

C. SELLERS.
DYNAMO ELECTRIC MACHINERY.

No. 520,940.

Patented June 5, 1894.

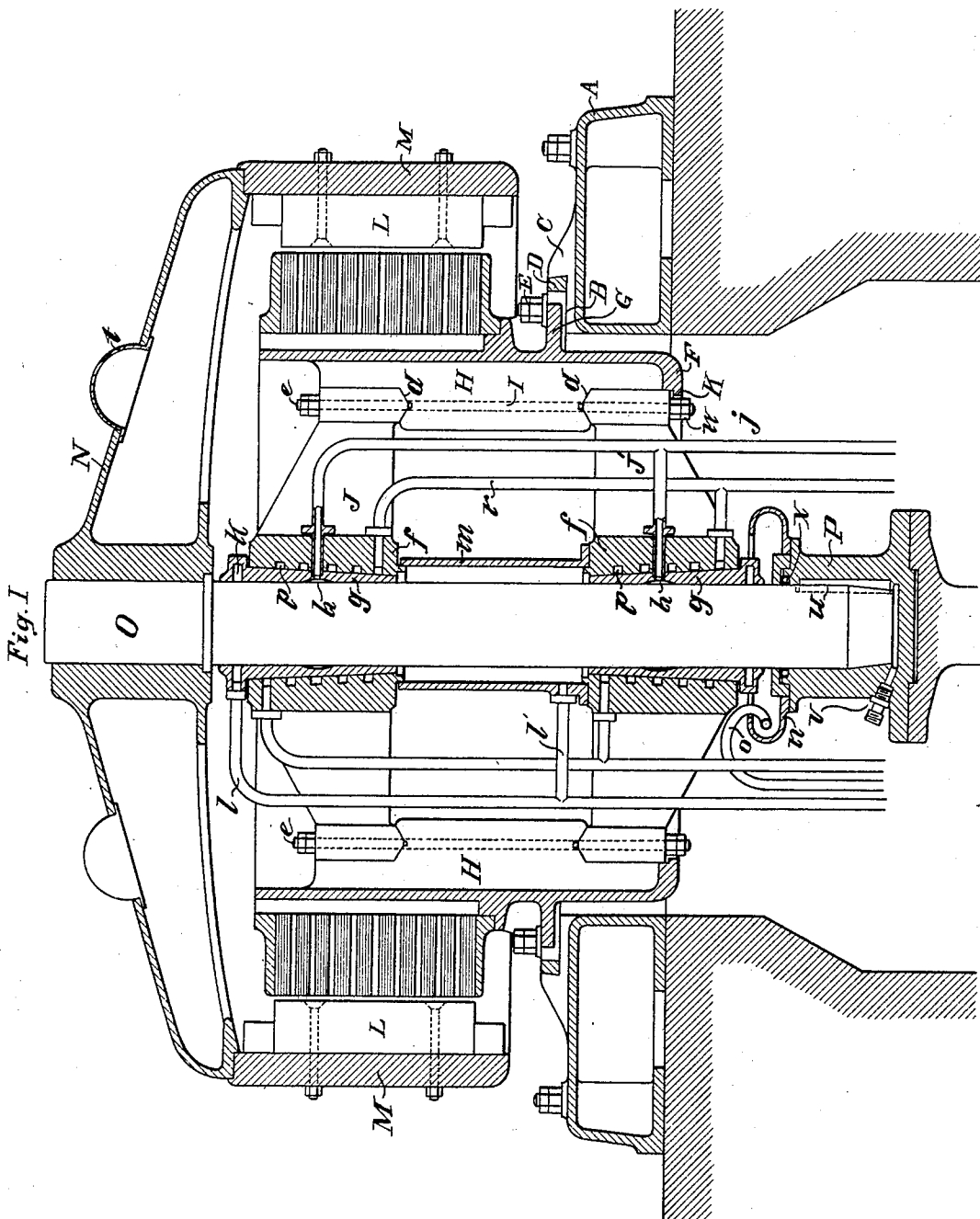


Fig. 1

Coleman Sellers, INVENTOR

BY

William Macomber, ATTORNEY.

