No. 812,024. PATENTED FEB. 6, 1906.

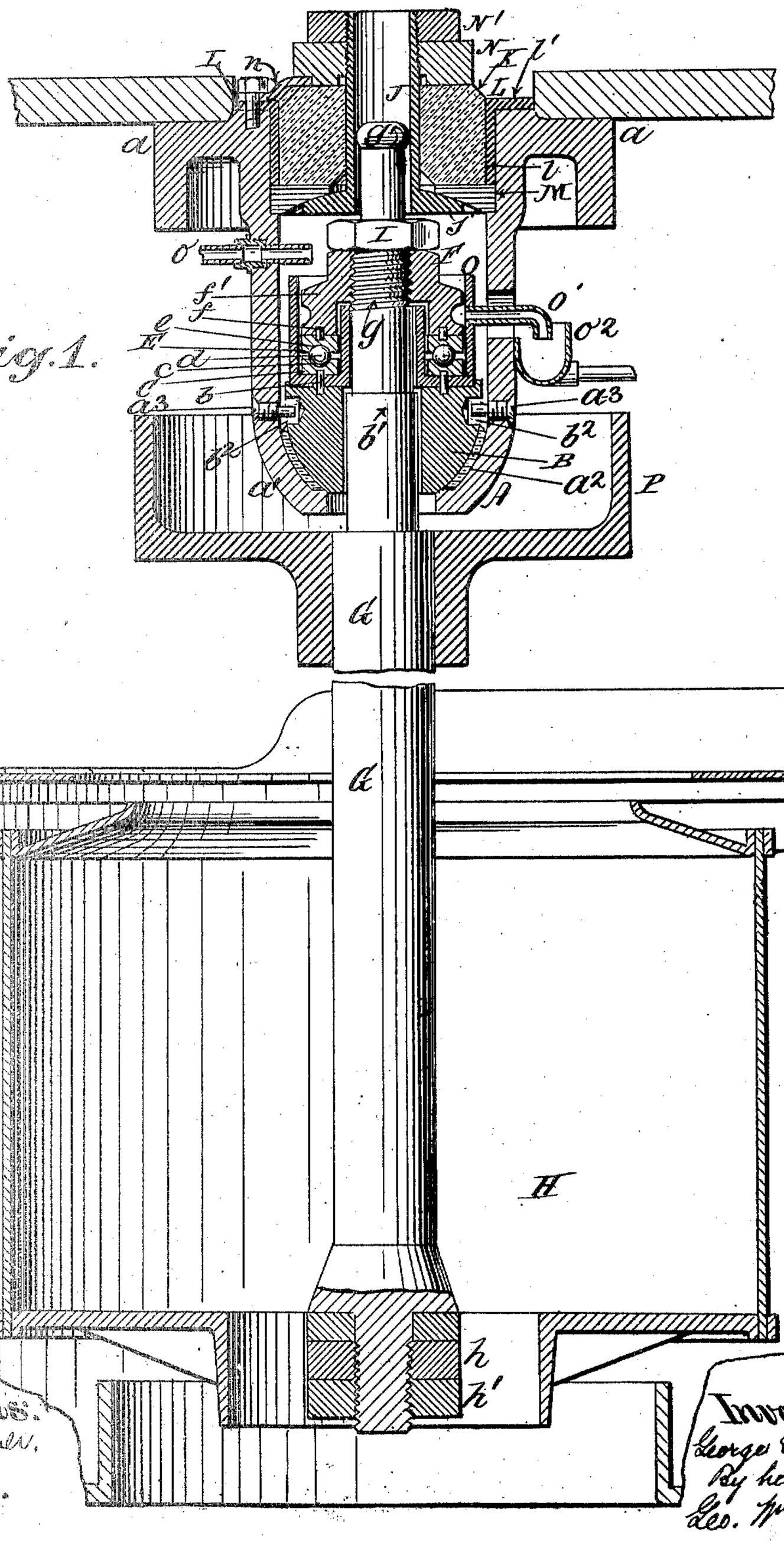
G. DINKEL.

MEANS FOR HANGING OVERDRIVEN CENTRIFUGAL MACHINES.

