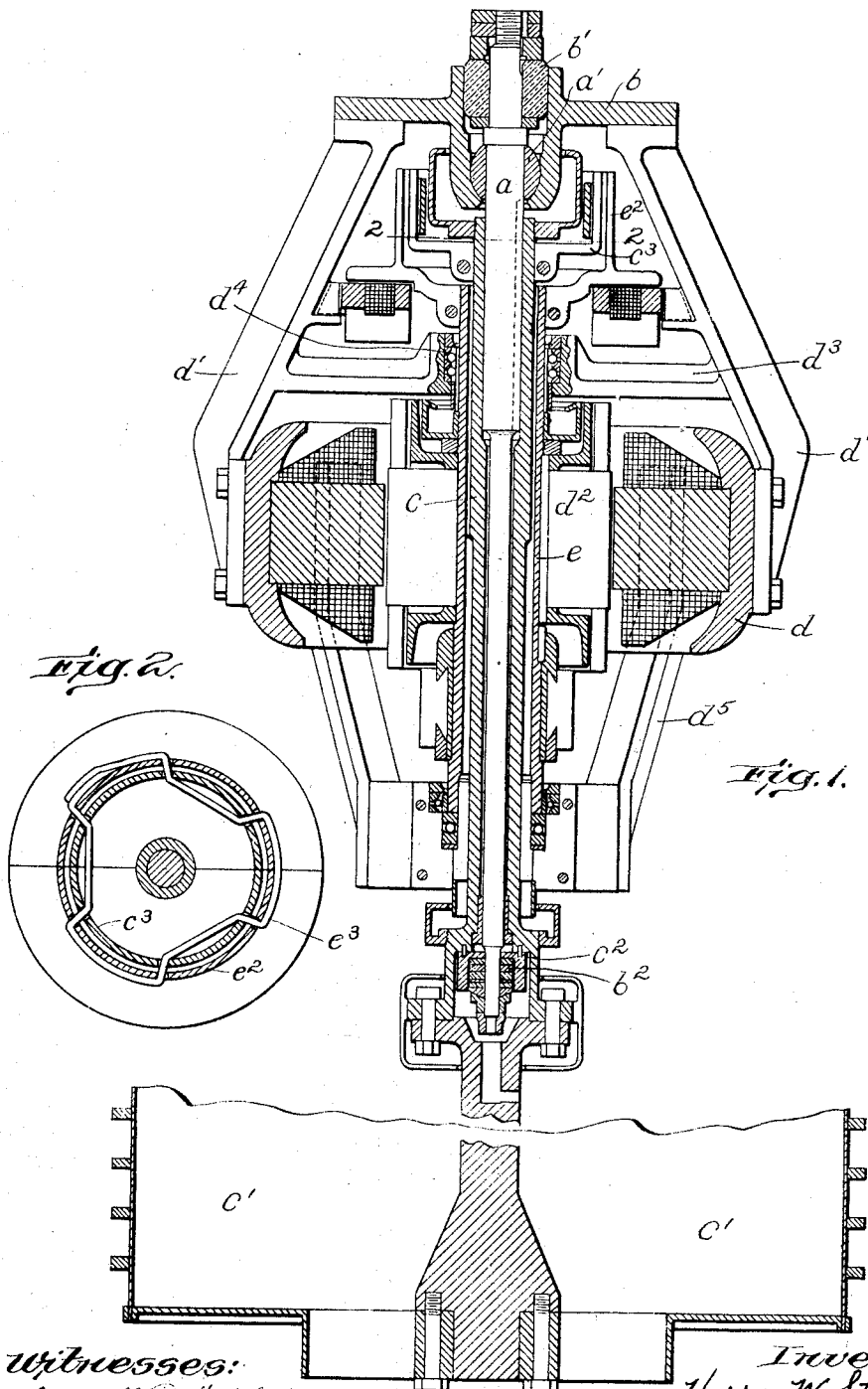


H. W. STURGES.
 MEANS FOR SUPPORTING CENTRIFUGAL MACHINES.
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Patented Nov. 12, 1912.



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UNITED STATES PATENT OFFICE.

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MEANS FOR SUPPORTING CENTRIFUGAL MACHINES.

1,044,287.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HARRY W. STURGES, citizen of the United States, and resident of Cambridge, county of Middlesex, Massachusetts, have invented certain new and useful Improvements in Means for Supporting Centrifugal Machines, of which the following is a specification.