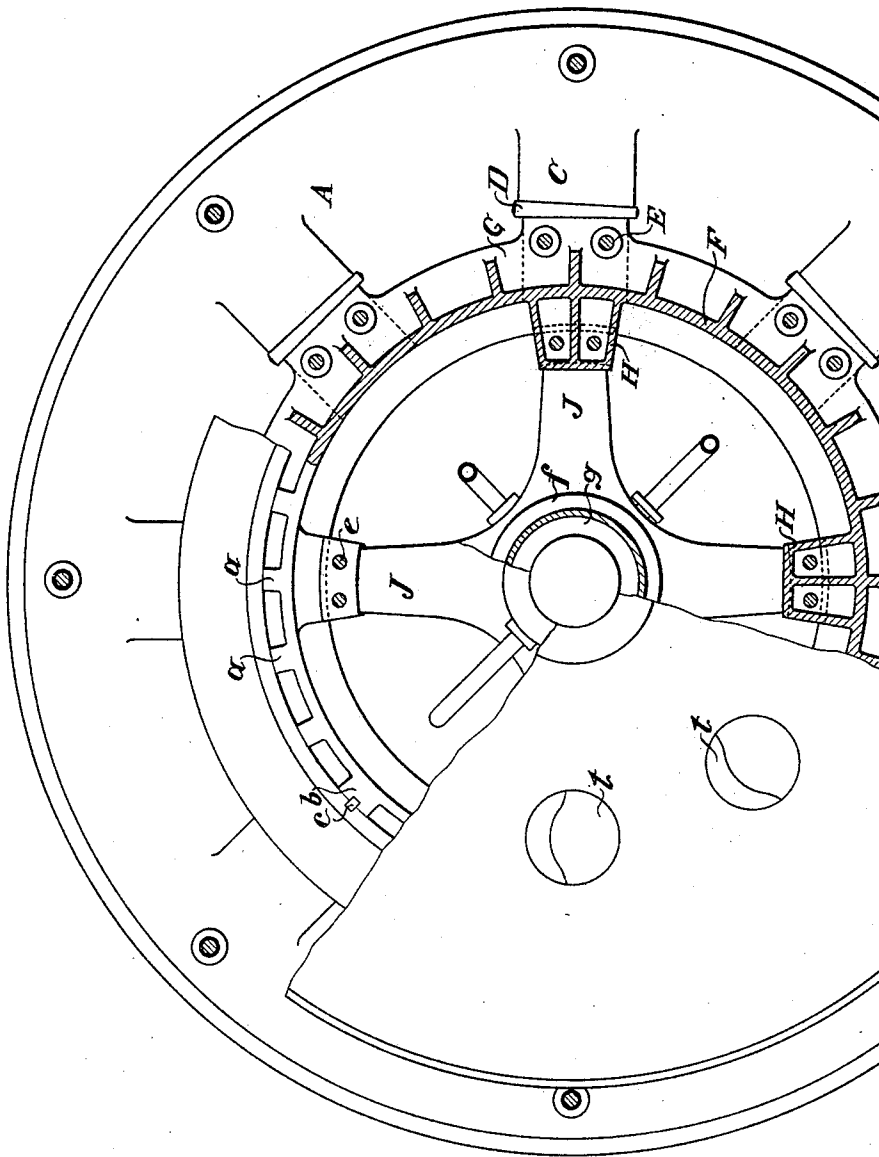
WITNESSES
William S. Preston
Austin R. Preston

C. SELLERS.
DYNAMO ELECTRIC MACHINERY.

No. 520,940.

Patented June 5, 1894.

