

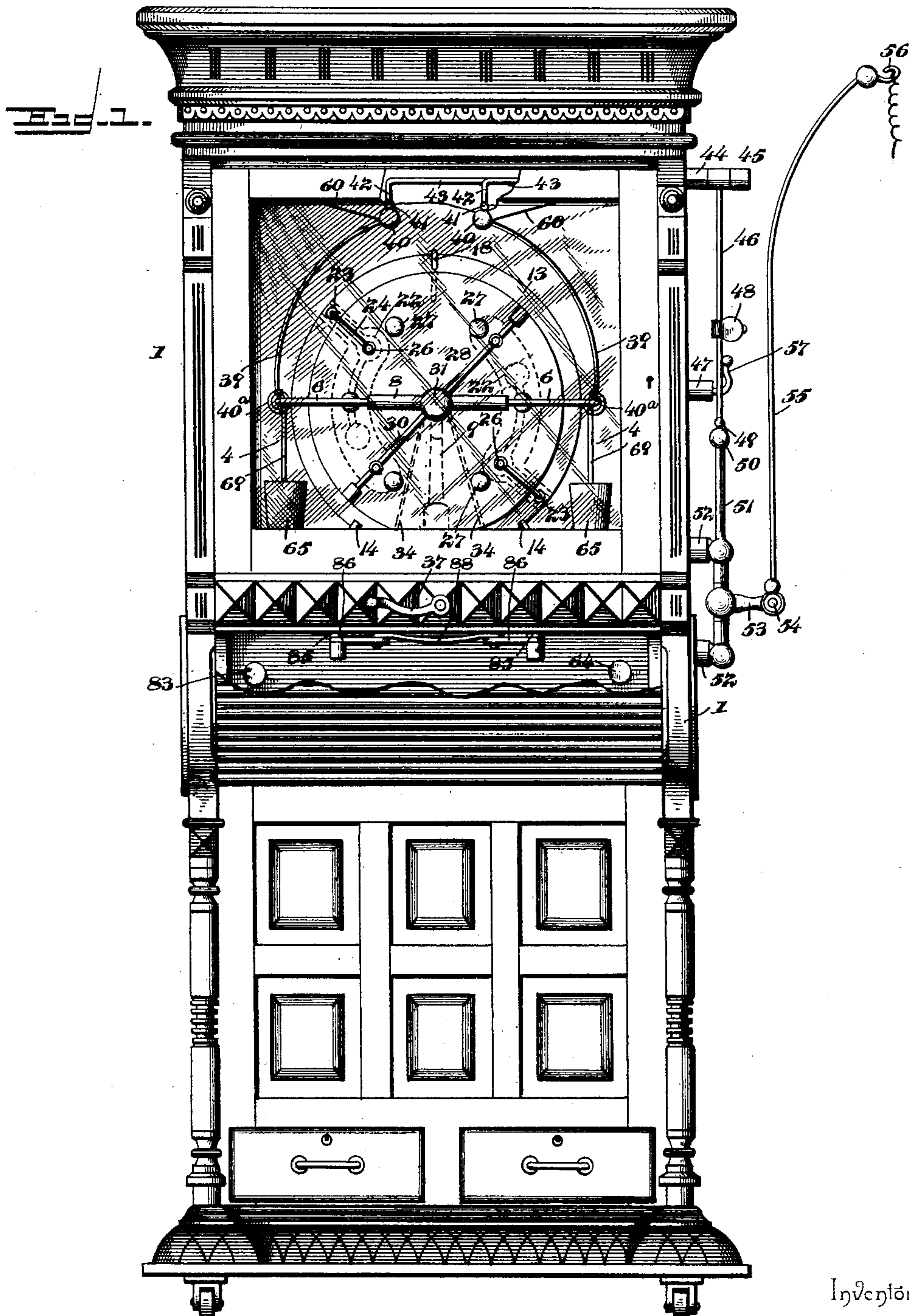
(No Model.)

3 Sheets—Sheet 1.

C. M. HOLLOPETER.  
STATIC ELECTRICAL MACHINE.

No. 560,852.

Patented May 26, 1896.



