No. 621,717. Patented Mar. 21, 1899.

C. SELLERS.

DYNAMO ELECTRIC MACHINE.

(Application filed Oct. 20, 1897. Renewed Oct. 31, 1898.)

(No Model.) 4 Sheets—Sheet 1.

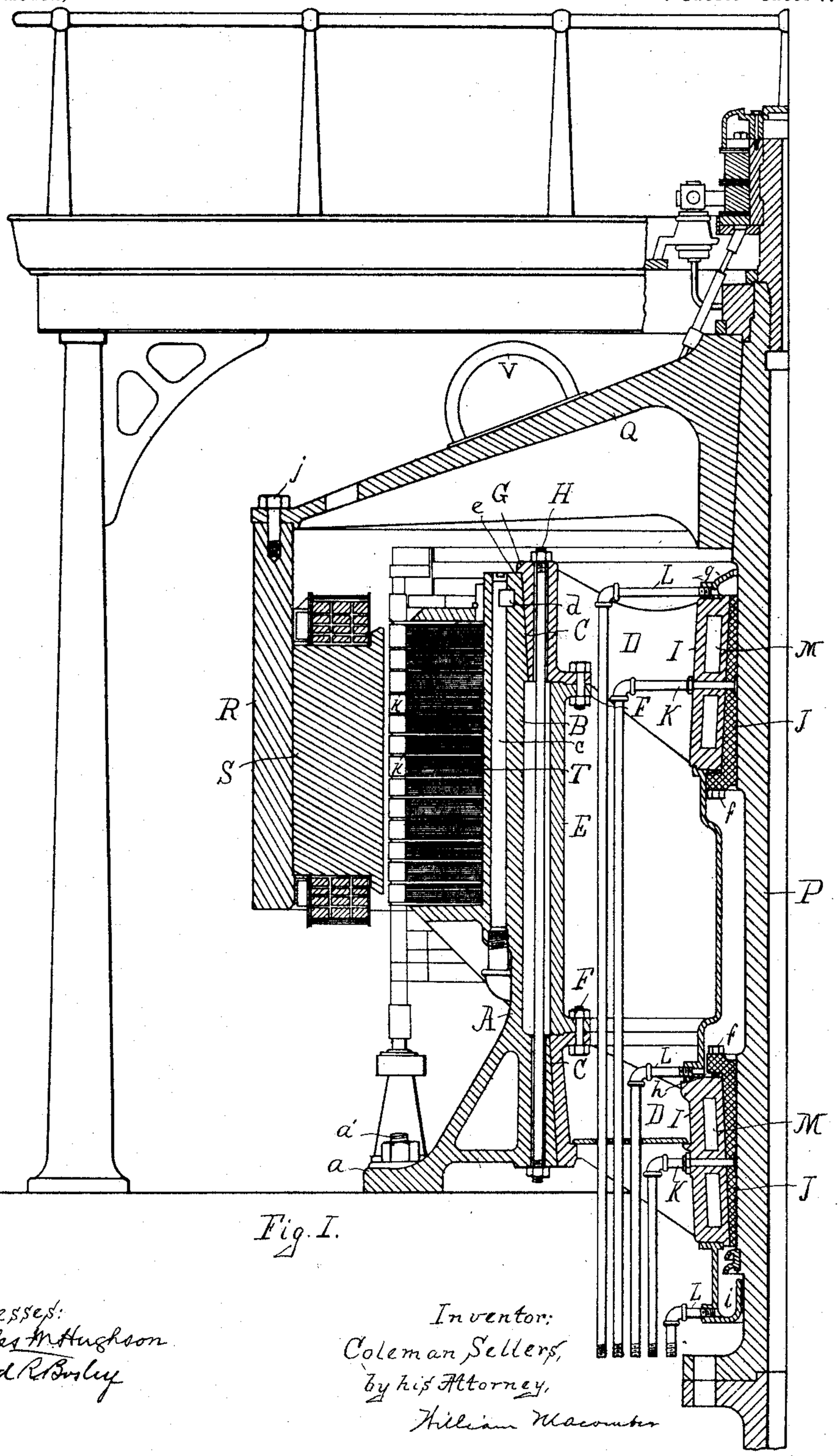

Fig. I.

Witnesses:
Charles M. Hughson
Edward R. Busley

Inventor:
Coleman Sellers,
by his Attorney,
William Macomber

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(No Model.) 4 Sheets—Sheet 2.