Fig. II



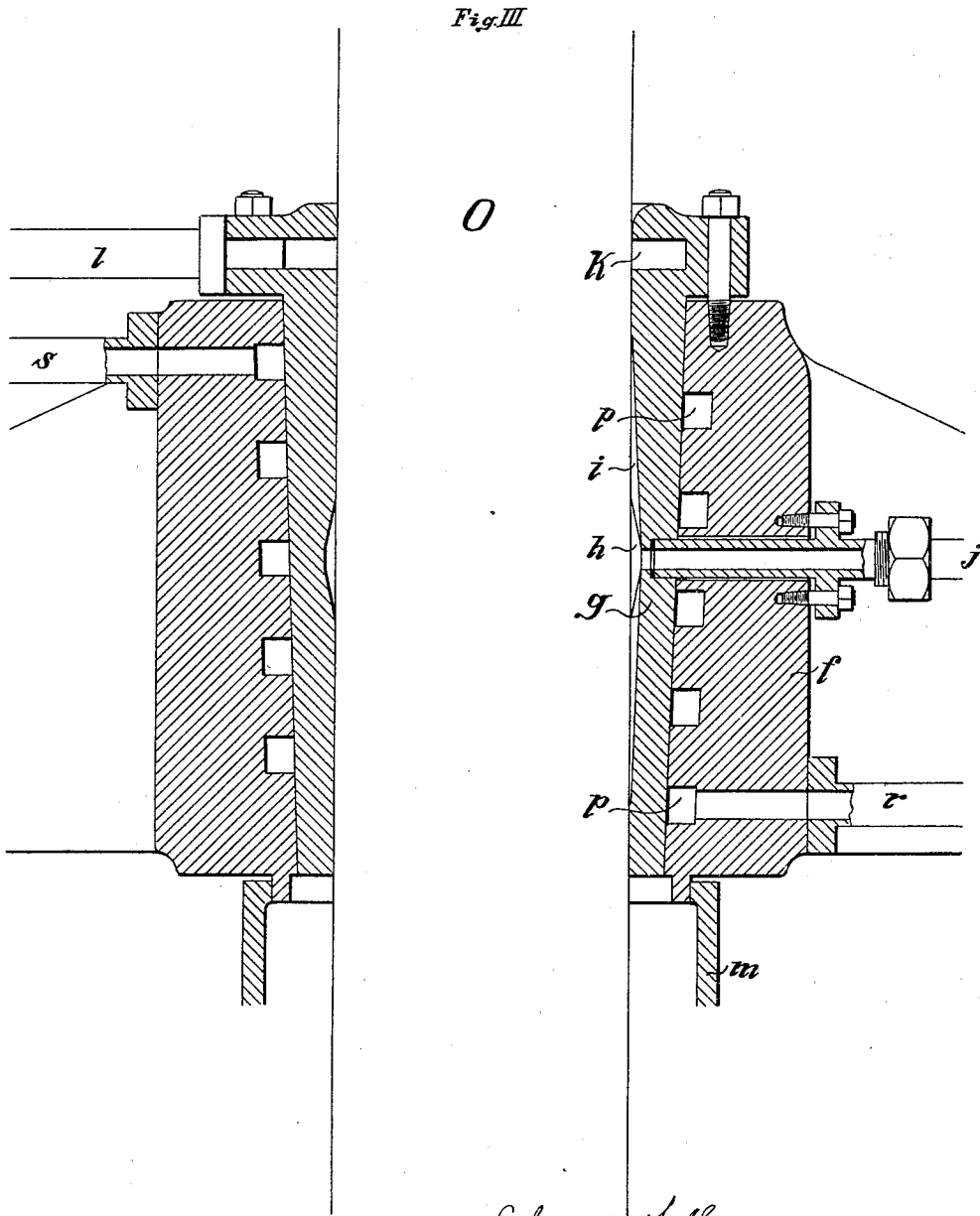
WITNESSES:
 William G. Preston
 Austin R. Preston

Coleman Sellers INVENTOR
 BY
 William Macone ATTORNEY

C. SELLERS.
DYNAMO ELECTRIC MACHINERY.

No. 520,940.

Patented June 5, 1894.



WITNESSES
William S. Preston
Austin R. Preston.

Coleman Sellers, INVENTOR
 BY
William Macomber, ATTORNEY.

UNITED STATES PATENT OFFICE.

