

G. DINKEL.
MOUNT FOR ELECTRIC MOTORS.

APPLICATION FILED JULY 5, 1902. RENEWED MAY 3, 1904.

1,059,930.

Patented Apr. 22, 1913.

3 SHEETS—SHEET 1.

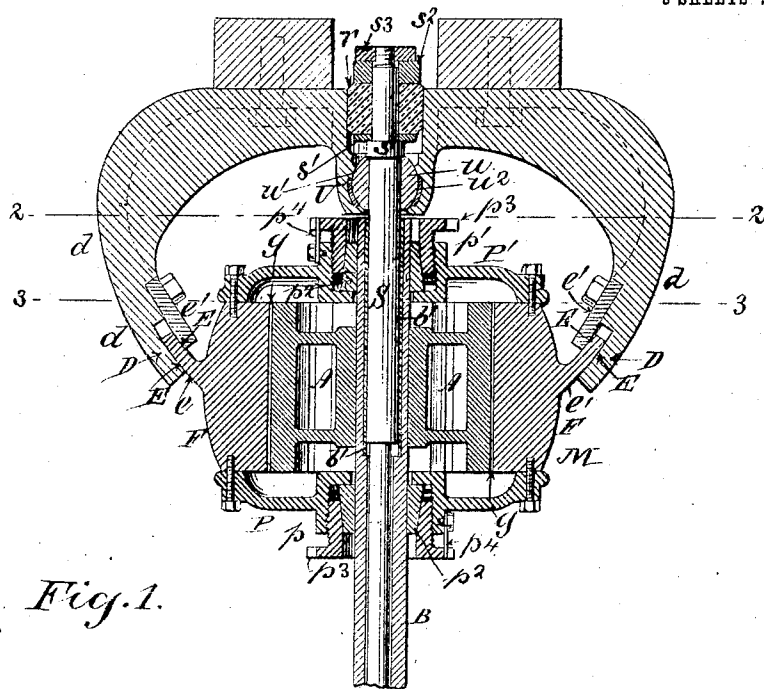
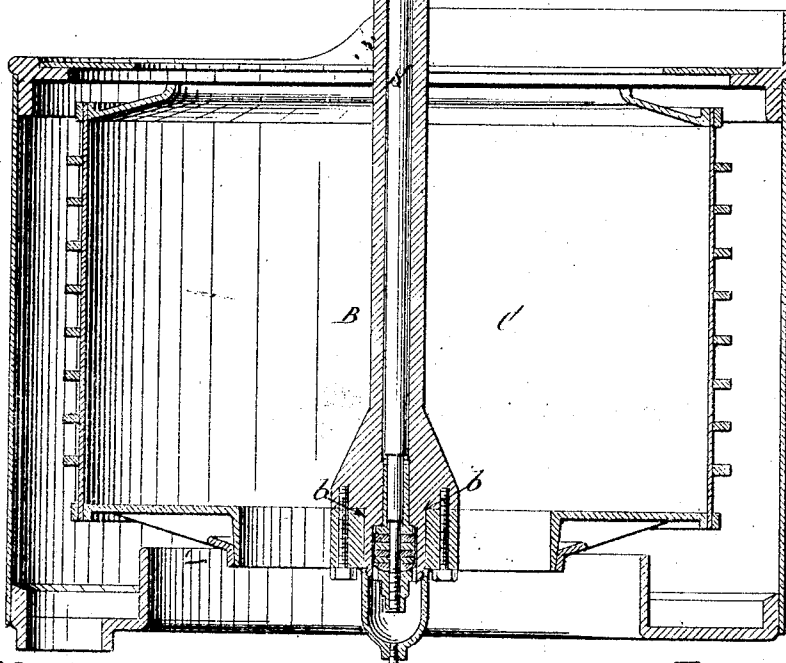


Fig. 1.



