No. 782,646. PATENTED FEB. 14, 1905.

W. L. D'OLIER.

ELECTRICAL DRIVE FOR HYDRO-EXTRACTORS.

APPLICATION FILED JULY 25, 1903.

2 SHEETS—SHEET 1.

Fig I

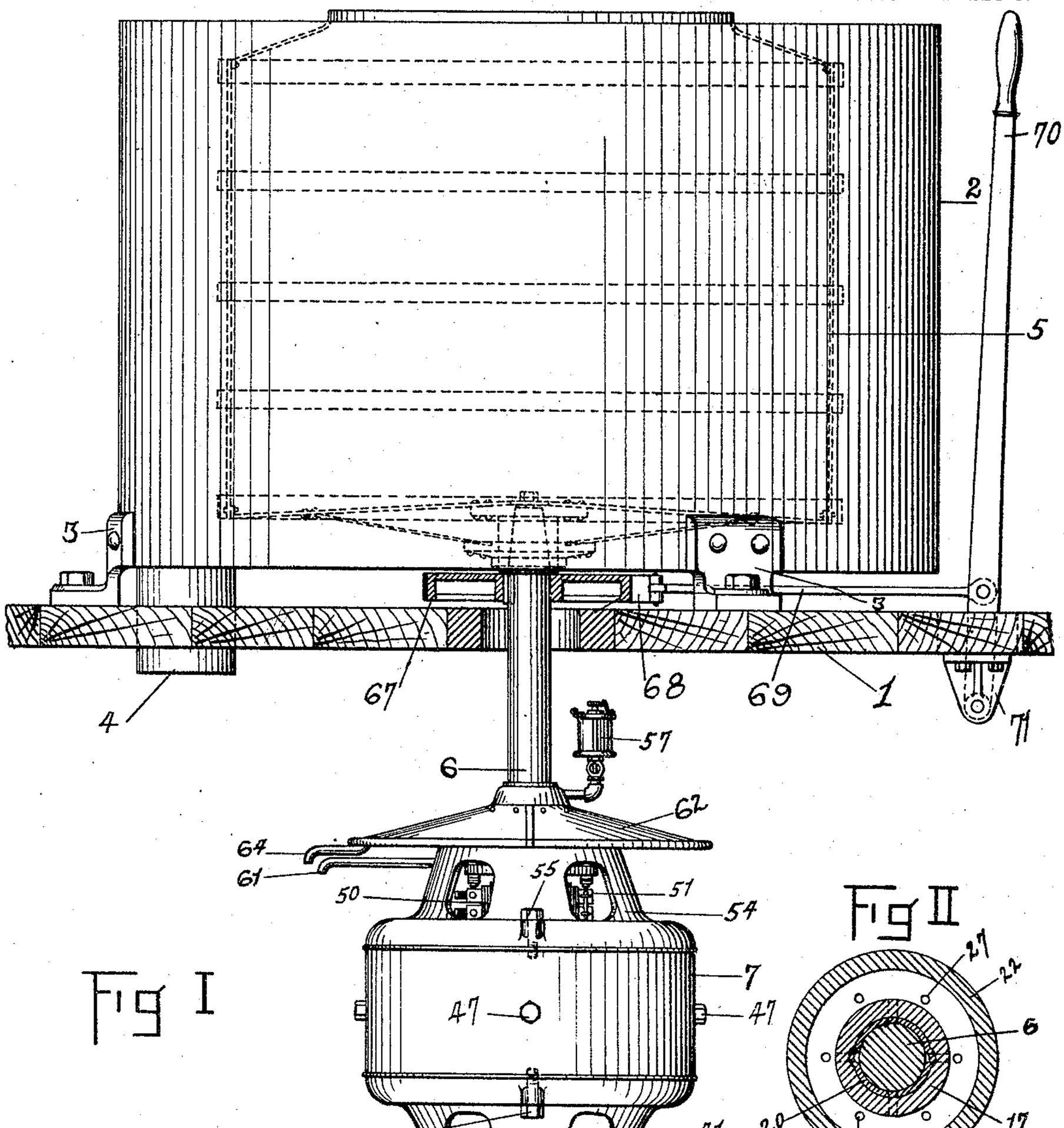

Fig II

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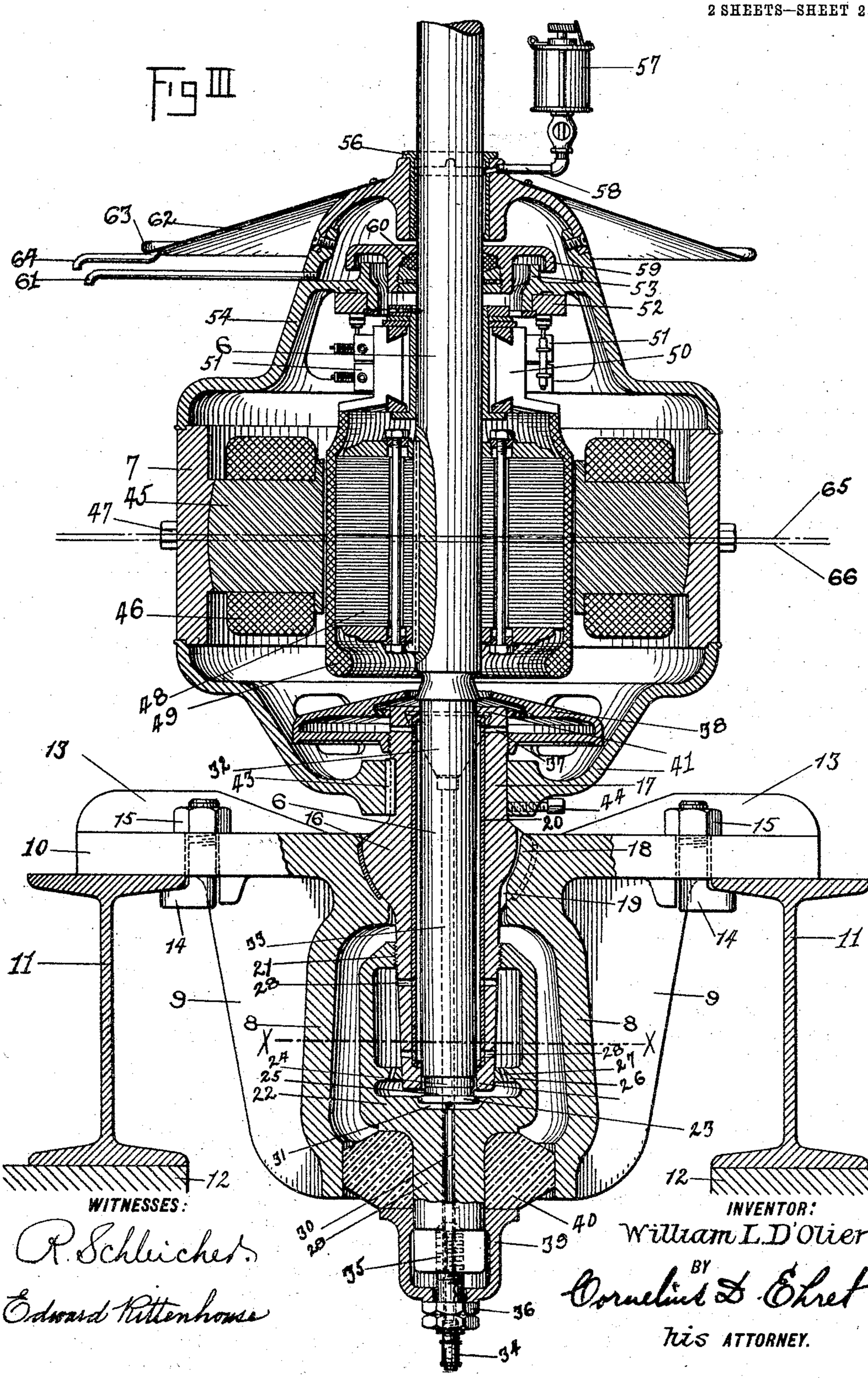
2 SHEETS—SHEET 2.