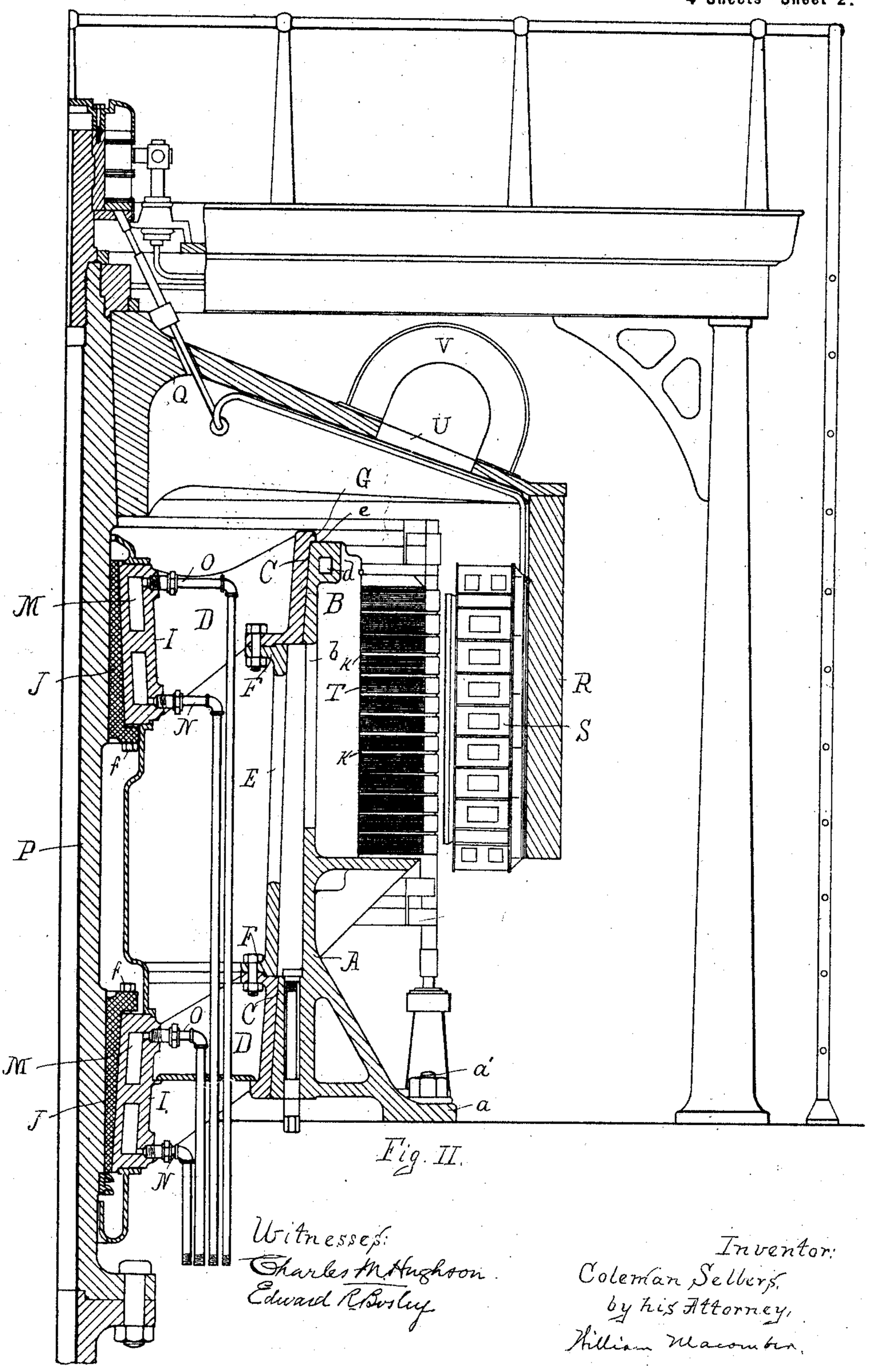

Fig. II.

Witnesses:
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(No Model.) 4 Sheets—Sheet 3.