This invention relates to centrifugal machines and more particularly to that class of centrifugal machines in which a suspended oscillatory basket-carrying shaft is arranged to be driven by means of a direct-connected electric motor.

In experimenting with various forms of direct-connected electrically driven centrifugal machines I have discovered that one of the principal difficulties experienced is due to the flexing or bending of the oscillatory shaft just sufficient to cause an undue heating of the bearings surrounding said shaft and forming part of the connection with the electric motor.

The present invention consists in a novel arrangement and construction of parts whereby this and other difficulties are obviated.

In the accompanying drawings I have illustrated one form of embodying the principle of this invention, Figure 1 thereof being a vertical elevation chiefly in central section. Fig. 2 is a cross sectional view on plane 2—2 Fig. 1 showing the flexible connection between the oscillatory and the non-oscillatory shafts.

According to the practice of my invention as illustrated in the drawings, I provide an oscillatory spindle *a* secured to and suspended from a bearing ball *a'* resting in the socket portion of the principal or fixed hanger *b* which may be provided with the usual rubber buffer *b'* to oppose a yielding resistance to the oscillation of the shaft of the spindle to center the same.

Surrounding the spindle *a* and rotatably supported thereby is a quill or basket-carrying shaft *c* to whose lower end is connected the basket *c'* in any suitable manner. As herein shown this rotary basket shaft is comprised of upper and lower sections, the lower portion of the upper section being provided with a bearing seat indicated at *c²* resting upon a series of anti-friction bear-

ing washers *b²* carried by the spindle. Although it will be understood that any suitable method of suspending the basket-carrying shaft may be employed so long as the same is suspended in effect from an overhead universal joint to permit a limited oscillation on all sides.

The electric motor for driving the basket shaft may be of any suitable type adapted to this class of work and hence the details of its construction form no part of this invention, since the invention consists particularly in the principle of arrangement by which any suitable motor is combined with an overhung centrifugal machine for the purpose of driving the same through direct connection. In this case the non-rotatable or field member *d* of the motor is suspended by means of brackets, hangers or arms *d'* extending down from the main hanger *b*. The armature or rotary member *d²* of the motor is mounted upon a hollow shaft *e* which is rotatably supported in upper and lower bearings located in portions of the downwardly extending frame or hangers *d'*. In this instance the depending hanger frame *d'* is provided with a transverse bridge piece *d³* formed with a bearing recess *d⁴* adapted to receive an anti-friction or other suitable form of bearing. The weight of the shaft *e* is supported in a bearing in a downward extension *d⁵* of the hanger frame *d'*. By such a construction and arrangement the hollow drive shaft *e* is supported and held firmly against lateral or oscillatory movement while it is permitted entire freedom of rotation. The hollow shaft *e* is made of sufficiently large internal diameter to give a substantial clearance space between its inner surface and the outer surface of the suspended oscillatory shaft which carries the basket.

For the purpose of imparting rotary motion from the drive shaft *e* to the basket-carrying shaft, any suitable form of connection may be employed. I have in this instance shown the basket-carrying shaft as provided with a flanged spider or hub *c³* and a similar spider or hub of larger diameter is secured to the hollow drive shaft *e* as indicated at *e²* so as to surround or lie opposed to the spider *c³*. A sufficient clearance is left between the two flanged spiders

to permit the inner one to rock or oscillate slightly inside the other. The flange of each spider is provided with a series of vertical slots and the driving connection between them is made by means of a piece of belting 5 *e*³ passed through the opposed vertical slots of the respective hangers in the manner indicated in Fig. 2. This belting gives sufficient flexibility to permit the slight degree of oscillation required for the inner spider 10 and at the same time causes the rotary movement of the outer spider to be imparted to the inner spider and to the oscillatory basket shaft.

One feature of my invention consists in disposing this flexible connection between the drive shaft and the basket shaft in a plane between the motor and the center of oscillation or the universal joint, this arrangement being preferred because at that point the oscillatory movement of the basket shaft in relation to the drive shaft is less than would be the case if the connection was made below the motor.

It will also be observed that by this construction and arrangement the entire weight of both elements of the motor, as well as the frame in which they are suspended, is carried independently of the universal joint so that the universal joint is relieved of the entire weight of all motor parts and hangers. This independent suspension of the entire motor lessens the tendency of the suspended shaft to spring from the straight line and also lessens the tendency of the universal joint to become heated when the machine is in operation.

