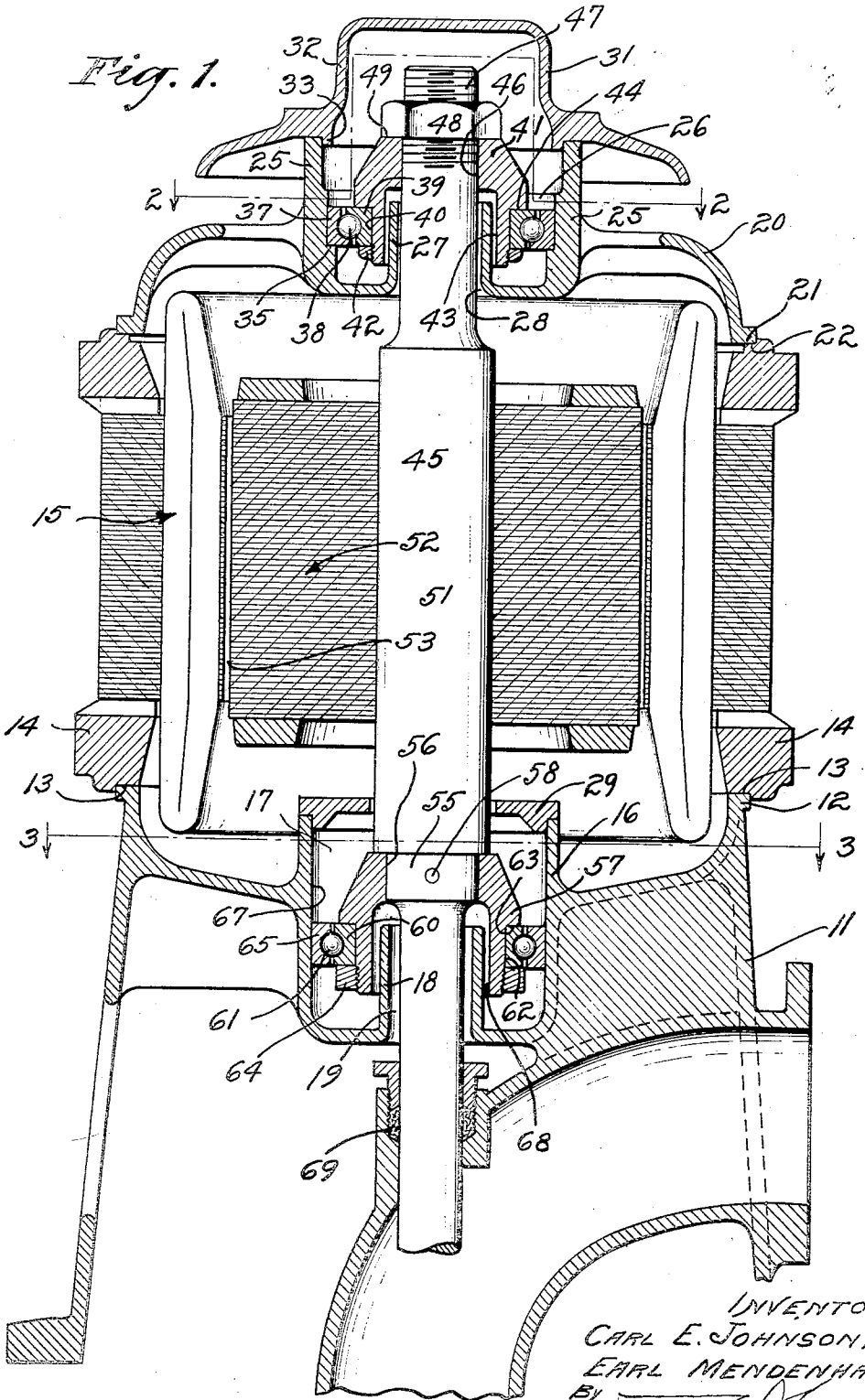
May 15, 1928. 1,669,938

C. E. JOHNSON ET AL

VERTICAL PUMP MOTOR WITH TOP ADJUSTMENT

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Fig. 1.