COLEMAN SELLERS, OF PHILADELPHIA, PENNSYLVANIA.

DYNAMO-ELECTRIC MACHINERY.

SPECIFICATION forming part of Letters Patent No. 520,940, dated June 5, 1894.

Application filed October 27, 1893. Serial No. 489,301. (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 Dynamo-Electric Machinery; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The objects of my invention are to facilitate the adaptation of electrical machinery, such as dynamos, to water- or steam-power service when the transmission of power to the dynamo requires the use of a vertical shaft; to enable the dynamo to be aligned to the axis of the power shaft, and thus insure free running; to facilitate and simplify the construction of the dynamo so far as its mechanical features are concerned, and to greatly increase the ease and certainty in the assembling of the several parts, in erection and in subsequent taking apart for repairs; to enable the central part of the dynamo to be quickly removed and replaced in such manner as to give free room for the removal of the several connecting parts situated beneath the dynamo, such as shafts, bearings, &c., without disturbing the primary alignment of the two machines, viz: the dynamo and water wheel or engine, shaft and bearings; to afford means for positive lubrication and means of cooling of the bearings; and also to provide means for induction by rotation of cooling air to the armature and field magnets.

As stated above, my invention is applicable to that class of dynamos in which a vertical shaft is employed. In the following description and in the drawings herewith I have shown and described a machine having a water wheel as a source of power; and I have done so for the purpose of clearness, and not for purposes of limitation, since it is apparent to one skilled in the art that the nature of the power, whether water or steam, is immaterial. With such understanding I shall show the construction and application of my invention in connection with a water wheel as a source of power.

The nature of my invention consists in arranging a primary bed-plate to be securely fastened to suitable foundations, the exact

shape or external form of this bed-plate being of no great importance, provided it is so arranged as to be solid on its foundations with its upper planed or dressed surface true as to its face, being at right angles to the axis of rotation of the driving shaft. It is important, however, that the bed-plate should be provided with projections or lugs to facilitate the adjustment of the main frame of the dynamo by means of keys or wedges, as I show herein. The main frame of the dynamo is preferably of cylindrical form and provided with feet which rest on the dressed portion of the bed-plate, and which are so constructed as to permit of being bolted to the bed-plate after being adjusted as to alignment with the axis of rotation of the driving shaft. Outside of this cylindrical frame, the armature, if stationary, can be attached and centered, or the field magnets may be located thereon, if the armature is made to revolve outside of the field magnets. Within this cylindrical frame, carrying the electrical machinery, are two or more projections which project inwardly, of a limited width provided with a V shaped groove on the top and bottom of each projection, said grooves being intended to receive and hold concentrically the spider frames that carry the shaft bearings of the dynamo by means of bolts which pass through bolt-holes in the projections upon the frame and through corresponding bolt-holes in the ends of the spider frame arms. Below these projections is a ring or flange, or segment of a ring, or flanges, upon which the lower spider frame rests when not held up to its V shaped bearing by the bolts. The spider frames have solid hubs which are preferably bored conically to receive conical bushings of bearing metal and provided with means of cooling; and the bushings of bearing metal are provided with means of maintaining a forced circulation of oil, as herein after described. Upon the exterior of this cylindrical frame are projecting ribs which carry the armature plates, thus leaving spaces into which cooling air is admitted; and to maintain such circulation of cooling air I have devised attachments to the bell-cap carrying the rotating rim upon which, in the present construction, the field magnets are mounted, as more fully described hereinafter.

But it will be apparent that, if the machine is constructed with stationary fields and revolving armature, these air spaces may be readily provided within the rotating rim and the circulation of air maintained in the same manner. Upon the upper end of the shaft supported within the frame, as explained, is mounted rigidly a revolving bell-cap carrying a rim or fly-wheel, within which the field magnets are mounted. The coupling which attaches the dynamo shaft to the water wheel shaft is arranged to be separated from the shaft by hydraulic power.