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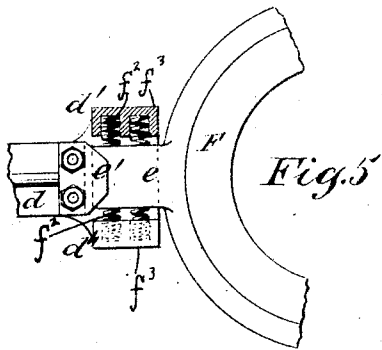
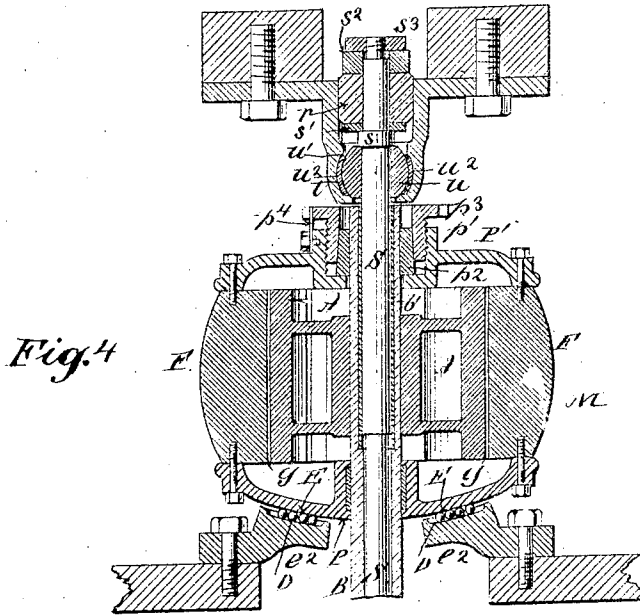
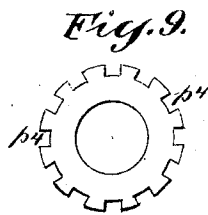


Fig. 6.



Fig. 7.

Fig. 8.



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UNITED STATES PATENT OFFICE.

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MOUNT FOR ELECTRIC MOTORS.

1,059,930.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GEORGE DINKEL, a citizen of the United States, residing in Jersey City, Hudson county, and State of New Jersey, have invented certain new and useful Improvements in Mounts for Electric Motors, of which the following is a specification sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

This invention comprises a novel construction and arrangement for the purpose of securing a durable and efficient means for electrically driving the suspended oscillatory shaft of a centrifugal machine, by means of any appropriate form of electric motor, without in any way interfering with the normal action of the shaft and its load, and without causing undue stress or strain on any part of the apparatus.

In the accompanying drawings I have shown my invention specifically applied to that type of centrifugal machine known as the compound-shaft or double-spindle machine, although it will be understood that I do not limit myself to the particular form or arrangement of the parts shown in the drawings, or to the application of the invention to this particular type of machine.

In the drawings Figure 1 is a vertical sectional view of a complete compound-shaft machine, equipped with an ordinary form of electric motor so as to embody one form of my invention. Fig. 2 is a plan view in section on the plane indicated by line 2—2 of Fig. 1. Fig. 3 is a similar view on the plane indicated by line 3—3 of Fig. 1. Fig. 4 is a vertical sectional view illustrating another of the forms under which my invention may be embodied. Fig. 5 is a detail view showing a modified form of device for yieldingly preventing rotation of the non-rotatable member. Figs. 6, 7 and 8 are detail views of the sectional washers employed for centering the field-magnet, or non-rotatable element. Fig. 9 is a plan view of the spanner nut forming part of the centering device.

The outside casing and the basket C, which carries the load, being of any ordinary usual construction, require no particular description. Where as in this instance a hollow shaft carried by a spindle is used, the basket C is secured to the hollow shaft B by suitable

bolts engaging the enlarged head *b* at the lower end of said member. The spindle S, which is supported near its upper end by means of a ball-like bearing head *u* supported in a socket *u'* formed in the hanger U, the socket being provided with a concave spherical bearing surface to engage the convex spherical bearing surface of the ball, so as to permit a free oscillation of the shaft laterally. This bearing may be provided with pieces of Babbitt metal *u*². The spindle S in this instance is shown as provided with a retaining or supporting collar *s* secured to it above the bearing head. A rubber block *r* is slipped over the upper end of the spindle and into the upper portion of the socket to afford a yielding and elastic resistance to the swaying movement of the spindle. This yielding block is clamped between two washers *S'* and *S*² which are caused to clamp it tightly by means of the nut *S*³. To the rotary shaft is secured the rotating member A of an electric motor, the rotation of which causes the shaft and the basket C to rotate in order to secure the necessary centrifugal action upon the contents of the basket.

Inasmuch as the weight of the field magnets, comprising the non-rotatable member F of the motor, and its necessary adjuncts, would, if carried by the spindle below its center of oscillation, form a very considerable addition to the weight of the basket, I have arranged the parts so as to relieve the spindle of this additional load below its center of oscillation in order to avoid the considerable strain at that point.

