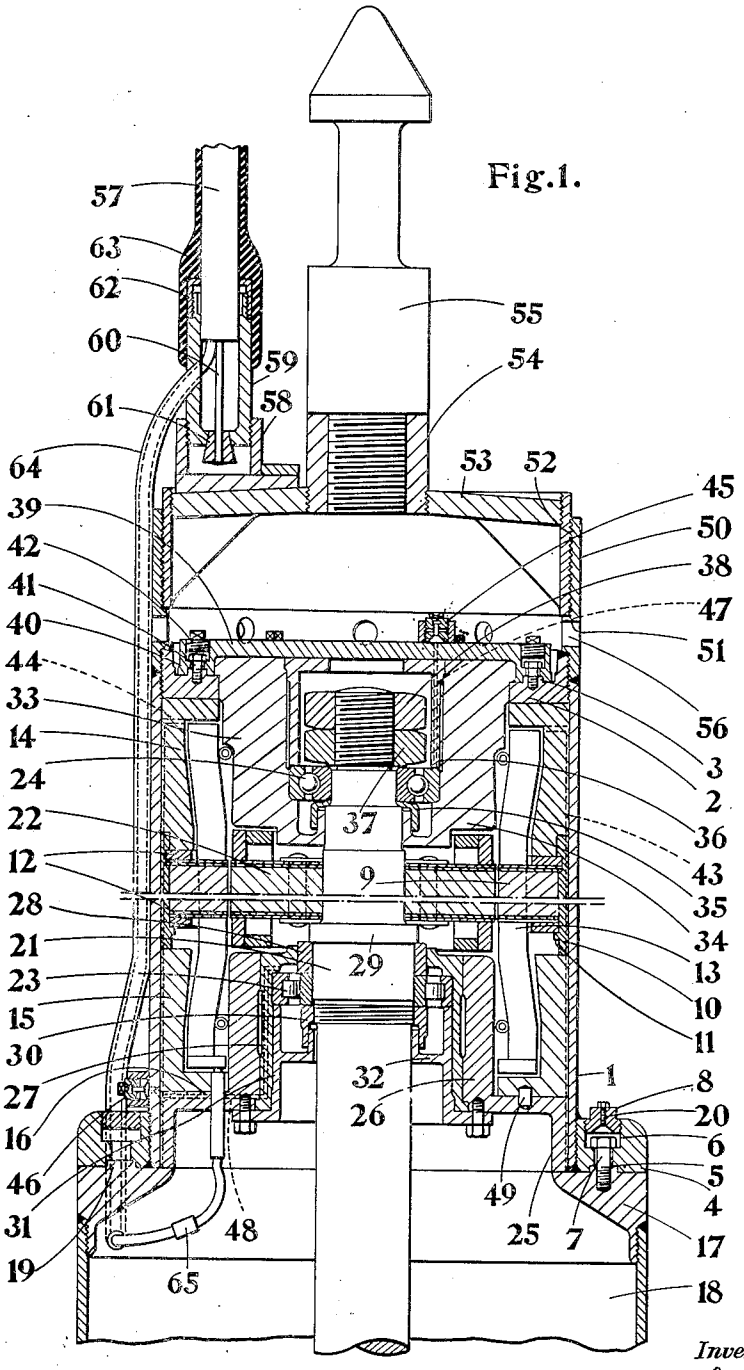
July 6, 1937. A. C. POTTER 2,085,998

BORE HOLE PUMP EQUIPMENT

Filed May 1, 1935 7 Sheets-Sheet 1

Fig.1.