APPLICATION FILED JAN. 27, 1904.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

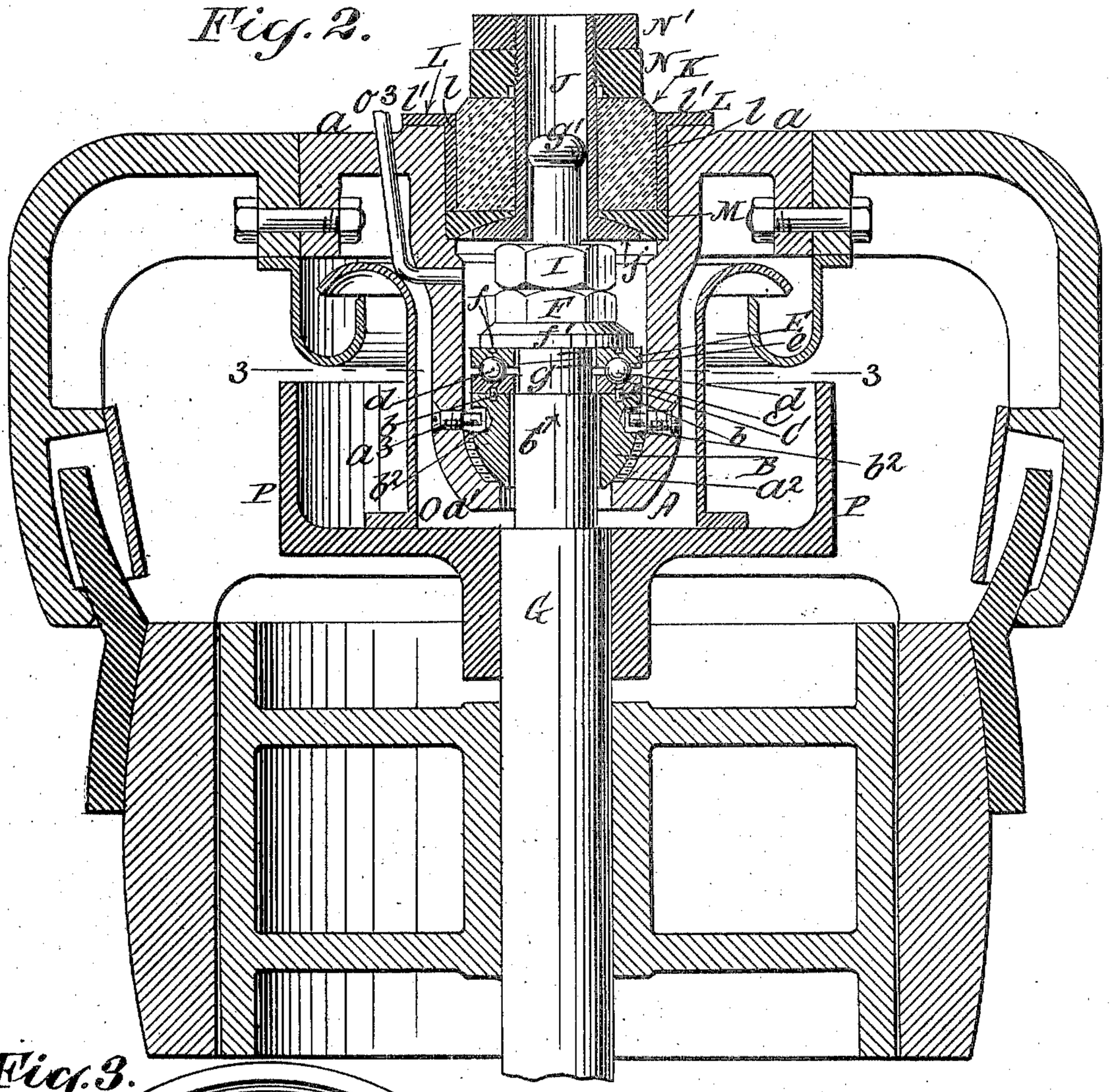


Fig. 3.