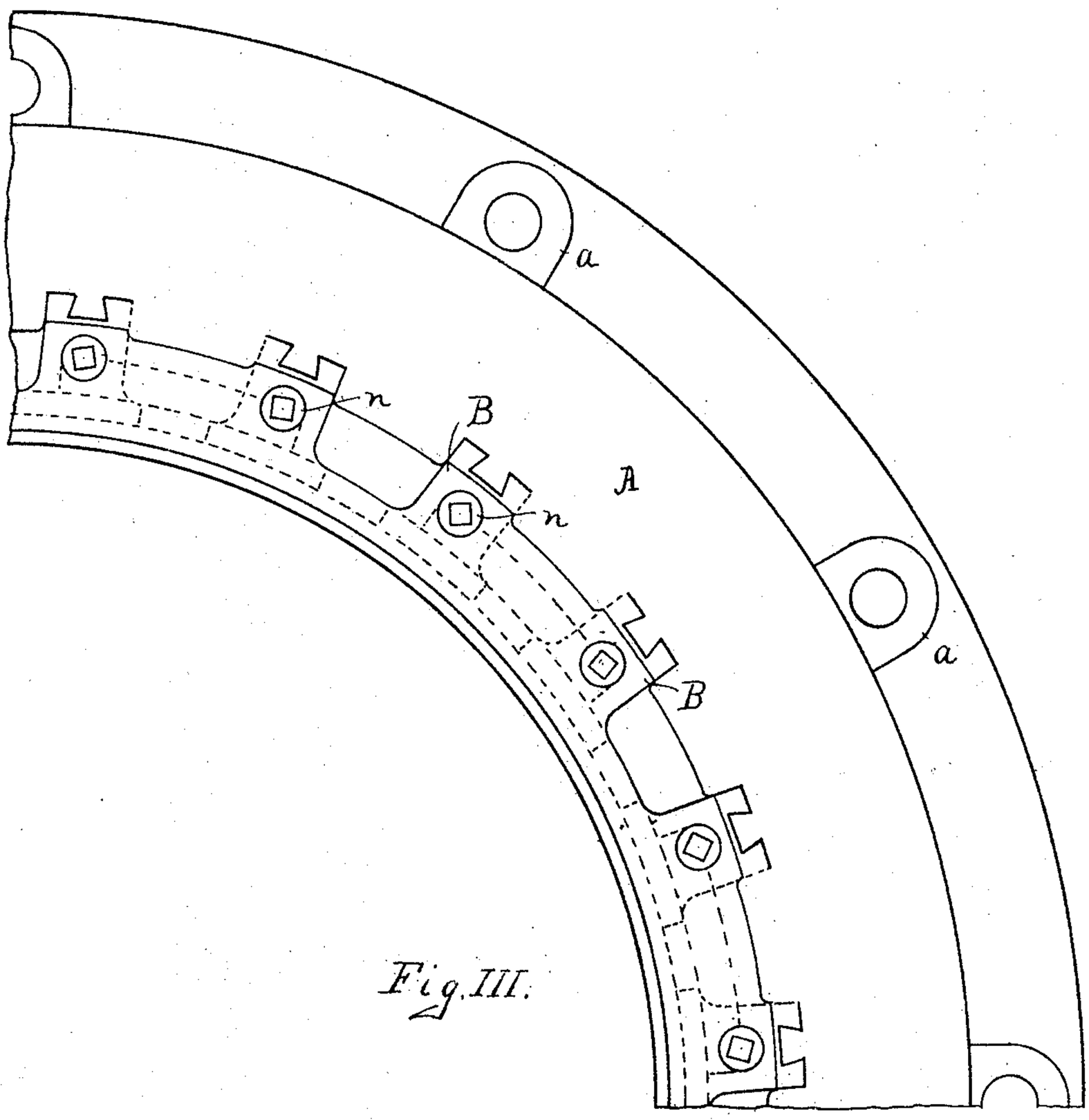

Fig. III.

Witnesses:
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Inventor:
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William Macomber

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DYNAMO ELECTRIC MACHINE.

(Application filed Oct. 20, 1897. Renewed Oct. 31, 1898.)

(No Model.) 4 Sheets—Sheet 4.