Inventor

Witnesses

*E. H. Stewart*  
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By *his* Attorneys,

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*C. A. Snow & Co.*

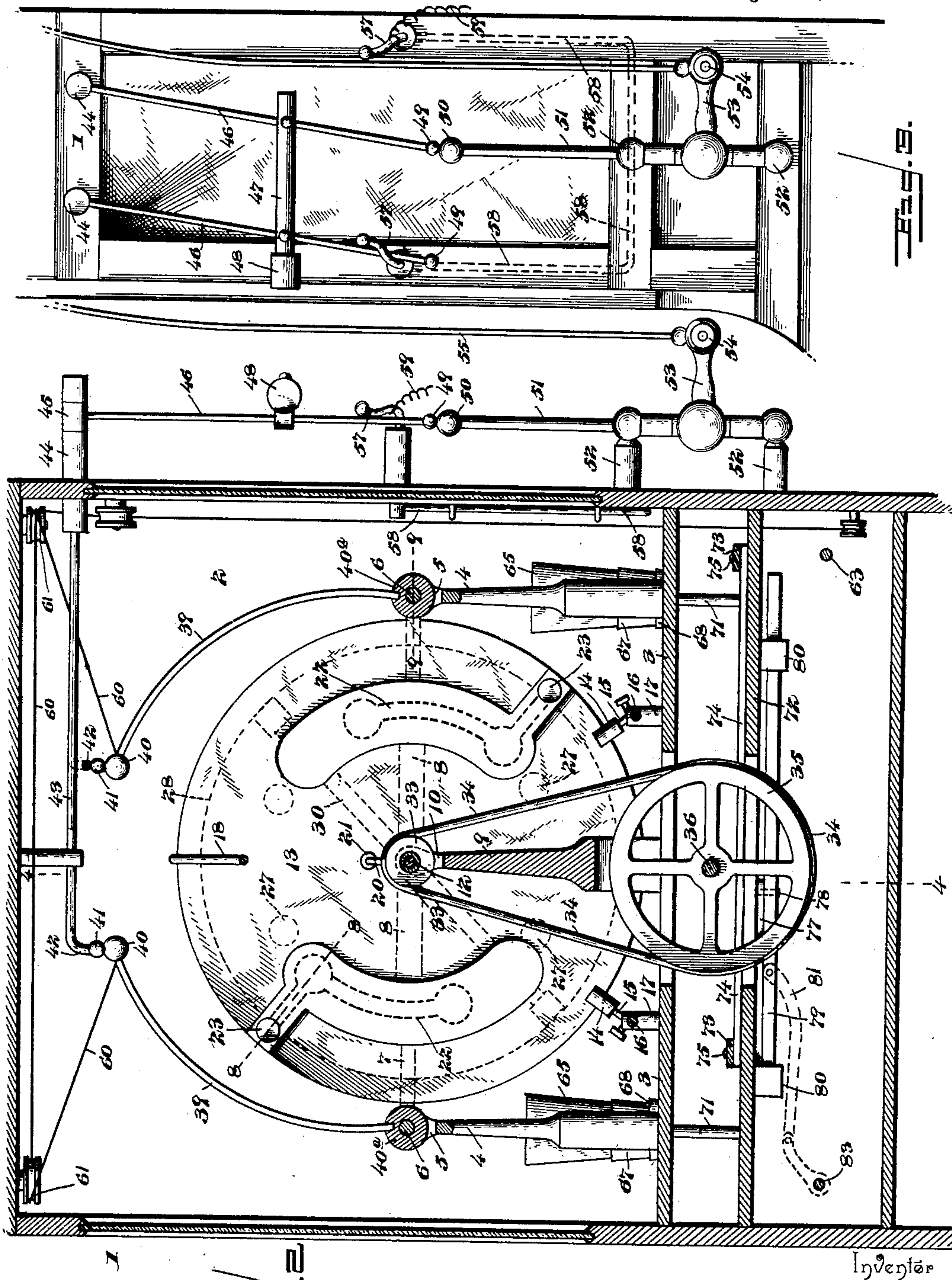
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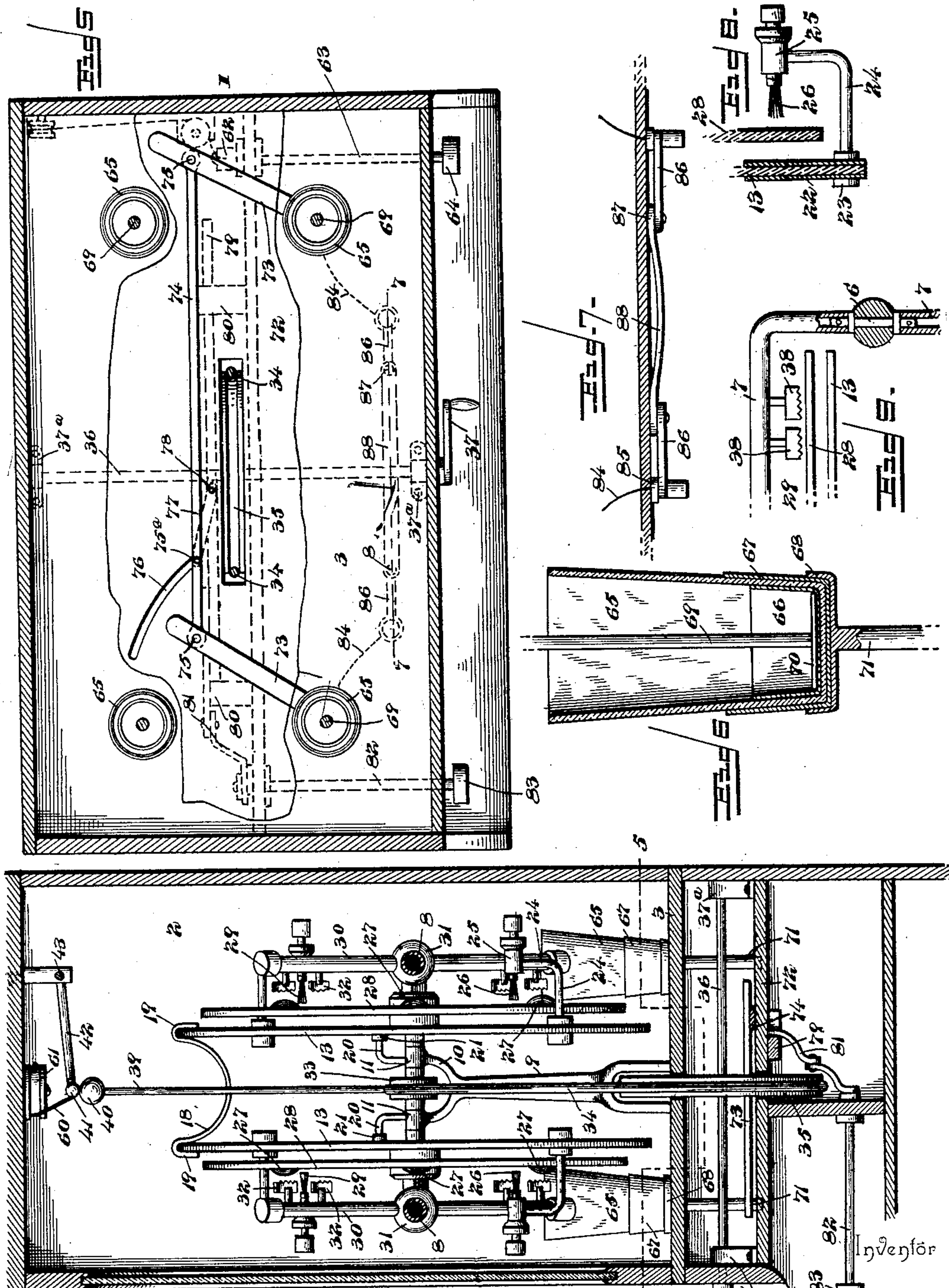
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3 Sheets—Sheet 3.