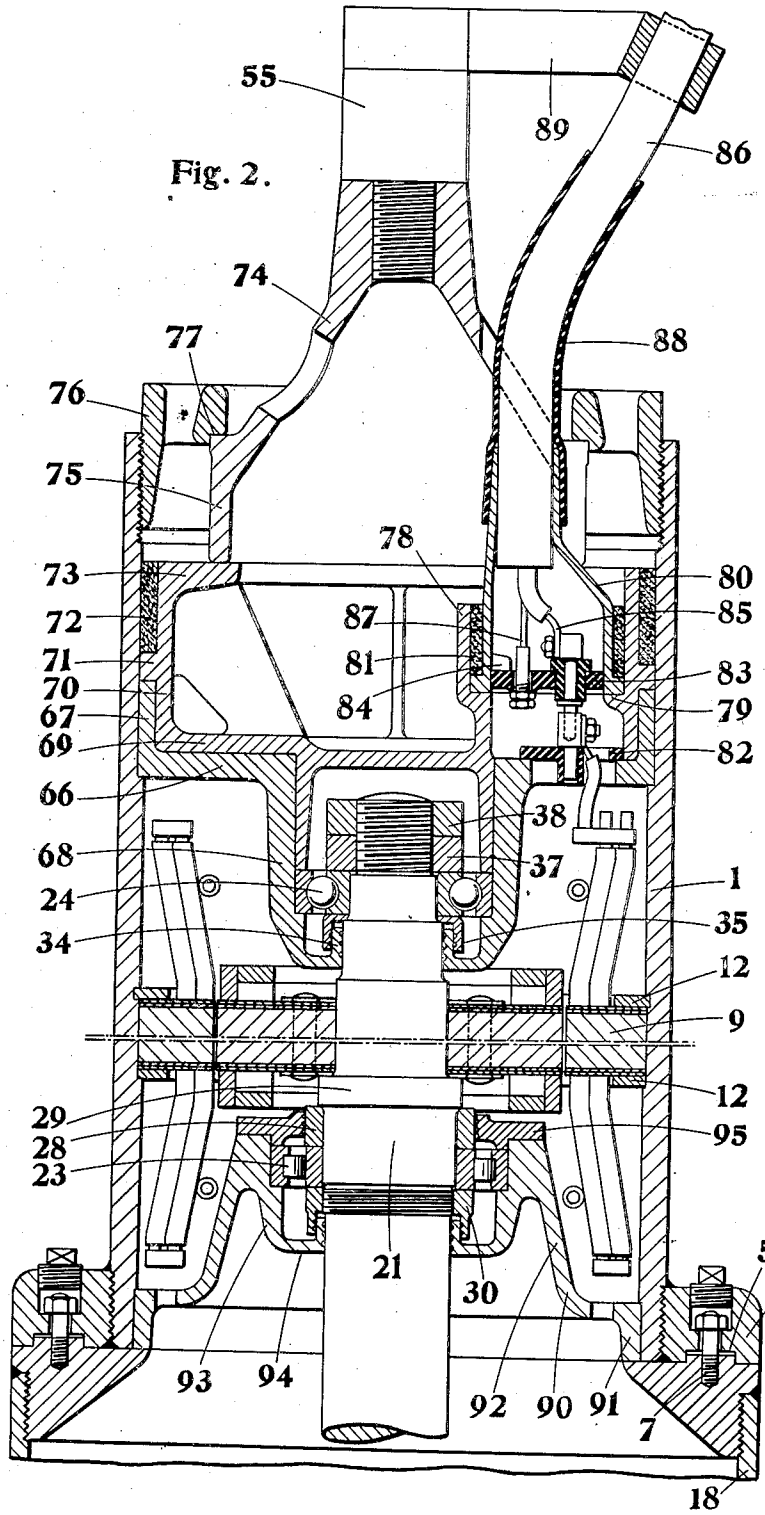
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BORE HOLE PUMP EQUIPMENT

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Fig. 2.