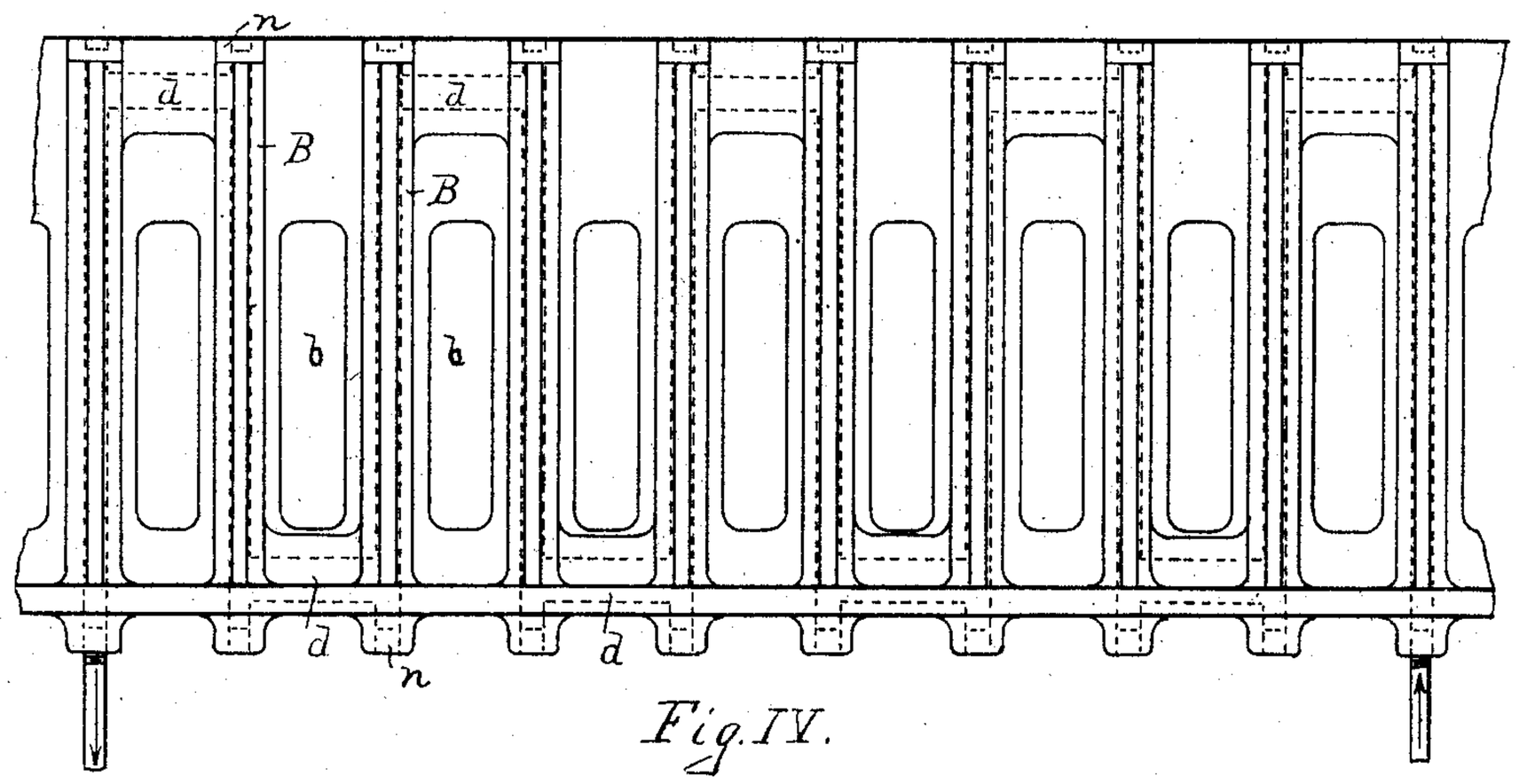

Fig. IV.

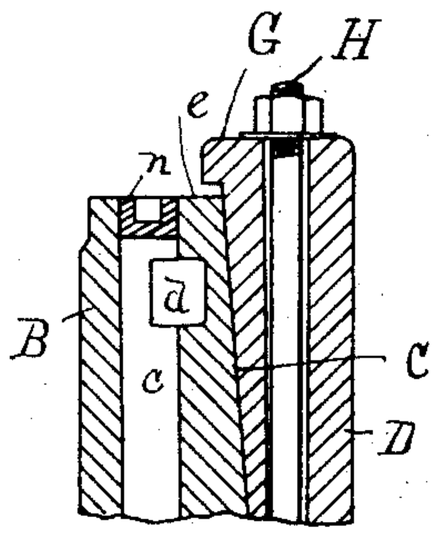

Fig. V.