It will be understood that various modifications of the details of arrangement and construction are possible in the practice of the principle of this invention.

Without attempting to set forth or indicate the various changes in form, construction and arrangement that may be made in the practice of my invention, what I claim is:—

1. In a centrifugal machine the combination of the rigid motor-supporting frame provided with stationary bearings, the hollow motor shaft mounted therein, a rotary basket-carrying shaft suspended to hang through said hollow shaft by means of a universal joint located above and independently of the motor shaft, and connecting means forming a flexible driving connection between said motor shaft and said rotary basket-shaft adjacent to the universal joint, substantially as described.

2. In a centrifugal machine the combination of the rotary basket-carrying shaft suspended from a fixed overhead supporting hanger by means of a universal joint to permit oscillation of the shaft on all sides, a hollow rotary non-oscillating drive shaft 65 mounted to surround the upper portion of

said rotary shaft, and means for flexibly connecting the hollow drive shaft with the rotary basket-shaft to rotate the basket without preventing its oscillation, the connecting means being located above the hollow drive shaft adjacent to the universal joint, substantially as described. 70

3. In a centrifugal machine the combination of a fixed overhead support, two concentric hollow shafts separated by an annular clearance space, the outer shaft being rotatably mounted in fixed bearings and the inner shaft being supported by an oscillatory spindle suspended from said fixed support by a ball and socket joint, a basket 80 secured to the lower end of the inner shaft, and means for flexibly connecting the outer shaft with the inner shaft to rotate the same, substantially as described.

4. In a centrifugal machine the combination of the two concentric hollow shafts, the outer shaft being mounted to rotate in a fixed bearing, the inner shaft being suspended by an overhead universal joint to hang through the outer shaft without contact therewith and to oscillate therein, a basket secured to the lower end of the inner shaft, an outwardly projecting spider or hub being secured to the upper end of each of said shafts, and a flexible lashing for 95 connecting said spiders while permitting the oscillation of one relative to the other, substantially as described.

5. In a centrifugal machine the combination of an electric motor secured to a tubular shaft mounted in stationary bearings, a concentric basket-carrying shaft suspended by a universal joint from a fixed hanger above the plane of the motor, and means for flexibly connecting the basket-carrying shaft 105 with the tubular motor shaft to rotate the former, said connection being formed above the plane of the motor, substantially as described.

6. In a centrifugal drive, the combination with a hanger, of a non-rotatable spindle having a gyration bearing in said hanger, a hollow shaft embracing said spindle and having a step or thrust bearing thereon, a basket shaft coupled to said hollow shaft, a motor, the rotatable element of said motor being non-gyratory and embracing said hollow shaft and spindle, and a flexible coupling between said rotatable motor element and said hollow shaft. 120

7. In a centrifugal drive, the combination with a base or support, of a hanger supported thereby, a gyratory spindle supported by said hanger, a hollow shaft embracing said spindle and having a step or thrust bearing on said spindle, a basket shaft secured to said hollow shaft, a sleeve embracing said hollow shaft, a yoke or bracket supported by said base member, a bearing member secured to said yoke or 130

bracket, said sleeve having a bearing in said bearing support, said sleeve embracing said hollow shaft and carrying the rotatable element of a motor, the fixed motor element being supported by said yoke or bracket.

8. In a centrifugal drive, the combination with a hanger, of a gyratory shaft supported thereby, an electric motor, the motor elements being non- gyratory, a hollow shaft embracing said gyratory shaft, a coupling between said hollow shaft and the rotatable motor element, and a solid basket shaft coupled to said hollow shaft and extending below said gyratory shaft.

15 9. The combination with a hanger, of a gyratory shaft supported thereby, a hollow shaft surrounding said gyratory shaft, an electric motor, the motor elements being non- gyratory, a coupling between the rotating motor element and said hollow shaft,

said gyratory and hollow shafts extending freely through the rotatable motor element.

10. The combination with a hanger, of a gyratory shaft supported thereby, a hollow shaft surrounding said gyratory shaft, 25 an electric motor, the motor elements being non- gyratory, a coupling between the rotating motor element and said hollow shaft, said gyratory and hollow shafts extending freely through the rotatable motor element, 30 and a basket shaft coupled to said hollow shaft and extending below said gyratory shaft.

In witness whereof, I have hereunto set my hand, this 28th day of June 1906.

HARRY W. STURGES.

In the presence of—

COMFORT A. ADAMS,
GEO. H. GODDARD.