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BORE HOLE PUMP EQUIPMENT

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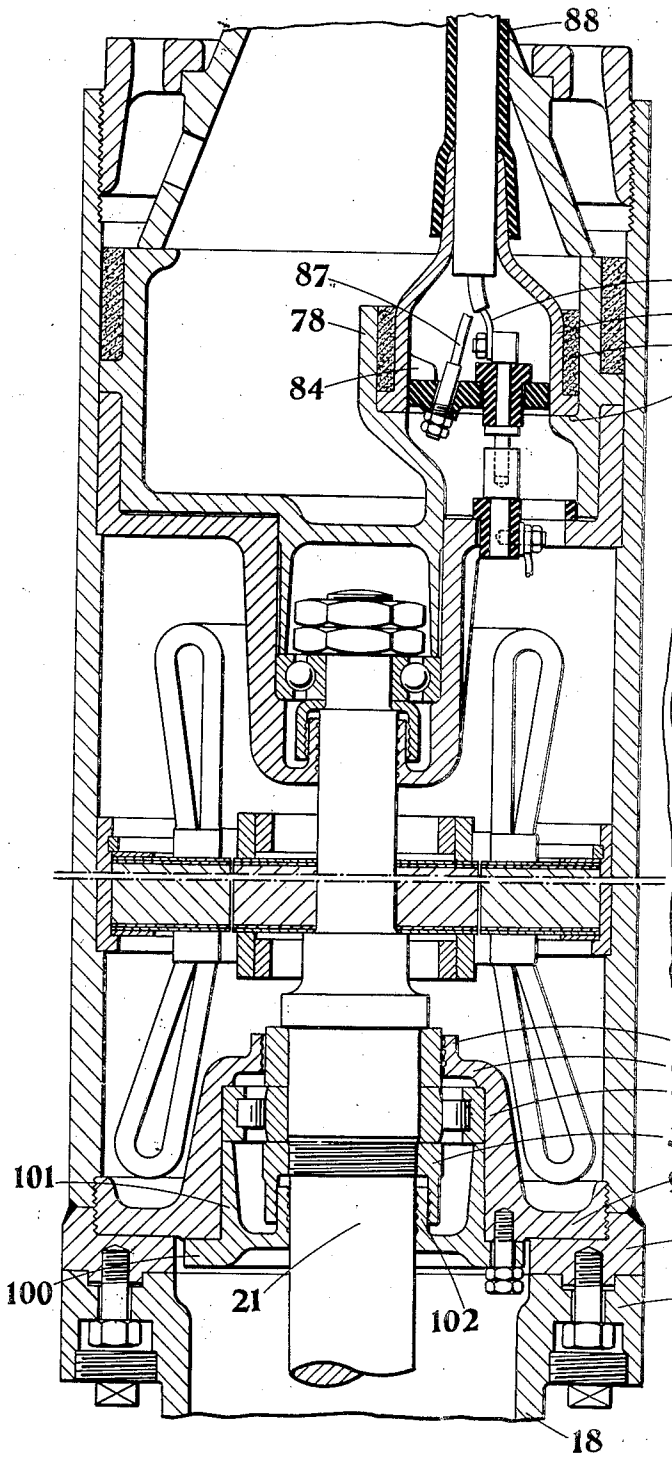


Fig. 3.

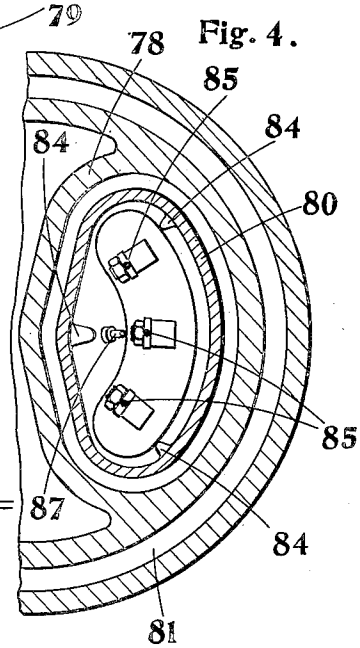


Fig. 4.

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BORE HOLE PUMP EQUIPMENT

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Fig. 5.