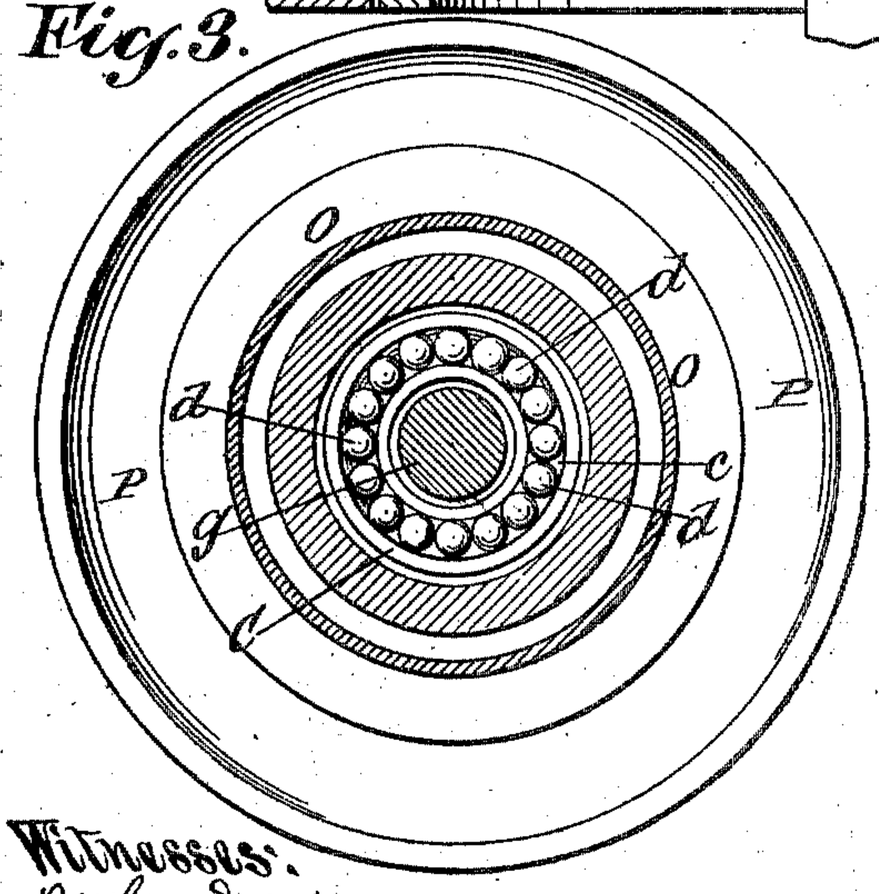
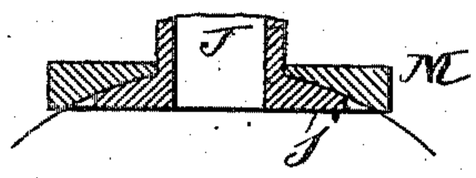
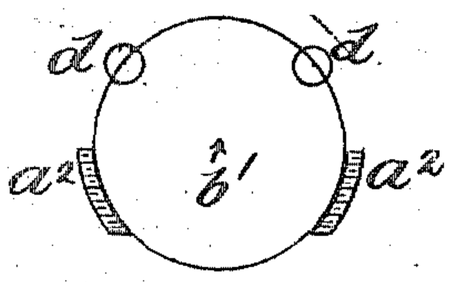


Fig. 4.





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UNITED STATES PATENT OFFICE.

GEORGE DINKEL, OF JERSEY CITY, NEW JERSEY.

MEANS FOR HANGING OVERDRIVEN CENTRIFUGAL MACHINES.

No. 812,024. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed January 27, 1904. Serial No. 190,803.

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 Means for Hanging Overdriven Centrifugal Machines, 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.

My invention relates to centrifugal machines hung and driven from above. Heretofore in apparatus of this character the basket has been secured to a rotatable hollow sleeve or shaft supported upon a non-rotatable spindle hung from an elevated bearing which admitted of slight lateral swing or deviation from the vertical or plumb, the lower end of the rotatable sleeve resting upon washers composed alternately of steel and composition, seated upon the lower end of the non-rotatable spindle and constituting the bearing upon which the basket and hollow spindle rotated.

The main object of my invention is to afford practicable means whereby the primary central supporting spindle or shaft, having the centrifugal basket attached directly thereto, may be rotatably mounted and controlled, thus dispensing entirely with the secondary hollow shaft and its attendant complications and simplify and cheapen the structure as a whole. Incidentally I aim to reduce frictional resistance by substituting rolling surfaces for sliding surfaces as a means of rotatable support for the spindle.