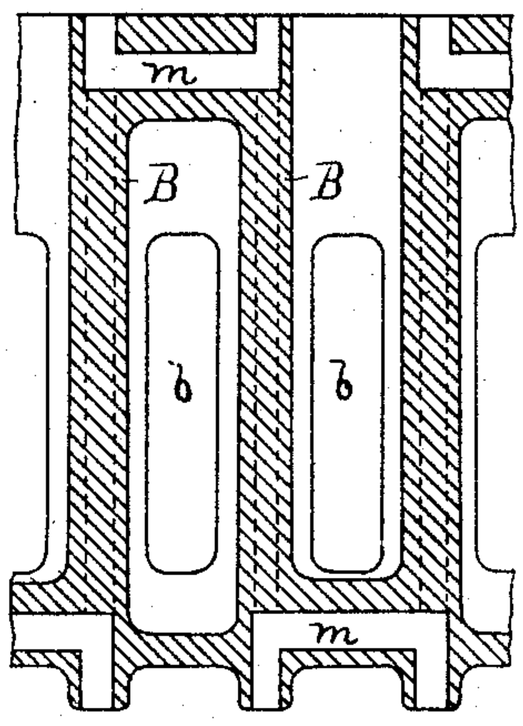

Fig. VI.

Witnesses:
Charles McHughson.
Edward R. Bosley.

Inventor:
Coleman Sellers,
by his Attorney,
William Macomber.

UNITED STATES PATENT OFFICE.

COLEMAN SELLERS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NIAGARA FALLS POWER COMPANY, OF NIAGARA FALLS, NEW YORK.

DYNAMO-ELECTRIC MACHINE.

SPECIFICATION forming part of Letters Patent No. 621,717, dated March 21, 1899.

Application filed October 20, 1897. Renewed October 31, 1898. Serial No. 695,054. (No model.)

To all whom it may concern:

Be it known that I, COLEMAN SELLERS, a citizen of the United States, residing at Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Dynamos, of which the following is a full, clear, and exact description.

My invention relates to certain improvements in dynamos, and particularly to dynamos having a vertical shaft.

My invention relates more particularly to methods of construction and means for securing proper alinement and concentricity of parts and also means for maintaining a cooling system within the machine. In the construction of machines of this class in which the unit of power is large and in which the source of power is a water-wheel or an engine it is essential that the alinement of the parts should be readily attained and that the interior portion of the machine should be capable of being readily removed and replaced, and it is also essential that the heat created by the generation of the current should be so disposed of as to prevent injury to the interior of the machine. By reference to Letters Patent hitherto granted to me on June 5, 1894, numbered 520,940, it will be seen that I have there shown one system of securing a proper alinement and adjustment of the parts of the machine and a system of air circulation for cooling the machine and also a system of oil circulation for the bearings of the shaft and water circulation about the bearings of the shaft for preventing the bearings from becoming heated.

My present improvement relates, first, to a method of constructing the spider-frames and connecting them with the armature-stand; second, a system of water circulation in the armature-stand, and, third, a system of water circulation in combination with a system of air circulation.

Referring now to the drawings herewith, consisting of four sheets, in which like letters refer to like parts, Figures I and II, taken together, constitute a vertical section of a machine embodying my invention. Fig. III is a top plan view of a section of the frame or armature-stand. Fig. IV is a vertical projection of a section of the same. Fig. V is a detail section of a portion of the frame or stand and the upper spider, showing the flange and means for drawing it to place. Fig. VI is a cylindrical section of a portion of the frame or stand, showing my method of coring and boring the same for the water circulation.

In the erection of these machines the first requirement is a solid foundation and bed-plate the upper surface of which shall be dressed with great accuracy and which shall lie in a horizontal plane or at right angles to the axis of the driving-shaft, since it is evident that all matters of alinement and adjustment must be ultimately referable to the bed-plate. Upon this bed-plate is secured a frame or stand A, which is cylindrical in form and which is provided with feet *a* to secure it in place by means of bolts *a'* when accurately alined to the axis of the driving-shaft. Secured to the exterior of this frame or stand are the laminations T, upon which are placed the windings of the armature, (for I have shown in the drawings a dynamo having a stationary armature and an exterior revolving field,) and within the central openings C are secured the bearings for the shaft P. Upon the upper end of the shaft is a bell-cap Q, to the periphery of which is secured the revolving field-ring R, which carries upon its inner surface the pole-pieces S and windings of the field.