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# UNITED STATES PATENT OFFICE.

CHARLES M. HOLLOPETER, OF FOSTORIA, OHIO.

## STATIC ELECTRICAL MACHINE.

SPECIFICATION forming part of Letters Patent No. 550,852, dated May 26, 1896.

Application filed July 19, 1895. Serial No. 556,528. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES M. HOLLOPETER, a citizen of the United States, residing at Fostoria, in the county of Seneca and State of Ohio, have invented a new and useful Static Electrical Machine, of which the following is a specification.

This invention relates to static electrical machines, and has for its object to construct a machine of this character on the Holtz principle that shall provide positive and efficient means for developing static electricity in quantities sufficient for therapeutical work.

To this end the main and primary object of the present invention is to provide a static electrical machine constructed with special reference to simplicity and efficiency, whereby the same shall be especially adapted for the use of the physician in treating cases requiring the static current.

A further object of the invention is to provide means whereby the entire machine is under the complete control of the operator, so that the current discharged from the machine can be accurately regulated to vary the intensity of the sensation or shock imparted to the patient under treatment, and in the attainment of this object the invention also contemplates the employment of a number of Leyden jars in connection with the machine, which jars may be used in a series of two or more at the option of the operator, and are intended to augment to the desired degree the quantity of current that is to be transmitted to the patient.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a front elevation of a static electrical machine constructed in accordance with this invention. Fig. 2 is a central vertical longitudinal sectional view thereof. Fig. 3 is an end view of the cabinet in which the machine is mounted, showing the pole-changer for changing the direction of the current as it is transmitted for use. Fig. 4 is a vertical transverse sectional view on the line 4 4 of Fig. 2. Fig. 5 is a horizontal sectional view on the line 5 5 of Fig. 4.

Fig. 6 is an enlarged detail sectional view of one of the Leyden jars and its connections. Fig. 7 is a detail sectional view of the Leyden-jar switch on the line 7 7 of Fig. 5. Fig. 8 is a detail sectional view on the line 8 8 of Fig. 2. Fig. 9 is a detail sectional view on the line 9 9 of Fig. 2.

Referring to the accompanying drawings, the numeral 1 designates an upright cabinet of an ornamental character, and which is adapted to form an ornamental casing for the machine, so as to be an attractive piece of office furniture, while at the same time serving to properly protect the working parts of the machine, in order that damp weather and the like will not ordinarily interfere with the successful operation of the machine to produce static currents. The cabinet 1 is provided in the upper part thereof with a compartment 2, inclosed at the bottom by the base-board 3, which forms the base or support for the main parts of the machine.

Suitably secured on the base-board 3 at opposite points are upright supporting-posts 4, provided with upper bifurcated ends 5, in which are fitted the connecting-rods 6, to the opposite ends of which connecting-rods are fitted one end of horizontal L-shaped-frame conductor-rods 7. The horizontal L-shaped-frame conductor-rods 7, that are suitably connected at one end to the extremities of the rods 6, are fitted at their other ends in insulator-collars 8, that are arranged horizontally at opposite sides of the machine and complete, together with the rods 7, a horizontal rectangular frame. By reason of the opposite disposition of the insulator-collars 8 between the supporting-posts 4 it will be obvious that one pair of the frame-rods 7 will have a metallic connection with the connecting-rod 6 at the upper end of one post 4, and the other pair of frame-rods will have a connection with the connecting-rod 6 at the upper end of the directly-opposite supporting-post 4; so that during the operation of the machine one pair of frame-rods 7 will form positive conductors, while the other pair of frame-rods will form negative conductors.

At a point intermediate of the opposite upright supporting-posts 4 is arranged the upright bearing-standard 9, suitably secured on top of the base-board 3 and provided with an



upper bifurcated end 10, having the alined bearing-collars 11, in which is mounted the plate-arbor 12. Loosely mounted on the arbor 12 at both sides of the standard 9 are the stationary glass plates 13. The glass plates 13 are substantially similar to the stationary glass plates employed in the ordinary Holtz machine, and in the present invention the said plates 13 are securely fitted at their lower edges in the bifurcated supporting-blocks 14, arranged between the posts 4 and the standard 9. The said supporting-blocks 14 are carried by the short attaching-arms 15, suitably fastened to the horizontal supporting-rods 16, that are mounted in the short posts 17, suitably fitted to the base-board 3. The supporting-blocks 14, when properly adjusted to engage the lower edges of the stationary plates 13, provide for securely supporting said plates properly in position, and in order to insure the plates 13 against breakage or displacement an intermediate bridge-wire 18 is employed. The bridge-wire 18, interposed between the two plates 13, is substantially U-shaped and provided at its extremities with the hooks 19, engaging the upper edges of the plates 13. In connection with the supporting-blocks 14 and the upper bridge-wire 18 are employed the centrally-arranged L-shaped brace-arms 20, projected integrally from the upper sides of the bearing-collars 11 and provided at their upper ends with the feet 21, made of suitable insulating material and resting against the inner faces of the stationary plates to provide for steadying and bracing the central portions of the plates.