Referring to the drawings herewith, consisting of three sheets:—Figure I is a vertical cross-section of a dynamo with a stationary armature and revolving field magnets. Fig. II is a top-plan view of the same, having a portion of the bell-cap and revolving fields cut away, and also showing a portion of the cylindrical frame in cross-section. Fig. III is an enlarged cross-section of the hub of one of the spider frames and the bushing of bearing metal, and showing also in section the pipe connections for the oil circulation and for the water cooling circulation.

Like letters refer to like parts throughout the drawings.

A is the bed-plate, provided with dressed surfaces, B, and projections, C, for wedges, D, and bolts, E. A cylindrical casting, F, with feet, G, resting on the surface, B, has ribs, *a*, (see Fig. II) on the outside, dressed to receive the armature punchings or plates, one or more of said ribs, as *b*, being provided with a key-way to receive a key, *c*, to prevent the armature from slipping.

Inside of the cylindrical frame, F, are two or more projections, H, H, (in the present case I have shown four) turned V shaped top and bottom (see *d*, *d*, Fig. I) and provided with bolt-holes, I, I. A ring, K, at the bottom of the cylinder is provided as a ledge upon which the lower spider, J', can rest when not held up to its V bearing, *b*, by the bolts, *e*, *e*. The spiders, J, J', are provided with solid hubs, *f*, *f*, which are bored conically to receive the bushings of bearing metal, *g*, *g*, which are held in place by any suitable means. The ends of the arms of the spiders, J and J', are turned V shaped upon their lower and upper surfaces respectively, to correspond with and fit into the V shaped bearings, *d*, *d*, upon the projections, H, H, upon the inside of the cylindrical frame, F, and have bolt-holes corresponding to the bolt-holes I, I, in the projections, H, H.

In constructing magneto electrical machines, either for alternating currents or continuous currents, when the machine is to be operated by water power, the problem of successful regulation of the speed of the water wheel yielding the power depends largely upon the possible fly-wheel effect obtainable through and by means of the revolving parts of the electrical machine. For this reason the revolving field magnets, L, L, as shown in

the drawings, or the revolving armature if placed inside of the continuous forged or cast steel rim, M, suspended from the bell-cap, N, which is rigidly mounted upon the shaft, O, will, conjointly with the rim, M, act as a fly-wheel with the centrifugal force acting outward against the rim, M, and can be readily brought into running balance, and if well balanced will relieve the bearings from all unequal pressure except such as may result from want of magnetic uniformity in magnetic attraction. Inasmuch as such want of magnetic balance may cause lateral pressure on the bearings in any direction, I prefer to make the metal lining, *g*, of the bearings continuous throughout their circumference. I also provide proper appliances for a forced circulation of oil by having a central chamber, *h*, in each bearing, *g*, *g*, with such extension by grooves from the central chamber, as shown at *i*, Fig. III, as may be required in either to insure distribution of oil over the whole length and surface of each bearing. This circulation may be maintained in any well-known manner either by gravity- or pump-pressure. I have also shown a convenient system of pipe connection for this purpose, which consists of the induction pipe, *j*, which, with proper branches, *h*, *h*, forces the oil into the central chambers, *h*, *h*. Referring now to the upper bearing, the oil which is forced upward collects within the annular opening, *k*, which is connected with the eduction pipe, *l*. The oil which passes downward is confined within a sleeve, *m*, about the shaft, O, the ends of which fit up against the inner faces of the hubs, *f*, *f*, and from which an eduction pipe, *l'*, leads to the pipe, *l*. It is also apparent that this provision also carries away the oil which is forced upward from the center of the lower bearing. The oil which passes downward from the center of the lower bearing is collected in an annular cup, *n*, which is attached to and rotates with the coupling, P. Leading into this cup is an eduction pipe, *o*, the open end of which is so placed within the annular cup, *n*, that the oil, by the centrifugal action and rotation is forced into the pipe, *o*. It is also desirable that this eduction pipe, *o*, should not lead directly into the eduction pipe, *l*, as a reverse flow of oil in the pipe, *o*, might occur; and it may also be desirable that this pipe should be connected with a pump for drawing off the oil. To further insure against heating, I provide grooves, *p*, *p*, preferably spiral, after the manner of a square thread of a screw, in the hubs, *f*, *f*, of the spider frames, J, J'. By means of a simple induction pipe, *r*, with connections to one end of each of these spiral grooves, *p*, *p*, and by means of an eduction pipe, *s*, with connections to the other end of each of these spiral grooves, *p*, *p*, a circulation of cooling water may be maintained about the bushings. To enable a sufficient quantity of air to be inducted by rotation for cooling purposes, I prefer turning the bell-cap, N, over