Fig III



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UNITED STATES PATENT OFFICE.

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ELECTRICAL DRIVE FOR HYDRO-EXTRACTORS.

SPECIFICATION forming part of Letters Patent No. 782,646, dated February 14, 1905.

Application filed July 25, 1903. Serial No. 166,964.

To all whom it may concern:

Be it known that I, WILLIAM L. D'OLIER, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Electrical Drive for Hydro-Extractors, of which the following is a specification.

My invention relates to an electrical drive for hydro-extractors, such as employed in laundries, dyeing establishments, and the like or in any relation where it is desirable to separate liquids from solids, liquids from liquids, or solids from solids by means of centrifugal action.

My invention comprises a centrifugal machine of any of the well-known types driven by an electric motor, the whole being so disposed that the motor and centrifugal may deflect from a given normal position under the influence of dissymmetry of the parts themselves or on account of the unsymmetrical loading of the centrifugal machine.

My invention consists, further, of an electric motor directly connected to a centrifugal machine, the centrifugal machine being mounted above the electric motor, the rotating elements of the motor and the centrifugal machine being both secured to a rotatable vertical shaft, which shaft bears at its lower portion.

My invention consists, further, in an arrangement of the fixed and rotatable elements of the electric motor such that when the motor is loaded there is a tendency to float the rotatable elements of the motor, the shaft, and the centrifugal machine, so that the centrifugal machine is, in fact, magnetically floated, whereby the friction effects are greatly reduced.

My invention consists, further, in an arrangement of a centrifugal machine above a platform or floor, the motor driving the same by direct connection and located below such floor or platform.

My invention comprises also details of construction and operation hereinafter pointed out.

Centrifugal machines—such as employed in laundries, dye-houses, and the like for the separation of liquor from fabrics—have heretofore been driven by belts and pulleys and the like. The centrifugal machine and its housing has been customarily located upon a floor or platform upon which the attendants may move about while the centrifugal is driven from below by a belt-and-pulley arrangement.

By the arrangement herein described it is possible to electrically drive centrifugals so disposed, the centrifugal being permitted to deflect from a truly vertical position, due to dissymmetrical loads or other effects, and the relation of the fixed and movable elements of the motor maintained concentric with respect to each other in the case of such deflection.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is an elevational view showing the centrifugal machine directly connected to an electric motor below the same. Fig. 2 is a cross-sectional view looking downward on the line X X in Fig. 3. Fig. 3 is a vertical view, partly in section and partly in elevation, of the motor and the supporting means, the centrifugal being omitted.

Referring to Fig. 1, 1 represents a floor or platform upon which is mounted the centrifugal housing 2 on supports 3. 4 is an outlet or drain pipe leading from the housing 2, through the floor 1, and carries off the liquid separated from the centrifugal basket 5, inclosed within the housing 2. The centrifugal basket is mounted by means well known in the art upon a vertical rotating shaft 6. Surrounding this shaft 6 is the field or stationary element 7 of an electric motor. Beneath the electric motor is a bowl-shaped support 8 for the motor and centrifugal basket. This support 8 has a main cylindrical portion and strengthening-webs 9. The upper portion of the bowl-support 8 has a horizontal plate member 10, resting upon I-beams 11, which in turn rest upon masonry or other supports 12. The plate 10 is strengthened by webs 13. The plate 10 is secured to I-beams 11 by the clamping-bolts 14, drawn up by the nuts 15.