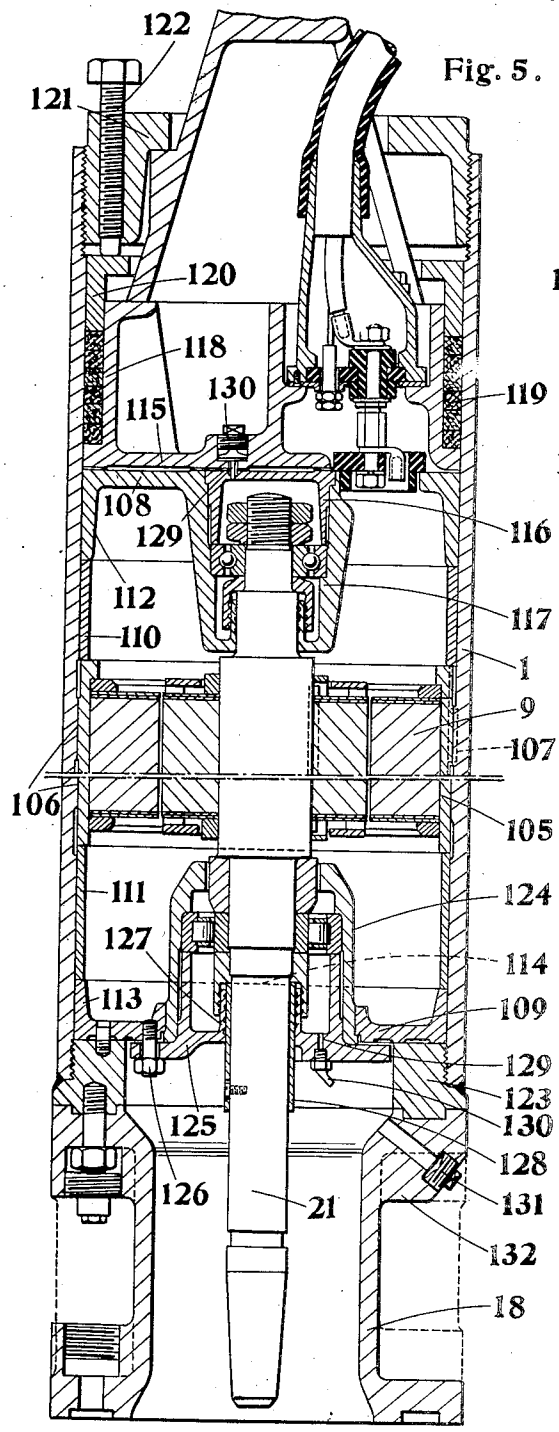


Fig. 6.

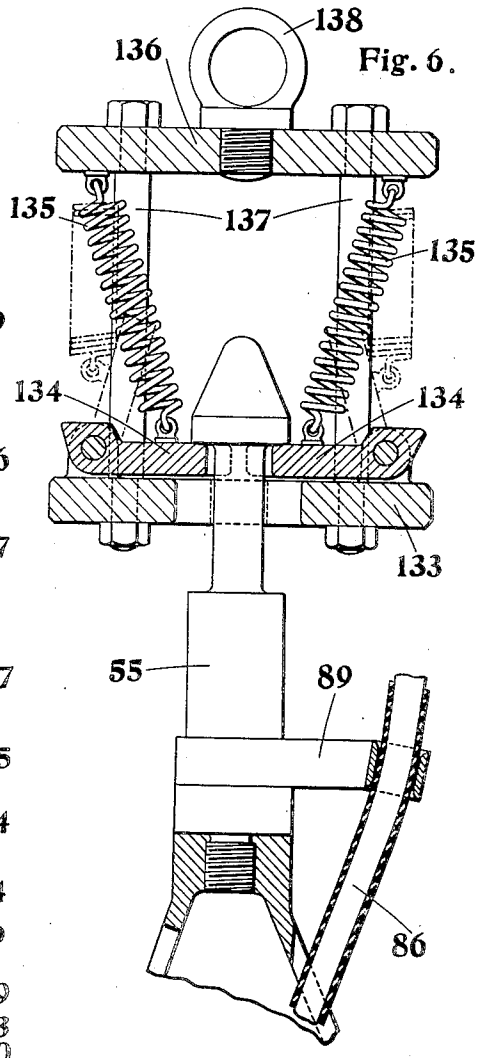
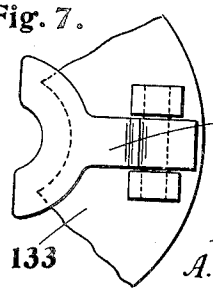


Fig. 7.