The stationary glass plates 13 are provided at diametrically-opposite points with the ordinary tin-foil armatures 22, with which armatures are metallically connected, as at 23, the inner ends of L-shaped brush-arms 24. The L-shaped brush-arms 24 extend outward from the point of connection with the plates 13 and the tin-foil armatures of such plates, and provided at their outer extremities with the usual collars 25, in which are adjustably mounted the metallic brushes 26, that are adapted to contact with the metallic buttons 27, fitted on the outer faces of the revolving glass plates 28.

The revolving glass plates are suitably mounted on the opposite extremities of the plate-arbor 12, adjacent to the stationary plates 13, and are of a smaller diameter than the stationary plates and bear the same relation to such plates as in the ordinary Holtz machine. The metallic buttons 27 are fitted on the outer faces of the revolving plates 28 in a circular series and at regularly-spaced intervals, while at the same time being so arranged as to travel directly in front of the tin-foil armatures 22 of the stationary plates in the usual manner. The said metallic buttons 27 of the revolving plates are not only carried around in contact with the metallic brushes 26, that are directly in circuit with the tin-foil armatures 22, but also contact with the exciting-brushes 29, adjustably fitted

in the diagonally-arranged metallic rods 30, near the ends of such rods.

The diagonally-arranged rods 30 are fitted in the metallic collars 31, connected with the insulator-collars 8, and insulated by such collars from the frame conductor-rods 7, and at both sides of the adjustable exciting-brushes 29, carried by the rods 30, the latter are further provided with the inwardly-projecting collecting-combs 32, that serve to transmit the induced charge of static electricity from one portion of the revolving plates to a directly-opposite portion, thereby equalizing the charge of said plates. In the accomplishment of this result the rods 30 and the attachments thereof perform a function which is common to static machines made on the Holtz principle.

The plate-arbor 12 has mounted thereon at an intermediate point between the collars 11 a pulley 33, over which passes the upper portion of a drive-belt 34, the lower portion of which belt passes over a large drive-wheel 35, mounted on a transversely-arranged drive-shaft 36. The drive-shaft 36 is mounted in suitable bearings 37<sup>a</sup>, below the base-board 3, within the cabinet, and at the front side of the cabinet the shaft 36 is adapted to have attached thereto the crank-handle 37. By reason of the disposition of the crank-handle 37 at the front side of the cabinet the operator can easily and conveniently operate the machine without the aid of an assistant and without interfering with the application of the electric current to the patient.

By manipulating the crank-handle 37 motion will be communicated, through the connections described, to the revolving plates 28, thereby causing the metallic buttons of said plates to be rubbed in contact with the several brushes arranged at the front sides of the plates and causing the tin-foil armatures of the stationary plates to become charged with positive and negative static electricity in the usual manner, and the consequent charging of the revolving plate with similar electricity by induction. The positive and negative charges of electricity are collected from the outer faces of the revolving plates by means of the metallic collecting-combs 38, projected inwardly toward the revolving plates from the inner sides of the L-shaped-frame conductor-rods.

The currents of static electricity which traverse the opposite pairs of frame-rods 7 are properly distributed to the point of use through the medium of the prime conductors 39. The prime conductors 39 are bowed or curved inwardly toward each other, and are provided at their upper adjustable ends with the contact-balls 40, and at their lower ends the curved prime conductors are fitted to the pivot-collars 40<sup>a</sup>, that are loosely mounted on the connecting-rods 6 within the upper bifurcated ends 5 of the supporting-posts 4. It will be seen that each prime conductor is metallically connected with one pair of frame-rods, so that the currents will be properly



distributed by the prime conductors, while at the same time the pivotal manner of mounting the prime conductors allows the unpivoted ends thereof to be adjusted to and away from the contact-balls 41 at the inner angled ends 42 of the auxiliary conducting-rods 43. The auxiliary conducting-rods 43 are mounted horizontally within the top of the cabinet and are of different lengths, so that one of said rods shall be adapted for contact with one of the prime conductors and the other conducting-rod for contact with the other prime conductor. Both of the conducting-rods 43 are extended at their outer ends through one side of the cabinet, as at 44, and have pivotally connected to their outer extremities, as at 45, the upper ends of the depending swinging pole-changer rods 46.