Referring to the drawings, 16 is a spherical-

like enlargement on a sleeve 17. This spherical-like enlargement 16 bears in a like cavity in the upper portion of the support 8, a lip or lug 18, integral with support 8, extending into and engaging loosely in the vertically-extending slot 19 in the spherical-like member 16. Within the sleeve 17 is a bushing 20. The shaft 6 extends vertically downward through the sleeve 17 and the bushing 20, being engaged only at the extreme upper end and the extreme lower end of the sleeve 17, the bushing 20 being separated from the portion of the shaft 6 which extends longitudinally through it. Below the spherical-like enlargement 16 in the sleeve 17 is fastened by screw-threads at 21 the cup-shaped member 22. In a central depression at the bottom of this cup is located a square washer 23, which has secured to it at its upper face the two washers 24 and 25. It is in the upper face of the washer 24 that the lower end of the shaft 6 bears normally, and it is upon this washer 24 that the motor and centrifugal rest, the shaft 6 being held in an approximately vertical position by the sleeve 17, which sleeve is prevented from rotating by means of the lip 18 and groove 19.

Near the bottom of the cup 22 is a horizontal partition 26, having several perforations 27.

From the chamber formed above the partition 26 holes 28 extend, through sleeve 17 and bushing 20, into the space surrounding the shaft 6. The cup 22 extends downwardly in a vertical cylindrical portion 29, perforated vertically by means of a hole 30, which communicates at its upper end by a channel 31 with a space beneath the partition 26.

32 is a funnel (shown in dotted lines) located at the top of the vertical pipe or tube or stand-pipe 33, which leads downwardly through the funnel and communicates, through the connection 34, with a vertically-extending hole drilled through the bolt 35, whose head is shown at 36. This bolt 35 is tapped into the lower end of the shank 29 of the cup member 22, and the hole extending through this bolt 35 communicates with the hole 30. It is thus seen that the oil poured into the funnel 32 will descend through tube 33, pass through the connection 34, and ascend through the hole within the bolt 35 and through the hole 30, channel 31, into the space below the partition 26 in the cup member 22. The oil will further rise through the holes 27 in the partition 26 and fill the space above such partition, which space then acts as an oil-reservoir, the oil passing through the holes 28 to the space surrounding the shaft 6, keeping the bearing upon the washer 24 and at the lower end of the bushing 20 and sleeve 17 well lubricated. Oil will rise also through the space between the bushing 20 and the shaft 6 and pass out through the holes in the bushing 20 and sleeve 17 (shown at 37) into a cavity in the member 38, which is secured at the upper end of the sleeve 17 by means of screw-threads.

The member 38 is supplied at its uppermost portion with a circular opening which embraces loosely the shaft 6. Just above the oil-receiving cavity in member 38 is a horizontally-disposed perforated partition. The height of the top edge of the funnel 32 is just equal to or slightly below this separating-partition in member 38. In consequence oil will rise only to this height and will not overflow through the opening at the upper end of member 38. In this manner the bearing between the shaft 6, sleeve 17, and bushing 20 at the upper ends of the bushing 20 and sleeve 17 is thoroughly lubricated. The bolt 35, engaging by screw-threads in the bottom of the shank 29 in the cup member 22, is adapted also to force upwardly the member 39 to compress the mass of rubber or other resilient material 40 within the space between the cup member 22 and the cylindrical opening at the bottom of the member 8. If the shaft 6 for any reason deflects from the true vertical position, such deflection is resisted by this resilient material 40, which communicates its resistance through the cup member 22 and the sleeve 17 to the shaft 6. This resilient material 40 is circular in a horizontal section and surrounds on all sides the shank 29.

The field-ring or fixed element of the motor is shown at 7 and is secured concentrically with respect to the shaft 6 by means of the end yoke-casting 41. This yoke member 41 is secured to the field-ring 7 by means of bolts, such as 42. The yoke member 41 is secured to the sleeve 17 by means of the key 43 and set-screw 44. It is thus seen that the field-ring is prevented from rotating and held truly concentrically with respect to the shaft 6. To the field-ring 7 are secured poles 45 of multipolar type, such poles 45 being surrounded by windings 46, both series and shunt.