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BORE HOLE PUMP EQUIPMENT

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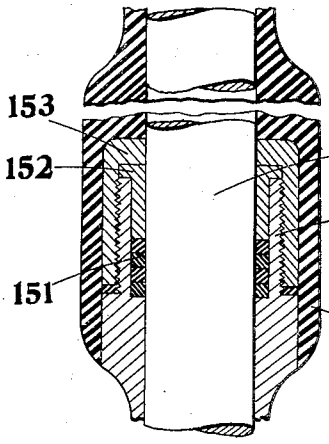


Fig. 10A.

Fig. 8.

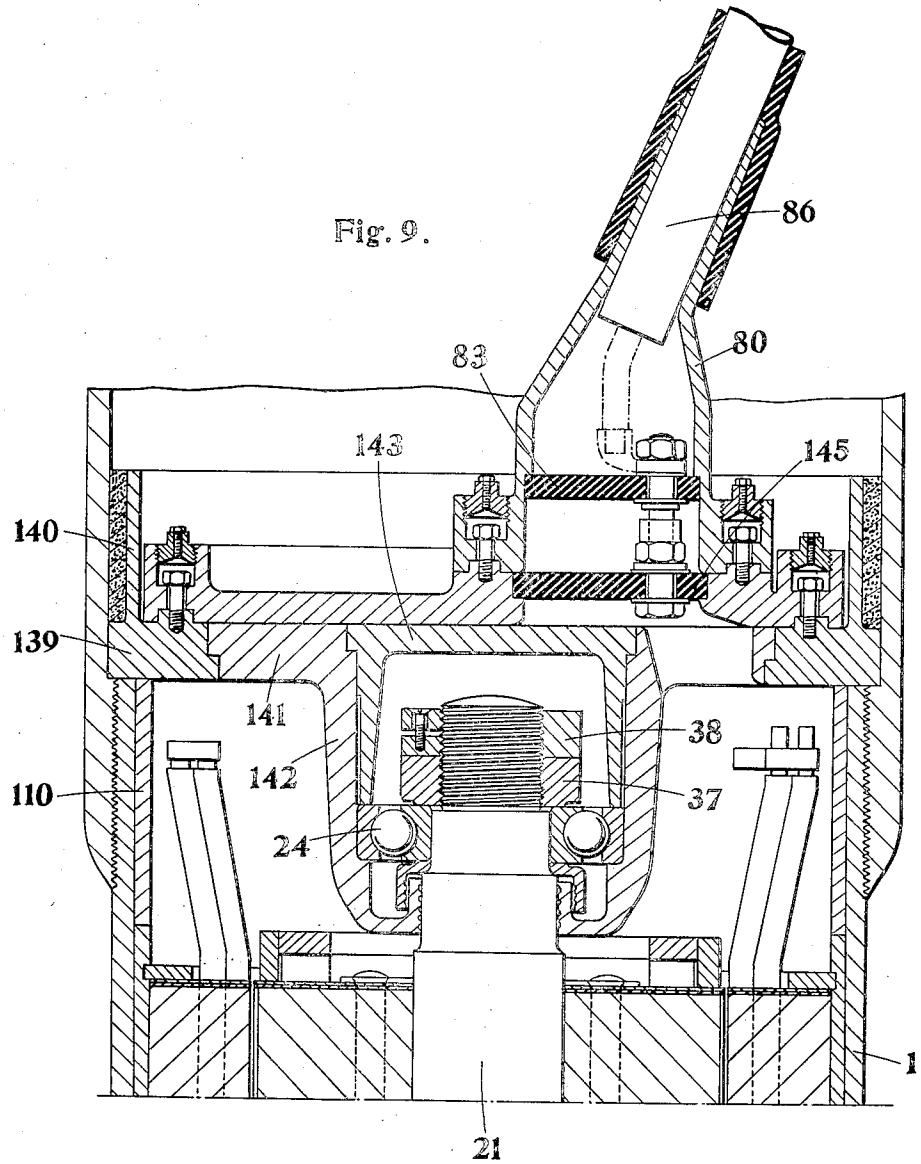
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BORE HOLE PUMP EQUIPMENT

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Fig. 9.