My invention consists, primarily, in the use of a single, preferably solid, rotatable shaft or spindle supported upon a so-called "ball-and-socket" or universal joint, which allows the rotatable shaft, to the lower end of which the basket is rigidly attached, to adapt itself within certain prescribed limits to gyratory motion or any lateral play or deviation of its longitudinal axis from the perpendicular during use.

My invention includes certain specific means for counteracting the tendency to lateral oscillation on the part of the rotatable spindle and for centralizing the same by resilient pressure. This has been accomplished in connection with a non-rotatable spindle supporting a rotatable sleeve hereinbefore referred to; but no practicable manner has heretofore been devised, so far as I am aware, for thus controlling and centralizing a rotatable spindle, so that this feature of my invention is a distinguishing and important one and contributes largely to the successful employment and operation of the single solid rotatable shaft. In this connection my invention may be said to consist, essentially, in fixedly and independently supporting the resilient buffer heretofore attached to the upper end of the non-rotatable spindle and in providing such buffer with a central bushing or sleeve in which the upper end of the rotatable shaft travels in such manner that the resilient buffer tends constantly to centralize the shaft without interfering with the rotation thereof, as hereinafter set forth.

Another feature of my invention is the interposition between the supporting universal joint and the rotatable spindle of antifriction-rollers upon which the rotatable spindle travels, said antifriction-rollers being arranged concentrically with relation to the center of support. Incidentally in this connection my invention embraces the idea of hanging the rotatable spindle from a central point with which all bearing-surfaces are concentric, as hereinafter set forth.

Finally, my invention comprehends certain other features in the construction and arrangement of parts hereinafter described and claimed specifically.

In the accompanying drawings, Figure 1 is a sectional elevation of an overdriven centrifugal hung according to my invention; Fig. 2, a similar view of a modified form of hanger, the basket being omitted. Fig. 3 is a horizontal section upon plane of line 3 3, Fig. 2. Fig. 4 is a diagram illustrating the concentricity of the bearing-surfaces.

A is a socket piece or hanger secured by its flange a to any suitable stationary elevated support and formed at its lower extremity with a semiglobular bearing cup or socket a', provided with a lining a^2 of Babbitt metal or other antifriction composition. Resting in this concave bearing-surface a^2 is a hemispherical bearing B, supporting an annular plate C, formed on its upper side with the annular groove c for the reception of antifriction-rollers d d, which in turn support the annular plate E, formed on its under side with the annular groove e, fitting over the said antifriction-rollers d d. The lower annular plate C is keyed to the hemispherical bearing B by one or more pins b b or otherwise held against rotation thereon, and in like manner the upper annular plate E is keyed by studs f or other-

wise secured to the bearing-nut F. The bearing-nut F engages with the male screw-thread *g*, formed on the rotatable spindle G, and thereby suspends the latter through the medium of the annular plate E upon the antifriction-rollers *d d*. The drawings show the bearing-nut F as formed with a flange *f'* on its lower side, so that the said nut rests upon and is connected directly with the upper annual plate E, although obviously the flange *f'* may consist of a separate piece or washer keyed or otherwise secured to the nut F without departing from the spirit and intent of my invention in this respect, which contemplates in a broad sense the suspension of the rotatable shaft or spindle G upon a rotatable bearing seated upon the hemispherical bearing B. The roller-bearing herein shown is a preferred means of support for the spindle G, although other forms may be substituted, if found expedient, with substantially the same result.

The rotatable spindle G is preferably, though not necessarily, made solid to afford the maximum of strength with the minimum of area in cross-section. To its lower extremity is rigidly secured the basket H, held in place upon the threaded end of the spindle G by jam-nuts *h h'*. A jam-nut I is also employed at the upper end of the spindle to lock the bearing-nut F in place. The extreme upper end of the spindle G extends above the position of the nut-lock I and is preferably formed with an annular knob or bearing *g'* for engagement with the inner sides of the sleeve-bushing J.