The poles 45 are secured to the field-ring 7 by bolts 47. On shaft 6 and just above member 38 is secured the rotating element or armature of the motor, comprising the laminated iron core 48 and the winding 49, this latter communicating in the well-known way in the case of a direct-current motor with the commutator 50, upon which bear the brushes 51. These commutator-brushes 51 are supported from a ring 52, adjustable about a portion 53 integral with the upper yoke member 54, which is secured to the ring 7 by means of bolts, such as 55. In the upper end of this yoke member 54 is an opening concentric with the shaft 6 and having a bushing 56, in which the shaft has a bearing.

57 is an oil-cup communicating, by means of tube 58, with a channel in the bushing 56. By this means oil is liberally supplied to the bearing in the bushing 56. Any oil which may work downwardly through this bearing is prevented from passing downward to the

commutator or armature or movable element of the motor by means of the apron 59, secured to and rotating with the shaft 6. Packing 60 is secured between the shaft 6 and the apron 59 in a manner well known in stuffing-boxes. Any oil which drops down to the top of the apron 59 cannot penetrate this packing 60, and therefore flows over the edges of the apron 59 onto the horizontally-disposed partition member 53 and is carried off through the tube 61. Mounted on top of the yoke member 54 is the conical hood member 62, turned up at its lower edge so as to form a groove or channel 63, which communicates with the tube or drain-pipe 64. The purpose of this hood 62 will be realized from an inspection of Fig. 1. Any dripping of water or the like coming through the floor 1 will be prevented by this hood 62 from striking the motor and will be carried off through drain-pipe 64.

In Fig. 3 the horizontal line 65 represents the center line of the field or stationary element of the electric motor, while 66 represents the center line of the armature or rotating element of the electric motor—that is, in this apparatus the center of the armature, electrically speaking, when the apparatus is at rest, is slightly below the center of the field member. The result of this arrangement is as follows:

When the motor is running, due to current passed through it, the armature tends, in addition to its rotation, to move in a vertical direction to such an extent that the center of the armature will correspond with the center of the field, so that the lines 65 and 66 shall coincide. This is due to the tendency of the armature to inclose by its winding a maximum number of lines of force. If the magnetic field is strong enough and the ampere-turns in the armature great enough, the armature will rise and lift the shaft 6 and the centrifugal basket 5, thus greatly reducing the friction or entirely eliminating it at the washer 24, any friction then being at the sleeve 17 and bushing 56, which is very slight, indeed. The effect then is to magnetically float the centrifugal basket during its rotation.

The controller for the motor (not shown) is located above the floor 1 and accessible to the attendant. When it is desired to stop the centrifugal, the electric controller is properly actuated, and the motor and centrifugal slow down and may be electrically braked, as shown in my copending application, Serial No. 151,245, filed April 6, 1903.

To bring the centrifugal basket and motor to a dead stop, I provide the brake-wheel 67, keyed to the shaft 6, with which brake-wheel coöperates the brake strap or band 68, operated in the well-known manner by the rod 69, controlled by operating-lever 70, which works through a slot in the floor 1 and is pivoted in a bracket 71.

From the foregoing description it is seen that I have provided a centrifugal machine directly driven by an electric motor, which motor is mounted beneath the centrifugal basket, the entire apparatus being supported from a point beneath the motor.

It is to be understood that I do not limit my invention to a multipolar motor, for it is obvious that a bipolar motor may be similarly employed. Furthermore, in place of a direct-current motor (herein shown) I may employ an alternating-current motor, either single or multiphase, a polyphase induction-motor being particularly well adapted for the purpose herein described.

What I claim is—

1. The combination with a centrifugal basket of an electric motor directly connected thereto, said centrifugal basket and motor both being deflectable about a point beneath said basket.

2. The combination with a centrifugal basket, of an electric motor directly connected thereto, both the motor and basket being deflectable about a point beneath the electric motor.

3. The combination with a centrifugal basket, of an electric motor directly connected thereto, both deflectable about a point beneath both motor and basket.

4. In combination, a centrifugal basket, the rotatable element of a motor directly connected with said basket, a vertically-extending shaft to which said motor element and basket are secured, a bearing for said shaft approximate its lower end, and means for permitting the deflection of said shaft.