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Fig. 2.

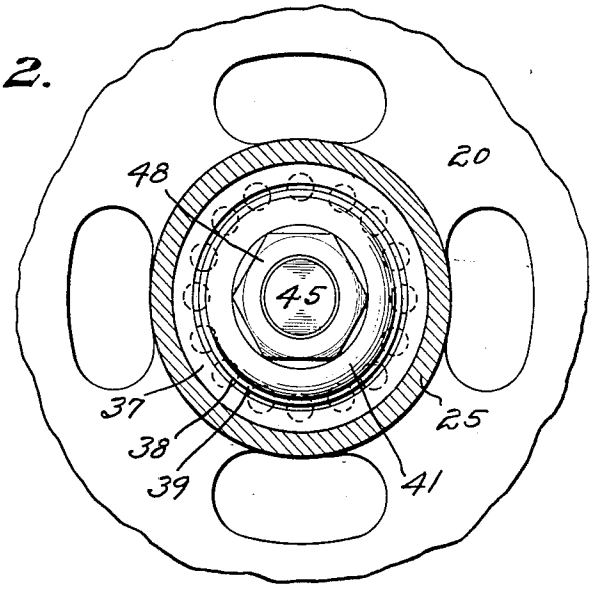
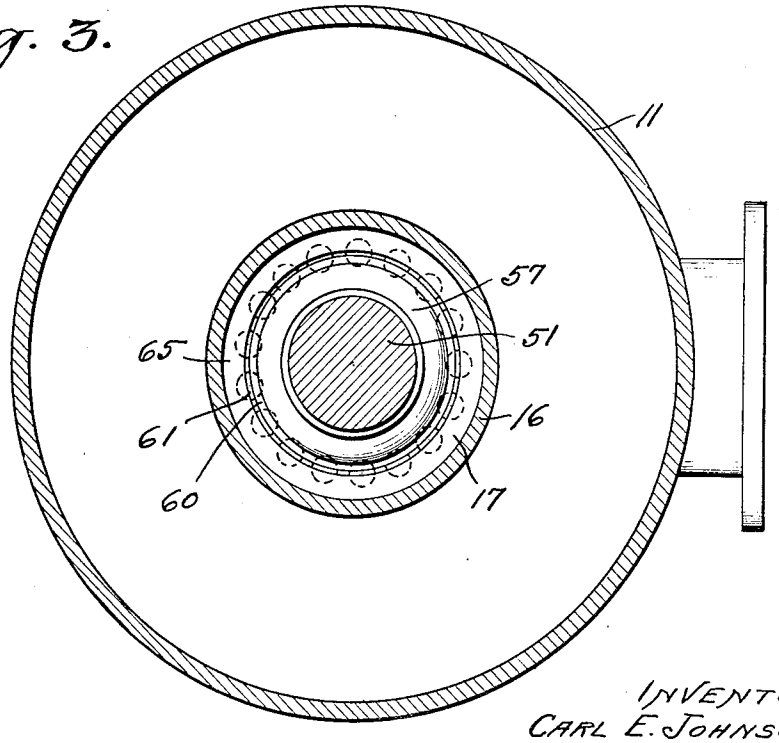



Fig. 3.




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Patented May 15, 1928. 1,669,938

# UNITED STATES PATENT OFFICE.

CARL E. JOHNSON AND EARL MENDENHALL, OF LOS ANGELES, CALIFORNIA, ASSIGNORS TO UNITED STATES ELECTRICAL MANUFACTURING COMPANY, OF LOS ANGELES, CALIFORNIA, A CORPORATOIN OF CALIFORNIA.

## VERTICAL PUMP MOTOR WITH TOP ADJUSTMENT.

Application filed July 2, 1925. Serial No. 41,032.

This invention relates to irrigation pumps and it concerns a direct connected pump head.