The swinging pole-changer rods 46 have pivotally connected thereto at an intermediate point a connecting-bar 47, made of suitable insulating material and provided at one end with a finger-knob 48, which provides means for shifting the position of the pole-changer, consisting of the connected rods 46. The lower ends of the rods 46 are provided with the contact-balls 49, adapted to contact with a similar ball 50 at the upper end of an upright conductor 51, arranged outside of the cabinet at one side thereof and suitably supported in position by a pair of offstanding brackets 52. The upright conductor 51 has pivotally mounted thereon between the brackets 52 the inner end of a horizontally-swinging arm 53, to the outer end of which is adjustably connected, as at 54, the lower end of the adjustable connecting-rod 55, provided at its free end with a hook 56, that affords a convenient connection for the wire that is designed to be connected with an electrode or any other suitable device that may be employed for the administration of the static current or spark to the patient being treated.

When the pole-changer is shifted with either one of the rods 46 in contact with the upper end of the upright conductor 51, the rod 46 not in contact with said upright conductor will be engaged with one of the contact-hooks 57, fitted to one end of the cabinet near the front and rear sides thereof. By reason of the hook shape of the contacts 57 the latter will serve as catches for the rod 46 in engagement therewith, so as to hold the pole-changer in its shifted position, and it will of course be understood that when the pole-changer is moved in either direction one of the rods 46 will be forced into a spring engagement with one of the hooks 57. The contact-hooks 57 have suitably connected with the inner extremities thereof the terminals of an intermediate connecting-wire 58, suitably insulated and arranged within the compartment 2 of the cabinet, and during the operation of the machine it will of course be understood that a suitable ground-wire connection 59 is made with one of the hooks 57, in order to

complete the circuit through the patient being operated upon.

The connections just described provide very desirable means for conducting the electricity directly from the generator to the outside of the cabinet and then distributing the same to the patient or other point of use, and while the machine is in operation and a patient is being operated upon by the physician it will be noted that by simply manipulating the pole-changer with one hand the direction of the current as it passes through the patient may be readily reversed at will in order to produce the desired effects. The adjustment of the prime conductors to and away from the auxiliary conducting-rods 43 provides for positively regulating the interruption to the spark as it passes from the prime conductors to the auxiliary conducting-rods, and thereby consequently regulating the intensity of the shock or sensation imparted to the patient.

The accurate adjustment of the prime conductors is secured by means of the adjusting-cords 60, which are connected at one end to the unpivoted ends of the prime conductors, are passed around suitably-arranged guide-pulleys 61, mounted within the cabinet, and are connected to a winding-drum 62, mounted on the inner end of the adjusting-shaft 63, arranged transversely within the cabinet and below the compartment 2, and provided at its outer end with a finger-knob 64, which is grasped by the operator to provide for turning the shaft 63, and thereby nicely adjusting the distance between the prime conductors and the auxiliary conductor-rods within the top of the cabinet.

In connection with the devices already described I employ a series of Leyden jars 65. The Leyden jars 65 are of the ordinary construction, being provided with the usual inner and outer coatings 66 and 67, respectively; but in the present invention the Leyden jars are set in the metallic cups 68, arranged on the base-board 3 in a convenient position below the four frame-rods 7. Each frame-rod 7 has connected thereto the upper end of a jar-conductor 69, the lower end of which contacts with the inner coating 66 of the Leyden jar immediately below the frame-rod. The lower ends of the jar-conductors 69 have fitted thereon celluloid or similar disks 70, that serve to maintain the conductors 69 properly positioned within the jars and in contact with the inner coatings of said jars.