5. In combination, a vertically-extending shaft, a centrifugal basket driven thereby, the rotating element of a motor secured to said shaft, a bearing for said shaft approximate its lower end and at a point beneath both the centrifugal basket and said motor, and means for permitting the deflection of said shaft.

6. In combination, a vertically-extending shaft, a centrifugal basket secured thereto, a motor, the rotatable element of said motor secured to said shaft beneath said centrifugal basket, a thrust-bearing at the lower end of said shaft, and means for permitting the deflection of said shaft.

7. In combination, a support, a member bearing in said support and capable of deflection therein and held against rotation, a vertically-extending shaft, the lower portion of said shaft engaging in said member, the rotatable element of a motor secured to said shaft, and a centrifugal basket secured to said shaft.

8. In combination, a bowl member, a sleeve member bearing therein, capable of deflection and incapable of rotation, a vertically-extending shaft, the lower portion of said shaft embraced by said sleeve member, a thrust-bearing for said shaft secured to said sleeve member, a centrifugal basket secured to said shaft,

and the rotatable element of a motor secured to said shaft.

9. In combination, a bowl-support, a vertically-extending shaft, a sleeve member embracing the lower portion of said shaft and having a deflection-bearing in said bowl member and held against rotation, a rotatable motor element secured to said shaft, the non-rotatable motor element being supported from said sleeve member, and a centrifugal basket secured to said shaft.

10. In combination, a bowl member, a vertically-extending shaft, a sleeve member embracing said shaft approximate its lower end, said sleeve member having a deflection-bearing in said bowl member and held against rotation, a thrust-bearing for said shaft, a rotatable element of a motor secured to said shaft above said deflection-bearing, the non-rotatable motor element supported by said sleeve member, and a centrifugal basket secured to said shaft.

11. In combination, a vertically-extending shaft, a centrifugal basket secured thereto, the rotatable element of a motor secured to said shaft beneath said centrifugal basket, a sleeve member embracing a lower portion of said shaft, the non-rotatable element of said motor supported by said sleeve member, said non-rotatable element of said motor being further supported by a bearing on said shaft, a bowl member, and a bearing for said sleeve member in said bowl member, said sleeve member being capable of deflection but incapable of rotation.

12. In combination, a vertically-extending shaft, a centrifugal basket secured thereto, the rotatable element of a motor secured thereto, a thrust-bearing for the lower end of said shaft, and means whereby said shaft may deflect from a vertical position.

13. In combination, a vertically-extending shaft, a centrifugal basket secured approximate the upper end thereof, the rotatable element of a motor secured to said shaft beneath said centrifugal basket, the non-rotatable element of said motor held concentric with said rotatable element, a thrust-bearing at the lower end of said shaft, and a deflection-bearing beneath the rotatable element of said motor for permitting a deflection of the shaft from a vertical position.

14. In a driving mechanism for centrifugal machines, a shaft, a centrifugal basket secured approximate the upper end thereof, a supporting member, and a sleeve member having a deflection-bearing in said supporting member, the lower portion of said shaft being embraced by said sleeve member.

15. In a driving mechanism for centrifugal machines, a rotatable shaft, a centrifugal basket secured to the upper end thereof, the rotatable element of a motor secured to said shaft, a sleeve member embracing the lower portion of said shaft, a thrust-bearing supported by said sleeve member, and a ball-and-socket bearing for said sleeve member beneath said centrifugal basket, whereby said centrifugal basket may deflect.

16. In a driving mechanism for centrifugal machines, a rotatable shaft, a centrifugal basket secured at the upper end thereof, a thrust-bearing at the lower end of said shaft, a sleeve member embracing the lower portion of said shaft and supporting said thrust-bearing, a ball-and-socket bearing for said sleeve member at a point beneath said centrifugal basket, and means secured to said shaft for rotating said centrifugal basket.

17. In a driving mechanism for centrifugal machines, a rotatable shaft, a centrifugal basket secured at the upper end thereof, a thrust-bearing for said shaft, a deflection-bearing for said shaft approximate the lower end thereof, and means for rotating said basket secured to said shaft intermediate said deflection-bearing and said basket.

