductor at the right thereof is continually being charged with electricity of a different sign. Of course the wire 79^a can be removed, so that no ground will be made, this being an old expedient and not necessary to be described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a static electric machine, the combination of a plurality of cylinders, a flexible belt of insulating material mounted thereon, friction mechanism for engaging said belt, electric connections for said friction mechanism, and collectors for removing electricity from said belt.

2. In a static electric machine, the combination of a pair of cylinders of insulating material, an endless belt mounted upon said cylinders and connecting the same, friction mechanism engaging said belt and provided with metallic connections for removing electricity of a certain sign therefrom, and collector mechanism for removing electricity of another sign from said belt.

3. In a static electric machine, the combination of revoluble members, an endless belt connecting the same, and a prime conductor having a collecting portion disposed in the form of a semicylinder and placed adjacent to one of said revoluble members.

4. In a static electric machine, the combination of a frame, a pair of revoluble cylinders mounted thereon, a metallic coating disposed within each cylinder, a flexible belt upon said cylinders and movable therewith, semicylindrical plates of metal bent partially around said cylinders and provided with conducting-plates, friction mechanism engaging a part of said belt, collectors disposed immediately adjacent to said belt at different portions thereof, metallic connections between the several collectors and said coatings of said cylinders, and means for actuating said cylinders.

5. In a static electric machine, the combination of two revoluble cylinders of insulating material, a flexible belt upon said cylinders and movable therewith, a metallic coating within each cylinder, serving as primary inductor, a comb-like conductor in electrical connection with each coating, to serve as a collector, a metallic member in electrical connection with each coating for the purpose of serving as a secondary inductor, a neutralizing-rod, provided with two comb-like conductors, adjacent to said secondary inductors and acting as an equalizer.

6. In a static electric machine, the combination of two revoluble cylinders, a metallic coating within each cylinder, an inductive plate, in electrical connection with each coating to serve as a secondary inductor, and two plates of insulating material clamping each metallic plate.

7. In a static electric machine, the combination of four spherical and metallic bearings, means for holding and insulating the same, two revoluble shafts supported by said bearings, a cylinder mounted rigidly upon each shaft, a metallic coating within each cylinder, means for electrical connection between the coating and the shaft, an inductive plate in electrical connection with each coating, and two insulating-plates clamping each inductive plate, one of the insulating-plates being completely plane and the other having two channeled ends, to clamp supporting-rods, substantially as described.

8. In a static electric machine, the combination of two revoluble cylinders, provided with metallic coatings for the purpose of serving as prime inductors, a metallic plate to serve as a secondary inductor in electrical connection with each coating and removable with its immediate connection, and a removable equalizing-rod adjacent to said inductive plates and provided with terminal comb-like inductors.

9. In a static electric machine, the combina-

tion of a plurality of revoluble cylinders, a metallic coating within each of said cylinders, and a plurality of inductive plates, each in electrical communication with one of said coatings and adapted to serve as a secondary inductor.

10. In a static electric machine, the combination of a plurality of revoluble cylinders of insulating material, a flexible belt mounted upon said cylinders and movable therewith, separate metallic coatings disposed within the several cylinders and serving as primary inductors, a separate member in electrical communication with each of said coatings, to serve as a collector, a metallic member in electrical connection with each coating and serving as a secondary inductor, and a neutralizing-rod, provided with portions disposed adjacent to said secondary inductors and adapted to act as an equalizer.

11. In a static electric machine, the combination of a plurality of cylinders of insulating material, an endless belt mounted upon said cylinders and free to move relatively thereto, friction mechanism engaging said belt and provided with metallic connections for removing electricity of a predetermined sign therefrom, and mechanism for removing electricity of another sign from said belt.

12. In a static electric machine, the combination of a plurality of cylinders of insulating material, a belt of insulating material mounted upon said cylinders and free to move thereupon, metallic conducting members disposed within said cylinders respectively and adapted to be influenced by the electrical condition of said belt, collectors disposed adjacent to said belt, and an electrical connection between said collectors and said metallic members, within said cylinders.

13. In a static electric machine, the combination of a plurality of revoluble members of insulating material, a flexible longitudinal member engaging said revoluble members and free to move thereupon, a metallic member disposed within one of said revoluble members, electrical connections from said last-mentioned metallic members to a point adjacent to said longitudinal flexible member, and collecting mechanism disposed adjacent to the path of said longitudinal flexible member.

14. In a static electric machine, the combination of a movable belt, a collector for charging a portion thereof with electricity of one sign, a member for acting inductively upon another portion thereof, and means for connecting together said last-mentioned member and said collector, so as to continually neutralize the same.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JUAN G. HOLGUIN BURBOA.

Witnesses:

GONZULO A. REYES,

C. M. LEONARD.