A centralizing rubber or equivalent buffer K surrounds the lower portion of the sleeve-bushing J, being confined between it and the cylindrical sides *l* of a gland L. The latter has a top flange *l'*, by which it is secured to the flange *a* of the hanger A. A bearing-plate M rests between the lower edge of the gland L and the flange *j* on the lower end of the sleeve-bushing J and acts as a floor-support for the buffer medium K, the under side of which latter is held in place by nuts N N', engaging with a screw-thread formed on the upper end of the bushing J. The buffer K is held against turning in its socket by compression and frictional contact, the nut N being held by a bolt *n* against rotation on the bushing J. The sleeve-bushing J protects the resilient medium from actual contact with the rotary spindle G without retarding the rotation of the latter or impairing the utility of said resilient medium in controlling and centralizing the spindle by counteracting or compensating for lateral play or variation of the longitudinal axis of the spindle from its true vertical line of rotation. The upper surface of the bushing-flange *j* is convex and concentric with the center *b'* of the hemispherical bearing B, and the under surface of the bearing-plate M is concave and concentric with said center *b'* of the hemispherical bearing B, so that the opposed surfaces of the bearing-plate M and flange *j* are adapted to slide over and upon each other.

P is the usual power or brake pulley.

The shaft or spindle G is rotated by power applied in any appropriate manner, as by belts or pulleys, gearing, and electric motor having its rotor attached to the spindle G and its stator supported in concentric bearings, as set forth in my application, Serial No. 114,358, filed July 5, 1902, as indicated in outline in Fig. 2, or by any mechanical expedient which may be available.

Provision is made for submerging the bearing of rotation in a lubricant by any suitable means, as by an oil-cup O, shown in Fig. 1 as attached directly to the hemispherical bearing B, the said cup containing and inclosing the annular plates C E and antifriction-rollers *d d*, the oil being fed through the hanger A by a pipe *o* and the overflow escaping through pipe O' into a receiver o^2. In Fig. 2 the oil-cup O is external, and the oil is fed into the hanger A as by pipe o^3 and works through the bearings into the said cup O.

The hemispherical bearing B is formed with one or more recesses b^2 occupying a horizontal plane with the center *b'* when the parts are at rest, as in the drawings. Projecting into each of these recesses b^2 is a stationary stud a^3, preferably formed by the extension of a screw in the side of the hanger A. Thus the oscillation of the bearing B upon its seat a^2 is restricted within prescribed limits in all directions, and any tendency of the bearing to yield or rotate with the spindle G is counteracted. This limited degree of oscillation is sufficient for all practical purposes, since very slight play or clearance between the sides of the recess b^2 and the stud a^3, owing to their proximity to the hemispheric center of support *b'*, will allow considerable deviation of the spindle G from the vertical or plumb.

By reference to Fig. 4 it will be seen that all the bearings are concentric with the point or center *b'* of the hemispherical bearing B, upon which center *b'* the rotatable spindle is practically suspended and which may be designated the "hemispheric" point of suspension, so that the said spindle G can freely and with the minimum degree of friction adapt itself within the limits prescribed to the gyratory or swinging motion caused by centrifugal force, owing to any variation of the center of gravity in the basket. Such vibrations are, however, immediately met and counteracted by the resilient buffer K, which by reason of the engagement of the bushing J with the upper end of the spindle G tends constantly to restore said spindle to and maintain it in its normal position with its longitudinal axis in a vertical line.

It will be seen that by my present invention the bearing upon which the spindle and

basket rotate is above the point of support of the basket instead of below the same and that I am thus enabled to dispense with a secondary hollow rotatable sleeve or spindle and to apply power directly to a single central rotatable spindle or shaft which may be made solid—an advantage of practical importance in actual construction and use. In other words, I obviate the necessity for a stationary supporting shaft or hanger, and thereby simplify and cheapen the construction of the apparatus while increasing its efficiency. Furthermore, by rotating the shaft and basket upon a ball-bearing (although I do not necessarily restrict myself thereto) in lieu of the disk-bearings heretofore used I greatly reduce the resistance to be overcome by the power applied and render the operation of the apparatus more smooth and regular.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a centrifugal apparatus, the combination of a universal joint, a bearing supported upon and supplemental to said universal joint above the hemispherical center thereof, a spindle suspended upon said universal joint and rotatable upon said bearing, the suspension of said spindle being directly on said bearing, and means receiving the upper end of the spindle and forming a support for a buffer.