18. In a driving mechanism for centrifugal machines, a rotatable shaft, a centrifugal basket secured to the upper end thereof, a supporting member, a sleeve member having a deflection-bearing in said supporting member, the lower portion of said shaft embraced by said sleeve member, and resilient means opposing the deflection of said shaft.

19. In a driving mechanism for centrifugal machines, a rotatable shaft, a centrifugal basket secured to the upper end thereof, a supporting member therefor, a sleeve member embracing the lower portion of said shaft and having a deflection-bearing in said supporting member, means for preventing the rotation of said sleeve member, and resilient means operating between said supporting member and said sleeve member for opposing the deflection of said shaft.

20. In a driving mechanism for centrifugal machines, a shaft, a centrifugal basket secured thereto, a supporting member, a sleeve member embracing said shaft below said basket, and means permitting the deflection of said sleeve member.

21. In combination, a supporting member, a sleeve member supported thereby and capable of deflection with respect thereto, means for preventing the rotation of said sleeve member, a shaft supported by said sleeve member, a centrifugal basket supported by said shaft, and a motor for driving said shaft.

22. In combination, a supporting member, a sleeve member having a spherical enlargement bearing in a socket in said supporting member, means for preventing the rotation of said sleeve member, a shaft supported by said sleeve member, the rotatable element of a motor secured to said shaft, the non-rotatable element of said motor supported by said sleeve member, and a centrifugal basket driven by said shaft.

23. In combination, a supporting member,

a sleeve member having a spherical portion bearing in the socket in said supporting member, means for preventing the rotation of said sleeve member, a shaft supported by said sleeve member, a centrifugal basket driven by said shaft, a rotatable element of a motor secured to said shaft, the non-rotatable element of said motor secured to said sleeve member, and a bearing intermediate said shaft and said fixed motor element.

24. In combination, a supporting member, a sleeve member having a spherical enlargement bearing in a socket in said supporting member, means for preventing the rotation of said sleeve member, a shaft supported by said sleeve member, a centrifugal basket secured to said shaft, and resilient means opposing the deflection of said shaft.

25. In combination, a supporting member, a sleeve member having a spherical portion bearing in a socket in said supporting member, a bearing supported by said sleeve member, a shaft, a centrifugal basket secured to said shaft, and resilient means opposing the deflection of said shaft.

26. In a driving mechanism for centrifugal machines, a shaft, a centrifugal basket secured thereto, a sleeve member embracing said shaft below said basket, a supporting member, said sleeve member having a deflection-bearing therein, and means for preventing the rotation of said sleeve member.

27. In a driving mechanism for centrifugal machines, a shaft, a centrifugal basket secured thereto, a sleeve member embracing said shaft, a supporting member, a ball-and-socket engagement between said sleeve member and said supporting member, and means engaging said sleeve member for preventing its rotation.

28. In a driving mechanism for centrifugal machines, a shaft, a centrifugal basket secured thereto, a sleeve member embracing said shaft below said basket, a supporting member with which said sleeve member has ball-and-socket engagement, and means operating upon said shaft intermediate said basket and said sleeve member for rotating said shaft.

29. In a driving mechanism for centrifugal machines, a supporting member, a ball member deflectable with respect to said supporting member, a shaft supported by and having a bearing of rotation with respect to said ball member, a centrifugal basket secured to said shaft, and means for rotating said shaft.

30. In a driving mechanism for centrifugal machines, a shaft, a centrifugal basket secured thereto, the rotatable element of a motor secured to said shaft, the non-rotatable element of said motor supported concentrically with said rotatable element, a supporting member, a sleeve member below said basket, and a thrust-bearing for said shaft supported by said sleeve member.

31. In a single-shaft centrifugal apparatus, a supporting member, a shaft supported by said member, a universal joint between said shaft and supporting member, a bearing for said shaft upon said universal joint, whereby said shaft may simultaneously rotate and gyrate, a centrifugal basket secured to said shaft, and means for rotating said shaft.

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