In the form of my invention illustrated in the drawings, this is accomplished by providing a supporting yoke having arms projecting radially outward and extending into the horizontal plane of the motor in position to support the non-rotatable member F concentrically with and in proper operative relationship to the rotatable member A. In the form shown in Fig. 1, the field-magnet is shown as being provided with a series of projecting bearing lugs *e*, whose bearing surfaces are concentric with the center of oscillation of the shaft, said lugs being seated in hollow spherical bearing surfaces E formed in the arms *d* of the yoke D. These bearing surfaces E are of sufficient extent to allow the free play or oscillation of the lugs *e* therein and said lugs are held in close en-

gagement with the bearing surfaces E by means of cap plates e' bolted to the arms. Where, as in this form, the non-rotatable member has a movable engagement with the yoke, it will be necessary to provide means for transmitting the movement of the oscillating shaft to the outside member F, which I may term the stator. This is accomplished by means of an upper spider P' and a lower spider P, which form a bridge or connection with the oscillatory shaft, and the spider both above and below the motor. Referring now to the details of construction of these connecting spiders P, P', it will be seen that they are provided with central recesses which are apertured to permit the shaft to pass through, said recesses being provided with conical collar for bushings, which are split to permit adjustment, said bushings being engaged by conical clamping nuts p^3 which have a screw-threaded engagement with the recesses p, p' . These adjusting nuts or caps p^3 are shown as provided with notched flanges constituting a sort of spanner nut. The accidental turning of the spanner nut is prevented by means of dogs or detents p^4 secured to the bridge pieces or spiders P, P' in position to engage the notches formed in the spanner nuts. Obviously by screwing up the spanner nuts p^3 , the split bushings will be pressed into as close an engagement with the sleeve B as may be desired. This construction and arrangement permit an accurate centering of the field-magnet, or stator.

In order to avoid a sudden torsional stress or strain upon the parts, I have provided a series of springs c , one end of each spring being secured to projecting lugs, or eye-bolts, on the stator, and the other end being secured to similar devices formed on the yoke arms d . These springs are arranged in pairs as shown in Figs. 2 and 3 so that their normal action is to return the stator to a uniform position while allowing it to yield slightly in a rotary direction under the sudden stress of starting, or other sudden strain. Moreover, these distensible or elastic retaining means serve to prevent the rotation of the stator without in any way interfering with its free oscillation. Of course this result may be accomplished in a variety of different ways, one of which is shown also in Fig. 5, in which the yoke arm d is shown to be provided with lateral flanges d' forming a box f^1 in which are seated compression springs f^2 instead of contractile springs such as are shown in Figs. 2 and 3.

While in the form shown in Fig. 1 the sustaining yoke D is shown as comprising arms d radiating from the hanger U, it will be understood that this arrangement may be modified in a variety of ways. For example, in Fig. 4 I have shown the lower connecting plate provided with a convex spheri-

cal bearing surface supported upon a series of bearing balls e^2 resting in an annular spherical track formed in a supporting yoke or bracket arranged beneath the plane of the motor. In both these cases, as in other variations, it will be observed that the weight of the stator and its accessory parts, does not bring any additional weight upon the shaft below the center of oscillation, which is the point aimed at. It will also be observed that by the arrangement described, the engagement by which the motion of the oscillatory shaft and basket is communicated to the stator F, is of considerable extent, thus preventing the application of severe lateral stress at a single point on the shaft.

As both the rotor and the stator members of the motor have a universal-joint-support to permit their lateral oscillation about a common center in all directions, it is obvious that a proper operative relationship will always be preserved between the two parts of the motor, thus securing the highest efficiency in driving the machine.

Without attempting to indicate all the modifications in form, construction and arrangement that may be made in the practice of my invention, or all the uses to which it may be applied, what I claim is:—

1. The combination of a shaft supported by a universal joint, an electric motor comprising a rotatable and a non-rotatable member, one of which is connected with the shaft to rotate the same, the other member being supported by another universal joint, substantially as described.

2. The combination of a shaft supported by means of a universal joint, an electric motor whose rotor is connected with the shaft to rotate the same and whose stator is supported by another universal joint whose center of oscillation is concentric with that of the universal joint supporting the shaft, substantially as described.

3. The combination of a shaft supported by a universal joint, an electric motor the rotor of which is attached rigidly to said shaft and the stator of which is formed with bearing surfaces which are concentric with said universal joint, and stationary concentric supports for engaging said concentric bearing surfaces upon the stator for the purpose and substantially as set forth.

4. The combination of a spindle supported by a universal joint, a hollow shaft supported upon said spindle, an electric motor the rotor of which is attached rigidly to said shaft and the stator of which is formed with bearing surfaces which are concentric with the said universal joint and stationary concentric supports for engaging said concentric bearing surfaces upon the stator, for the purpose and substantially as set forth.

5. The combination of a shaft supported

by a universal joint, an electric motor the rotor of which is attached rigidly to said shaft and the stator of which is formed with bearing surfaces which are concentric with the said universal joint, stationary concentric supports engaging said concentric bearing surfaces upon the stator and means for positively limiting the rotative play or extent of motion of said stator, substantially as and for the purpose set forth.