its entire upper surface, and through holes of sufficient size, placed symmetrically about the central axis, I project metal hoods, *t, t*, open on the side in the direction of rotation to catch the air and project it into the interior of the generator, from whence it passes out through the magnet and armature spaces, and by contact carries off the heat of such parts. In constructing and attaching these hoods, *t, t*, I make them with flanges and insert them from the under side of the bell-cap, so that they are firmly secured and the possibility of their flying off is precluded. I prefer to have the central shaft, *O*, attached permanently to the bell-cap, *N*, and made detachable from a coupling, *P*, below, for the purpose of making the shaft serve as a guide when the whole bell and its attached parts are removed to facilitate repairs or alterations. The lower end of the shaft, *O*, is tapered and fits into a corresponding taper socket in the coupling, *P*. A key, *u*, is fitted into the coupling and shaft, which is driven tight as the shaft settles into the taper socket. To facilitate the removal of the shaft from the coupling, I provide a screw-threaded opening, *v*, in the side of the coupling through which hydraulic pressure may be applied to force a separation of the shaft and coupling; and to prevent leakage in the application of hydraulic pressure, a collar of packing, *x*, is fitted about the shaft between the coupling, *P*, and the annular cup, *n*. When the bell-cap, *N*, shaft, *O*, and rim, *M*, have been removed, the oil and water circulation pipes uncoupled, and the nuts, *w*, of the bolts, *e*, at the lower end are unscrewed, the lower spider, *J'*, will sink until it rests on the inner flange, *K*. The upper spider, *J*, with the bolts, *e*, can be then removed by hoisting. The lower spider, *J'*, rotated on the flange, *K*, until clear of the projections, *H*, can then be removed in like manner. Then the spiders, once out of the way, the whole central part of the machine presents a clear opening through which the hoisting machinery can reach the water wheel shaft. If the machine and water wheel shaft are properly proportioned the one offers no impediment to the free access to the other. All parts can be restored by the reverse of these operations; and it will be noted at once as a most important feature that this method of construction affords absolute preservation of the concentricity of parts when assembling or re-assembling them in proper order, and also that this condition is in no wise disturbed in adjusting the machine upon the bed-plate to secure perfect alignment with the water wheel.

I do not limit my claims to the precise form and proportion and arrangement of the lining bushings and the water cooling arrangement as shown, inasmuch as it must be evident to any intelligent mechanic that, while a conical form to the outside of the lining facilitates construction, a cylindrical bushing properly fitted will be equally efficient; also that, while a passage for water made in a spiral

like the thread of a screw is shown, a correspondingly good result can be obtained by grooves for water made horizontal and parallel one to another, united by connecting passages to afford proper water circulation.

I do not limit my claims to the peculiar *V* shape of the grooves that determine the concentricity of the several parts, as the same effect may be accomplished by flat bearing surfaces with a projecting tongue on one part engaging in a corresponding groove in the other part. The intent of my invention being to insure proper concentricity by means analogous to *V* joints as shown, which enable similarly formed spider frames to be used for top and bottom bearings, the one removable directly, the other removable by being turned around clear of the lugs while resting on the inner lower flange and then lifted clear of the supporting projections. The lower flange, while described in its simplest form as a continuous flange, may be of any shape. It need not be continuous if separate projections are provided to give support to the spider frame when the bolts are freed from their nuts. The hoisting device once attached to the lower spider, it can be rotated clear of the projections and then removed, even if the flanges do not project beyond the width of the projections.