The metallic cups 68 are in direct contact with the outer coatings 67 of the Leyden jars, and extended from the lower sides of said metallic cups are the short conductor-rods 71, that extend below the base-board 3 and fit at their lower ends in the horizontal partition-board 72, fitted in the cabinet below the base-board for the machine. The short conducting-rods 71 of the front pair of Leyden jars have pivotally connected thereto one end of



the circuit-plates 73, which are connected together for simultaneous movement by an intermediate connecting-bar 74, pivotally connected at its extremities to the said circuit-plates, as at 75. The connecting-bar 74 for the swinging circuit-plates 73 has connected thereto at an intermediate point the upper end of a shifting pin 75<sup>a</sup>, that works in a curved slot 76 in the partition-board 72, and is connected at its lower end to one end of the adjusting-link 77, the other end of which link is connected at 78 to an intermediate point of the slide-bar 79. The slide-bar 79 is arranged to slide under the partition-board 72 in the guides 80, and has pivotally connected to one end thereof the crank-arm 81, fitted on the inner end of an adjusting-shaft 82. The adjusting-shaft 82 is mounted transversely within the cabinet below the partition-board 72 and is provided at its outer end with a finger-knob 83, which is grasped by the operator to control the movement of the circuit-plates 73.

The short conducting-rods 71 of the front pair of Leyden jars also have connected therewith one end of the circuit-wires 84, the other ends of which are connected with contact-buttons 85, fitted to the under side of the partition-board 72 near the front of the cabinet. The contact-buttons 85 are adapted to be engaged by the free ends of the switch-levers 86, which are pivoted at one end, as at 87, to the opposite ends of the metallic bridge-plate 88, fitted to the under side of the board 72 intermediate of the contact-buttons 85, and thereby completing a double-switch connection between the spaced contact-buttons. This double switch provides means for closing the circuit between the front pair of Leyden jars, and also, when open, prevents the spark jumping across the space between the said contact-buttons. With the switch closed the front pair of Leyden jars may be thrown into circuit, so as to discharge their charge of electricity through the prime conductors of the generator and thereby augmenting the charge that is administered to the patient. If it should be desired to discharge both pairs of Leyden jars at the same time, it is simply necessary to close the switch and to manipulate the adjusting-shaft 82, which, through the medium of the connections described, will provide means for swinging the circuit-plates 73 to a position that will bring the unpivoted ends thereof into contact with the short conducting-rods 71 for the rear pair of Leyden jars.

From the above it is thought that the construction, operation, and many advantages of the herein-described machine will be readily apparent without further description, and it will be understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what

is claimed, and desired to be secured by Letters Patent, is—

1. In a static electrical machine, a horizontal rectangular frame consisting of opposite insulated pairs of L-shaped-frame conductor-rods provided with inwardly-projecting collecting-combs, the stationary and revolving plates arranged within the frame, adjustable prime conductors connected respectively with the opposite pairs of frame-rods, suitably-arranged auxiliary conductor-rods, and adjusting means for the prime conductors, substantially as set forth.

2. In a static electrical machine, a rectangular frame consisting of opposite insulated pairs of frame conductor-rods, the stationary and revolving generator-plates mounted within the frame, and swinging adjustable prime conductors pivotally connected respectively with the opposite pairs of frame-rods, substantially as set forth.

3. In a static electrical machine, opposite upright supporting-posts provided with upper bifurcated ends, connecting-rods fitted in the upper ends of the posts, horizontal L-shaped-frame conductor-rods connected at one end to the extremities of the connecting-rods, insulator-collars connecting the other ends of said conductor-rods and thereby separating said rods into opposite pairs, two pairs of stationary and revolving generator-plates suitably mounted within the rod-framing, and the prime conductors pivotally connected at one end respectively to the opposite connecting-rods for the frame conductor-rods, substantially as set forth.

4. In a static electrical machine, a horizontal rectangular frame, consisting of opposite insulated pairs of L-shaped frame-rods, an intermediately-arranged upright bearing-standard provided at its upper end with aligned bearing-collars and outwardly-extending L-shaped brace-arms extended from the upper sides of said bearing-collars, a suitably-rotated plate-arbor mounted in said bearing-collars, the opposite pairs of stationary and revolving generator-plates arranged on the opposite extremities of said arbor, said stationary plates resting at an intermediate point against said brace-arms, adjustable supporting-blocks engaging the lower edges of the stationary plates, the U-shaped bridge-wire interposed between the stationary plates and provided with hooks engaging the upper edges of said plates, and the prime conductors respectively connected with the opposite pairs of frame-rods, substantially as set forth.