Irrigation pumps which our invention concerns generally comprise a pump section which is placed at the lower part of a well. Extending from this pump section is a column pipe which extends to the surface of the ground and is secured to a pump head. A pump shaft extends from impeller means in the pump section upwardly through the column pipe and attaches to rotating means of the pump head. Pump heads are of two classes, belt driven heads and direct connected heads.

It is an object of our invention to provide a direct connected pump head having a novel arrangement for axially adjusting the pump shaft in order to properly position the impeller means of the pump section.

It is another object of our invention to provide a pump head of this character having a rotor secured directly to the pump shaft.

A still further object of our invention is to provide a rotor which is longer than the stator so that the pump shaft may be adjusted without danger of removing the rotor from the field of the stator.

Another object of our invention is to provide a radial and thrust bearing arrangement by reason of which it is possible to provide the novel adjustment means of our invention.

Other objects and the particular advantages of our invention will be made evident hereinafter.

Referring to the two sheets of drawings in which we illustrate a preferred form of our invention:

Fig. 1 is a vertical sectional direct connected pump head embodying the features of our invention.

Fig. 2 is a section taken on the line 2—2 of Fig. 1, this view showing an upper thrust bearing of our invention.

Fig. 3 is a section taken on the line 3—3 of Fig. 1, this view showing a lower radial bearing of our invention.

The form of our invention shown in the drawings comprises a pump head having a main body casting 11 having a horizontal annular wall 12 on which an annular face 13 of a stator frame 14 rests. The stator frame 14 carries a stator 15 which may be of any well known construction.

The main body 11 has a cup-shaped formation 16 which provides a lower bearing chamber 17. The cup-shaped member has an upwardly projecting annular lip 18 which forms a central opening 19. A top frame 20 has an annular face 21 which rests on an annular shoulder 22 provided at the upper part of the stator frame 14. The top frame 20 has a cup-shaped member 25 which provides an upper bearing chamber 26. This cup-shaped member 25 has an upwardly extending annular lip 27 which provides an opening 28. A cover 29 closes the upper part of the lower bearing chamber 17, and a cover 31 closes the upper end of the upper bearing chamber 26. The cover 31 has a dome 32 and an annular lip 33 which extends inside the upper part of the cylindrical wall of the cup member 25.

On an annular shoulder 35 formed in the upper bearing chamber 26 there rests an outer race 37 of a thrust bearing 38. An inner race 39 of the thrust bearing 38 surrounds a cylindrical face 40 of an upper bearing holder 41. A nut 42 clamps the race 39 in place on the upper bearing holder 41 against an annular face 44. The bearing holder 41 is placed, as shown clearly in Fig. 1, so that the annular lip 27 extends in an opening 43 thereof. A motor shaft 45 extends through an opening 46 of the upper bearing holder 41, this shaft 45 being threaded at the upper end as at 47 to receive an adjustment means in the form of a nut 48. The nut 48 engages the upper face 49 of the upper bearing holder 41.

Rigidly secured on a portion 51 of the pump shaft 45 is a rotor 52, this rotor operating in a cylindrical opening 53 formed in the stator 15. As clearly shown in Fig. 1, the rotor 52 is longer than the stator 15 and extends to either side thereof.

A cylindrical part 55 of the shaft 45 extends in an openig 56 of a lower bearing

holder 57. A pin 58 or any other securing means is provided for rigidly securing the bearing holder 57 to the shaft 45. An inner race 60 of a radial bearing 61 is secured on a cylindrical face 62 and against a radial face 63 of the bearing holder 57 by a lock nut 64. An outer race 65 of the radial bearing 61 engages a cylindrical face 67 of the bearing chamber 17. The lower bearing holder 57 is positioned so that the cylindrical lip 18 extends into an opening 68 thereof, as clearly shown in Fig. 1. The shaft 45, as shown in Fig. 1, extends through a suitable stuffing box 69 of the body 11 and extends down to the pump section of the pump (not shown).