6. The combination of a shaft supported by a universal joint, an electric motor the rotor of which is attached rigidly to said shaft and the stator of which is formed with bearing surfaces which are concentric with the said universal joint, stationary concentric supports engaging said concentric bearing surfaces upon the stator, and springs interposed between the stator and stationary parts of the apparatus in such manner as to tend constantly to hold and maintain the stator in its normal position, substantially as and for the purpose set forth.

7. The combination of a shaft supported by a universal joint, an electric motor the rotor of which is attached rigidly to said shaft and the stator of which is formed with bearing surfaces which are concentric with the said universal joint, stationary concentric supports engaging said concentric bearing surfaces upon the stator, springs interposed between the stator and stationary parts of the apparatus and tending constantly to retain the field in its normal position, and means for positively limiting the extent of motion of the stator, substantially as and for the purpose set forth.

8. The combination of a centrifugal machine embracing a rotary oscillatory shaft, an attached basket, the rotary element of an electric motor secured directly to said shaft, a non-rotatable motor element supported to oscillate in constant relation with respect to said rotatable element, the support for said non-rotatable element comprising a series of supporting arms projecting outwardly from above the center of oscillation and extending downwardly to the plane of said electric motor.

9. The combination of a shaft supported by a universal joint, an electric motor the rotor of which is attached rigidly to said shaft and the stator of which is formed with bearing surfaces which are concentric with the said universal joint, stationary concentric supports engaging said concentric bearing surfaces upon the stator, and centralizing plates on the stator, said centralizing plates being provided with split conical bushings for engagement with the shaft, and with means for adjusting said split conical bushings, substantially as and for the purpose set forth.

10. The combination of a spindle supported by a universal joint, a hollow shaft

supported by said spindle, an electric motor the rotor of which is rigidly attached to said hollow shaft, and the stator of which is formed with bearing surfaces which are concentric with said universal joint, stationary concentric supports for the stator and adjustable means for centralizing the stator about the shaft and with relation to the rotor, for the purpose set forth.

11. The combination of a shaft suspended by means of a universal joint, an electric motor the rotor and the stator of which are provided with connections to cause them to oscillate with said shaft, adjustable means for centralizing the stator with relation to the shaft, and springs interposed between the stator and stationary parts of the apparatus, said springs tending by their action to retain the stator in its normal position, substantially as described.

12. The combination of a spindle supported by a universal joint, a hollow shaft supported on said spindle, an electric motor the rotor of which is rigidly attached to said hollow shaft, and the stator of which is formed with bearing surfaces which are concentric with said universal joint, stationary concentric supports for engaging said concentric bearing surfaces upon the stator, adjustable means for centralizing the stator upon the shaft and with relation to the rotor, and means for positively limiting the extent of rotary movement of said stator, substantially in the manner set forth.

13. The combination of a spindle supported by a universal joint, a hollow shaft supported on said spindle, an electric motor the rotor of which is rigidly attached to said hollow shaft and the stator of which is formed with bearing surfaces which are concentric with said universal joint, stationary concentric supports for engaging said concentric bearing surfaces upon the stator, adjustable means for centralizing the stator about the shaft, and with relation to the rotor, springs interposed between the stator and stationary parts of the apparatus and tending constantly to retain the stator in its normal position, and means for positively limiting the extent of motion of said stator, for the purpose and substantially as set forth.

14. In a direct driven centrifugal machine the combination with a suspended oscillatory rotary basket, a suspended oscillatory motor whose armature has direct driving connection with said basket, supporting arms extending from a plane above the center of oscillation downward to engage and support the oscillatory field of the motor, substantially as described.

15. The combination of an oscillatory centrifugal machine embracing a rotary shaft suspended by a universal joint, an electric motor comprising rotary and non-rotating

elements both having oscillation about the center of said universal joint, the rotary member being secured directly to said shaft by which it is supported, and a support for said non-rotating element comprising a spider with radiating arms extending from a plane above said universal joint to a plane below said universal joint adjacent to the said motor, substantially as described.

10 16. In a direct-driven centrifugal machine the combination with a fixed hanger of an oscillatory rotatable basket-shaft suspended from a bearing socket formed in said hanger, a direct-connected motor whose rotor element is secured to said shaft and whose stator element has an oscillatory non-rotary bearing support in said hanger, a connecting bracket secured to the stator and having rotary bearing engagement with the rotary

basket shaft above the motor, substantially as described. 20

17. In a centrifugal machine the combination of the supporting hanger, the oscillatory rotary basket shaft suspended from a bearing rocket formed in said hanger and its basket secured thereto, a direct-connected motor whose stator element has oscillatory bearing support in said hanger, upper and lower brackets secured to the stator and provided with co-axial bearings for said rotary shaft, the rotor element of said motor being secured to said shaft between said bearings in the brackets, substantially as described. 25 30

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