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BORE HOLE PUMP EQUIPMENT

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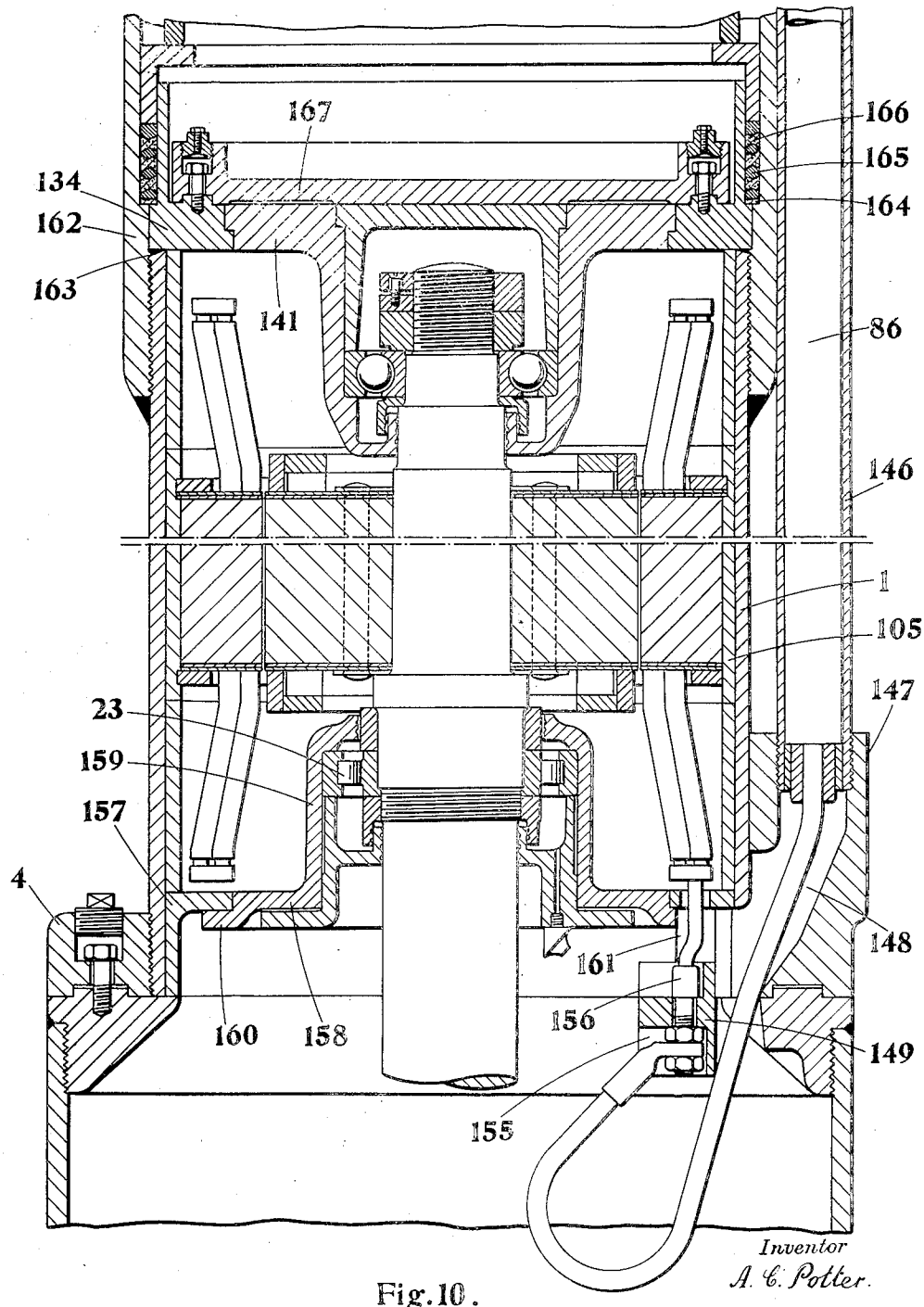


Fig. 10.