5. In a static electrical machine, a cabinet, the generator-plates, the conductor-rods at one side of the revolving plate, the opposite prime conductors pivotally connected at one end with said conductor-rods, a pair of auxiliary conductor-rods mounted within the cabinet above the prime conductors and extending outside of the cabinet, suitable connections with the outer ends of the auxiliary conductor-rods, and an adjusting device for the



free ends of the prime conductors, substantially as set forth.

6. In a static electrical machine, the cabinet, the generator-plates suitably mounted within the cabinet, the conductor-rods at one side of the revolving plate, the opposite prime conductors pivotally connected at one end with said conductor-rods, a pair of auxiliary conductor-rods mounted within the cabinet above the prime conductors, a winding device mounted within the cabinet, suitably arranged guide-pulleys, and adjusting-cords connected with said winding device, passed around said guide-pulleys, and connected to the unpivoted ends of the prime conductors, substantially as set forth.

7. In a static electrical machine, the cabinet, the generator-plates suitably mounted within the cabinet, the conductor-rods at one side of the revolving plate, the oppositely-arranged inwardly-curved prime conductors pivotally supported at their lower ends and metallically connected with said conductor-rods, a pair of auxiliary conductor-rods mounted within the cabinet and provided with inner angled ends adapted to respectively contact with the unpivoted ends of the separate prime conductors, an adjusting device for the unpivoted ends of the prime conductors, and a pole-changer connected with the outer ends of the auxiliary conductor-rods, substantially as set forth.

8. In a static electrical machine, the combination of a cabinet, the generating devices mounted within the cabinet, opposite pivotally-supported and adjustable prime conductors, a pair of auxiliary conductor-rods mounted within the cabinet above the prime conductors and extending outside of the cabinet, a swinging pole-changer consisting of connected rods pivotally connected at their upper ends respectively to the outer ends of the separate auxiliary conductor-rods, a pair of spaced contact-hooks electrically connected and adapted to be engaged by the pole-changer rods, and a stationary upright conductor arranged below and intermediate of said contact-hooks, substantially as set forth.

9. In a static electrical machine, the generating devices, opposite pivotally-supported and adjustable prime conductors, a pair of auxiliary conductor-rods mounted above the prime conductors and adapted to have their inner ends connected with said prime conductors, a swinging pole-changer consisting of a pair of connected rods pivotally connected at their upper ends respectively to one end of the separate auxiliary conductor-rods, a pair of spaced contact-hooks electrically connected and adapted to be engaged by the pole-changer rod, a stationary upright conductor

arranged below and intermediate of the contact-hooks, and an adjustable connecting-rod having a universal connection with said stationary upright conductor, substantially as set forth.

10. The combination with a static generator having opposite insulated pairs of conductor-rods; of Leyden jars arranged below said rods, jar-conductors leading from the conductor-rods of the generator to the inner coatings of the jars, a switch connection between the outer coatings of one pair of jars, and an adjustable circuit-closing device for closing the circuit through all of the Leyden jars, substantially as set forth.

11. The combination with a static generator having opposite insulated pairs of conductor-rods, of Leyden jars arranged below said rods, metallic cups for the jars, said cups having short depending conducting-rods, jar-conductors leading from the conductor-rods of the generator to the inner coatings of the jars, a switch connection between the outer coatings of one pair of jars, swinging circuit-plates pivotally connected at one end with the short conducting-rods for the pair of Leyden jars having the switch connection, and an adjusting device for moving the circuit-plates in and out of contact with the short conducting-rods of the isolated pair of Leyden jars, substantially as set forth.

12. The combination with a static generator having opposite insulated pairs of conducting-rods, of Leyden jars arranged below the rods, metallic cups for the jars having short depending conducting-rods, jar-conductors leading from the conducting-rods of the generator to the inner coatings of the jars, a switch connection between the outer coatings of one pair of jars, swinging circuit-plates pivotally connected at one end with the short conducting-rods for the pair of jars having the switch connection and adapted to contact with the short conducting-rods of the isolated pair of jars, a bar pivotally connecting the circuit-plates for simultaneous movement, an adjusting-link pivotally connected at one end with the connecting-bar for the circuit-plates, a suitably-arranged slide-bar connected with said link, and a suitably-arranged adjusting-shaft provided at one end with a crank-arm connected with one end of said slide-bar, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CHARLES M. HOLLOPETER.

Witnesses:

H. S. JENNINGS,  
NOAH STAHL.