2. In a centrifugal apparatus, the combination of a universal joint, a bearing supported upon and supplemental to said universal joint above the hemispherical center thereof, a spindle suspended upon said universal joint and rotatable upon said bearing, the suspension of said spindle being directly on said bearing, and means receiving the upper end of the spindle and forming a support for a buffer, and a resilient buffer through which said means passes, said buffer constructed to centralize the shaft without interfering with its rotation.

3. In a centrifugal apparatus, the combination of a universal joint and a roller-bearing above the same, a spindle suspended upon said universal joint and rotatable upon said bearing, said bearing being supplemental to and disposed above the hemispheric center of said universal joint, means receiving freely the upper end of said spindle, means engaging said spindle between said bearing and said first-mentioned means, and a buffer surrounding and supported by said first-mentioned means.

4. In a centrifugal apparatus, the combination of an antifriction-bearing and a universal joint, a spindle suspended upon said universal joint and directly rotatable upon said bearing, said bearing being supplemental to and supported on said universal joint above the hemispheric center thereof, a resilient buffer around the upper end of the said spindle for centralizing the same, means surrounding the upper end of said spindle and extended through said buffer, and means fixed relatively to said universal joint to limit the movement of the hemispheric bearing.

5. In a centrifugal apparatus, the combination of an antifriction-bearing and a universal joint, a spindle suspended upon said joint and directly rotatable upon said bearing, said bearing being supplemental to and supported on said universal joint above the hemispheric center thereof, a resilient buffer around the upper end of said spindle for centralizing the same, means surrounding the upper end of said spindle and extended through said buffer, and means coöperating with the hemispherical bearing and disposed at right angles to the length of the spindle to restrict the oscillation of said bearing and to counteract its tendency to rotate with the spindle.

6. In a centrifugal apparatus the combination of a spindle suspended upon a universal joint and rotatable upon a bearing supported upon said universal joint above the hemispheric center thereof, said bearing of rotation and said universal joint, a resilient buffer surrounding the end of said rotatable spindle above its center of suspension, a bushing interposed between said upper end of the spindle and the resilient medium, said bushing being formed at its lower extremity with a flange having a convex surface concentric with the said center of suspension, and a bearing-plate interposed between said convex surface of the flange and the resilient medium, said bearing-plate being formed with a concave surface concentric to said center of suspension.

7. In a centrifugal apparatus, the combination of an antifriction-bearing and a universal joint, a spindle suspended upon said universal joint and directly rotatable upon said bearing, said bearing being supplemental to and supported on said universal joint above the hemispheric center thereof, a resilient buffer around the upper end of said spindle for centralizing the same, means surrounding the upper end of said spindle and extended through said buffer, and means cooperating with the hemispherical bearing and disposed at right angles to the length of the spindle to restrict the oscillation of said bearing and to counteract its tendency to rotate with the spindle.

8. In a centrifugal apparatus, the combination of an antifriction-bearing and a universal joint, a spindle suspended upon said universal joint and directly rotatable upon said bearing, said bearing being supplemental to and supported on said universal joint above the hemispheric center thereof, a resilient buffer around the upper end of said spindle for centralizing the same, means sur-

rounding the upper end of said spindle and extended through said buffer, means coöperating with the hemispherical bearing and disposed at right angles to the length of the spindle to restrict the oscillation of said bearing and to counteract its tendency to rotate with the spindle, said spindle being hung from a central point with which all bearing-surfaces are concentric, and a bearing-plate for said buffer, having a curved bearing on the means which passes through said buffer.

9. In a centrifugal apparatus, the combination of a universal joint, a roller-bearing supported upon and supplemental to said universal joint, a spindle suspended upon said universal joint, and rotatable on said bearing, and a resilient buffer surrounding the upper end of said spindle, and extended above the same.

10. In a centrifugal apparatus, the combination of a universal joint, and a roller-bearing supported upon and supplemental to said universal joint, a spindle supported upon and suspended from said universal joint and rotatable on said bearing, a resilient buffer surrounding the upper end of the spindle and extended above the same, and means beneath said bearing and coöperating with said joint to counteract the tendency of said spindle to oscillate laterally.

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