In order that in the erection of the machine and in subsequent taking down and setting up accuracy of alinement and concentricity of parts may always be insured, it is necessary that the spider-frames D, which carry the shaft-bearings J, should be so fitted and secured to the frame of the machine as to go to place with great accuracy. In order to accomplish this end, I first bore the frame or stand conically downward, as shown at C, top and bottom, and dress the upper surface of the frame or stand perfectly parallel to its base. This frame then, once in place and adjusted with reference to its internal conical boring to accurate concentricity with the shaft, establishes a concentric surface and a

plane surface at right angles to the shaft, to which the frames of the bearings may be fitted and secured.

The spider-frames D, which carry the shaft-bearings J within their hubs I, have their surfaces dressed conically to fit into the conical borings C of the frame or stand A. These spider-frames are joined together by means of a coupling-frame E and flange-unions F, and the upper spider-frame is provided with a flange G upon its upper periphery, the lower side of which is accurately dressed to a plane at right angles to the axis of the spider-frame and which is calculated when drawn down to fit down upon the upper plane surface of the frame or stand A. Taking through this upper spider and through the lower portion of the frame or stand are bolts H, by means of which the spider-frames are drawn down firmly into their conical seats and by means of which the flange G of the upper spider is brought into uniform contact with the upper plane surface of the frame or stand. In construction the diameter of the cones of the spider-frames should be slightly greater than that of the frame, so that they will go to place only with the strain of the bolts. In this manner I secure a perfect concentric fit and a perfect axial alinement of the frames which carry the shaft-bearings. The hubs I of these spiders are bored conically to receive cylindro-conical bearings J for the shaft P. These bearings at their bases are provided with flanges having bolt-holes through which bolts secured to the spider-hub pass and by which they are drawn to place.

Passing through the spider-hubs and opening upon the inner surface of the bearings centrally are inlets for oil K, by which I supply oil to the bearing under pressure, and leading from annular recesses at the top of both and at the bottom of the lower bearing, as indicated at *g*, *h*, and *i*, are eduction-pipes L, which carry away the oil which is forced outward at the top and bottom of the bearings.

Within the hub of the spider-frames I provide annular or spiral openings M, which are connected with induction and eduction pipes N and O, respectively, through which a circulation of cold water is maintained about the bearing to prevent the communication of heat to the bearing from the generation of the electric current. These features are properly described and claimed in my former patent above referred to and are here explained only for the purpose of a full understanding of my present invention and for the purpose of claiming them as entering into the combinations of my present invention. In like manner and for like purposes I will explain briefly the system of air circulation, which is also explained and claimed in said patent. The frame or stand A is provided with longitudinal ribs or columns B, to which the laminations T are secured. The laminations are built up with intervening air-spaces *k k* from point to point, so that air may pass inwardly from the air-gap and through openings in the frame or stand, as indicated at *b*, be carried away. Openings U upon the bell-cap Q are provided, which are partially covered by reversed hoods or funnels V, which in rapid rotation tend to create a partial vacuum within the openings, and thus draw the air outward. While such a system of air cooling and ventilation is adequate and effective in many cases, in the generation of electricity in very large units over long periods and at full load I have found it expedient, in order to maintain the full efficiency of the machines and full protection to the interior mechanism, to supplement this cooling system by a system of water circulation within the armature-stand or frame. This I construct by making the columns B of the stand or frame hollow, as shown at *c*, and by connecting the openings in the columns, top and bottom, in series, as shown at *d*. These openings are connected with a supply of cold water by means of induction and eduction pipes, which are connected with a pump or other means for maintaining the circulation. By this means the heat of the adjacent parts is carried away by the water and the air, which is drawn inwardly, is somewhat cooled by coming in contact with the columns of the armature-stand. Since it would be difficult, if not impossible, to core a casting of the size and shape of this frame, so as to make the water-circulation openings, I have illustrated in Fig. VI my method of making these openings. The transverse openings which connect the hollow columns are cored in casting, as shown at *m*. These cores produce openings, top and bottom, upon the lines of the openings in the columns. Through these openings the columns are bored out, as indicated by the dotted lines in this figure. The openings, top and bottom, are then closed by screw-plugs, as shown at *n*, Figs. III and IV.

The machine shown in the drawings is of the alternating-current type, and the mechanism for communicating the exciting-current to the field is shown; but as that mechanism forms no part of my present invention a detailed description is unnecessary.