I am aware of the several inventions made the subject of applications for Letters Patent by Professor George Forbes, of London, England, relative to machinery of this character; and I therefore do not claim any of those features distinctly shown and claimed by him. Nor do I claim broadly the adjustment of the cylindrical frame upon the bed-plate for purposes of alignment. Nor do I claim broadly the circulation of cooling air about the armature and field magnets of a dynamo; but

What I do claim is—

1. In a dynamo electric machine having a vertical shaft, a cylindrical frame provided with internal projections having bearings concentric with the axis of rotation of the shaft, substantially as described.

2. In a dynamo electric machine having a vertical shaft, the combination of a cylindrical frame with internal projections having bearings concentric with the axis of rotation, with spider frames having corresponding concentric bearings, and hubs to support the bearings of the shaft, substantially as described.

3. In a dynamo electric machine having a vertical shaft, a cylindrical frame provided with internal projections having bearings concentric with the axis of rotation and spider frames and hubs to support the bearings for the shaft, the said spider frames fitting into the said bearings upon the cylindrical frame and detachably secured thereto and capable of being removed and replaced, the one by being immediately lifted out and the other by being rotated upon its axis until the spider frame is clear of the projections and then by hoisting, substantially as described.

4. In a dynamo electric machine having a vertical shaft, a cylindrical frame having internal projections and concentric bearings to receive the spider frames within which the shaft is supported, and provided with a ring or flange, or segments of rings, or flanges, so situated as to form a ledge upon which the ends of the lower spider frame may rest when removing or replacing the same, substantially as described.

5. A dynamo electric machine having a vertical shaft, spider frames or supports detachably secured to the concentric bearings of a cylindrical frame and having the hubs of said spider frames concentrically bored to receive conical bushings of bearing metal within which the shaft is supported, substantially as described.

6. In a dynamo electric machine having a vertical shaft, the combination of a shaft carrying a bell-cap and rim within which are supported either the field magnets or the armature plates, the lower end of said shaft being detachably secured to the power shaft, with a cylindrical frame having internal projections and concentric bearings to receive the arms of the spider frames which support the shaft within concentric conical bearings, substantially as described.

7. A dynamo electric machine having a vertical shaft carrying a bell-shaped revolving field or armature and supported within bearings carried by spider frames detachably secured in concentric bearings upon projections within a cylindrical frame which is provided with projections which rest upon the bed-plate and which are capable of adjustment thereon to secure alignment with the power shaft without disturbing the determined concentricity of the stationary and revolving parts of the machine, substantially as described.

8. In a dynamo electric machine having a vertical shaft, the combination of a bell shaped revolving field or armature with two similarly formed spider frames, to be used for top and bottom bearings, a cylindrical

frame provided with lugs or projections and a flange or ledge, whereby the lower spider may be removed by being turned around clear of the lugs or projections while resting upon said flange or ledge and then lifted clear of the supporting projections, substantially as described.

9. In a dynamo electric machine having a vertical shaft, the combination with said shaft of conical bearings continuous throughout their circumference supported within spider frames and a cylindrical frame concentric with said shaft, substantially as described.

10. In a dynamo electric machine having a vertical shaft, the combination of conical bearings with a system of forced circulation of oil by means of induction and eduction pipes and chambers and graduated guiding grooves within the bearings to secure distribution of the oil, substantially as described.

11. In a dynamo electric machine having a vertical shaft, the combination of the bearings provided with a forced circulation of oil by means of induction and eduction pipes placed vertically within the armature and chambers and graduated guiding grooves within the bearings to secure distribution of the oil, with a forced circulation of cooling water by means of induction and eduction pipes placed vertically within the armature and connecting with spiral grooves about the bearings, substantially as described.

12. In a dynamo electric machine having a bell-shaped revolving field or armature, the combination of a bell-cap with hooded openings, open on the side in the direction of their rotation, to induce by rotation a current of air within the machine to cool the armature and field magnets by contact in passing through the air spaces, substantially as described.

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

COLEMAN SELLERS.

Witnesses:

AGNES B. CLARK,
W. CARYL ELY.