It is necessary to accurately adjust the vertical position of the pump shaft 45 in order to position the impellers of the pump section in proper working disposal. In the common type of direct connected pump it is quite inconvenient to make this adjustment, owing to the fact that the shaft of the motor and the pump shaft must be separate because the rotor of the motor cannot be axially moved and it is necessary to adjust the pump shaft independently of the motor shaft. In our invention we provide a construction which eliminates previous difficulties and renders it quite easy to adjust the pump shaft to proper axial position. The pump shaft 45 of our invention is adjusted as follows:

The cover 31 is removed, which gives access to the adjustment nut 48. The adjustment nut 48 is then rotated relative to the shaft 45, the shaft 45 being moved upward or downward as desired. The motor shaft when being adjusted is moved relative to the upper bearing holder 41 and obviously to the thrust bearing 38. The lower bearing holder 57, however, being pinned to the shaft 45 moves therewith and consequently the radial bearing 61 is moved with the shaft. The rotor 52, as previously mentioned, is somewhat longer than the stator 15 and is not moved out of the field when the pump shaft 45 is moved axially. Therefore, an adjustment of the shaft has no detrimental effects on the operation of the motor of the pump head.

The bearing chambers 17 and 26 are filled with oil, which oil may be kept at a level lower than the upper end of the annular lips 18 and 27. The upper bearing of our invention is adapted to take all of the weight of the pump, and the lower radial bearing 61 is arranged to take the radial strains and prevent disalignment of the shaft 45 at this point, thus retaining the rotor 52 centrally in the stator 15.

From the foregoing description it is evident that by our invention it is possible to readily adjust the pump shaft of an irrigation pump of this type. Our invention eliminates the need for making the motor shaft separate, principally by the bearing arrangements and by providing a rotor which is longer than the field so that it may be moved axially without interfering with the operation of the motor. The bearing arrangement of our invention is quite novel in itself and it is mostly due to this novel arrangement that we are able to accomplish our invention.

We claim as our invention:

1. In a motor construction, the combination of: a vertical shaft; an upper thrust bearing for supporting said shaft; a lower radial anti-friction bearing mounted on said shaft and adapted to move vertically therewith; means for vertically adjusting said shaft relative to said thrust bearing; a stator having a magnetic body, and surrounding said shaft; and a rotor secured rigidly to said shaft, said rotor being placed inside said stator and having a magnetic body of a different length than said magnetic body of said stator in order that a vertical movement of said shaft will not affect the operating characteristics of said motor.

2. In a motor construction, the combination of: a vertical shaft; an upper thrust bearing for supporting said shaft; a lower radial anti-friction bearing mounted on said shaft and adapted to move vertically therewith; means for vertically adjusting said shaft relative to said thrust bearing; a stator having a magnetic body, and surrounding said shaft; and a rotor secured rigidly to said shaft, said rotor being placed inside said stator and having a magnetic body of a greater length than said magnetic body of said stator in order that a vertical movement of said shaft will not affect the operating characteristics of said motor.

3. In a motor construction, the combination of: a vertical shaft; an upper thrust bearing for supporting said shaft; walls forming an upper bearing chamber, said thrust bearing being placed therein; a lower radial anti-friction bearing mounted on said shaft and adapted to move vertically therewith; walls forming a lower bearing chamber, said radial bearing being vertically movable therein; means for vertically adjusting said shaft relative to said thrust bearing; a stator having a magnetic body, and surrounding said shaft; and a rotor secured rigidly to said shaft, said rotor being placed inside said stator and having a magnetic body of a different length than said magnetic body of said stator in order that a vertical movement of said shaft will not affect the operating characteristics of said motor.

4. In a motor construction, the combination of: a supporting frame; a stator carried thereby; a vertical shaft; a rotor positioned within said stator and fixed to said shaft; an upper thrust bearing carried by said frame and supporting said rotor and

shaft; a lower radial anti-friction bearing movable vertically with said shaft and including an inner annular race secured to said shaft, an outer annular race slidably supported in said frame and surrounding said inner race, and rotatable bearing elements between said inner and outer races; and means for axially adjusting said shaft, rotor and lower bearing relative to said frame and stator.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 26 day of June, 1925.

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EARL MENDENHALL.