Having thus described my invention, what I claim is—

1. In a dynamo having a vertical shaft, a frame or armature-stand cylindrical in form having its upper and lower surfaces dressed parallel to a plane at right angles to its axis and its inner cylindrical surface bored conically, top and bottom, spider-frames carrying the shaft-bearings having their exterior surfaces dressed conically to fit to the conical borings of the frame and concentric with the shaft, a coupling-frame uniting the upper and lower spider-frames, and means for drawing said spider-frames to place within the frame, substantially as and for the purposes set forth.

2. In a dynamo having a vertical shaft, a frame or armature-stand cylindrical in form

having its upper and lower surfaces dressed parallel to a plane at right angles to its axis and its inner cylindrical surface bored conically, top and bottom, spider-frames carrying the shaft-bearings having their exterior surfaces dressed conically to fit to the conical borings of the frame and concentric with the shaft, a coupling-frame uniting the upper and lower spider-frames, a flange upon the upper surface of the upper frame having its bearing-surface dressed to a plane at right angles to the axis of the spider-frame, and bolts taking through said spider-frame and through the frame or armature-stand for the purpose of drawing said spider-frames to place and said flange to place upon the upper plane surface of the frame or armature-stand, substantially as and for the purposes set forth.

3. In a dynamo having a vertical shaft, the combination of a cylindrical frame having its upper and lower surfaces dressed parallel and at right angles to the axis and bored conically internally, top and bottom, spider-frames dressed conically exteriorly to fit said conical borings, a coupling-frame uniting said spider-frames, a flange upon the upper surface of the upper spider having its bearing-surface dressed to a plane at right angles to the axis of the spider-frame and bolts taking through said upper spider and said frame to draw the spiders to place, with cylindro-conical bearings concentric with said conical surfaces of said spider-frames and fitting into concentric conical borings in the hubs of said spider-frames, substantially as and for the purposes set forth.

4. In a dynamo-electric machine having a vertical shaft, a cylindrical frame bored conically top and bottom, and dressed top and bottom to a plane at right angles to its axis, spider-frames having corresponding conical surfaces and united by a coupling-frame, a flange upon the upper spider dressed to a plane at right angles to its axis, bolts taking through said spider and said frame, with spider-hubs having conical concentric borings and cylindro-conical shaft-bearings concentric with said spider-frames and fitting into said conical borings in said spider-hubs and bolts for drawing said bearings to place, substantially as and for the purposes set forth.

5. In a dynamo, a water cooling system consisting of a cylindrical frame provided with hollow longitudinal columns, which are connected in series, and an induction and an eduction pipe connecting therewith, and means for maintaining a forced circulation of water, substantially as and for the purposes set forth.

6. In a dynamo, the combination of a cooling and ventilating system, consisting of a cylindrical frame provided with hollow longitudinal columns connected in series, and provided with induction and eduction pipes, and means for maintaining a forced circulation of water, with a system of air circulation consisting of air-spaces from point to point in the laminations of the armature, longitudinal air-spaces between the columns of the frame of the machine, and means for maintaining a forced circulation of air through the armature and frame of the machine, substantially as and for the purposes set forth.

7. In a dynamo, the combination of a cooling and ventilating system for the armature consisting of a forced circulation of water within the armature-stand by means of a series of hollow longitudinal columns connected in series and provided with induction and eduction pipes, and forced circulation of air maintained through air-spaces in the laminations of the armature and spaces in said longitudinal columns of the frame of the machine by means of inverted hoods over apertures in the bell-cap, with a forced circulation of oil over the bearings consisting of induction-pipes which carry the oil under pressure centrally to each bearing, and eduction-pipes connecting with annular spaces about said bearings for the purpose of carrying away the oil, substantially as and for the purposes set forth.

8. In a dynamo, the combination of a cooling and ventilating system for the armature consisting of a forced circulation of water within the frame of the armature by means of a series of hollow longitudinal columns connected in series and provided with induction and eduction pipes and a forced circulation of air maintained through air-spaces within the laminations of the armature and intervening spaces in said longitudinal columns of the frame of the machine by means of inverted hoods over apertures in the bell-cap of the machine, with a forced circulation of oil over the bearing consisting of induction-pipes which carry oil under pressure centrally to each bearing, and eduction-pipes connecting with annular spaces about said bearing, and a forced circulation of water about said bearings by means of annular or spiral openings within the hubs surrounding said bearings and induction and eduction pipes by which a forced circulation of water is maintained within said openings, substantially as and for the purposes set forth.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

COLEMAN SELLERS.

Witnesses:
PAUL M. LINCOLN,
LINCOLN A. GROAT.