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UNITED STATES PATENT OFFICE

2,085,998

BORE HOLE PUMP EQUIPMENT

Arthur Crawley Potter, Grantham, England

Application May 1, 1935, Serial No. 19,229
In Great Britain May 4, 1934

17 Claims. (Cl. 171—252)

This invention relates to bore hole pump equipments in which the pump and motor for driving the pump are arranged in close association for introduction into the bore hole in such manner that the motor is immersed, together with the pump, in the liquid to be raised.

The invention has among its objects so to construct the motor casing that the closure may be effected in a simple manner which, while being liquid-tight, permits the ready removal of the upper bearing and the rotor for inspection or repair; to provide a construction of motor permitting the utilization to the full of the available diameter of the motor casing; to provide for the adequate and effective cooling of the parts of the motor, and generally to provide an improved construction of motor.

The invention consists in providing the motor with a tubular casing in which the stator is secured in position and in supporting the shaft of the rotor in bearings disposed in housings carried by bearing members which extend as partitions across the casing, the bearings being confined within the housings by the closure members that are applied upon the bearing members.

According to the invention the casing of the motor may be provided near the upper end with an inwardly directed flange which serves as a seating for the upper closure member of the casing and forms a positioning member for the stator jacket, which is introduced from the lower end of the casing and retained in the adjusted position by the lower bearing member.

According to the invention, moreover, the upper bearing member may be adapted to rest upon the inwardly directed flange at the upper end of the motor casing and to be retained in its position by the closure member.

According to the invention, moreover, the lower bearing member may slidably fit within the lower end of the motor casing, or be keyed therein, and may be retained in position by an inwardly directed flange of the air chamber or other part of the pump equipment that is immediately below the motor casing and to which is secured an outwardly directed flange provided at the lower end of the motor casing.

According to the invention, also, the stator jacket may be positioned between the inwardly directed flange at the upper end of the motor casing and the bearing member at the lower end of the casing by distance members fitting to the wall of the casing and provided as annular elements, which may be formed in a plurality of sections.

According to the invention, also for the purpose of assisting the cooling of the conductors of the motor and more especially of the stator, the ends of the latter conductors, which project from the laminations or body of the stator, may be positioned between parts of the upper and lower bearing members and the distance members of the stator jacket or equivalent fitting members, which parts and members are of metal and of massive form and fit as closely as possible about the said ends of the stator conductors.

According to the invention, also, the casing is provided to receive above the upper closure member a lifting member to which lifting tackle may be coupled, and space is advantageously provided between the closure member and the lifting member through which liquid may flow in contact with the closure member, thus assisting in the cooling of the motor.

According to the invention, moreover, the bearing members may be protected against the entry of liquid at the junction surfaces by packed joints.

According to the invention, moreover, the upper bearing member may embody a casing or housing for ball or roller bearings, which casing or housing is provided with a closure member of a form serving to secure the bearing member in position within the motor casing, the joint between the motor casing and the closure member being packed by metal packing, such as lead, or by flexible resilient packing, such as rubber.

According to the invention, moreover, the closure member may be maintained in position within the motor casing by means of a lifting cap which in turn is clamped in position by means of an annular member adapted to be secured to the motor casing and to maintain the lifting cap in a position seated upon the closure member.

According to the invention, moreover, where the joint between the closure member and the motor casing is packed by resilient packing, a gland ring may be provided to apply pressure upon such packing, and such gland ring may receive pressure by way of the annular member. Thus, the annular member may be provided with means such as screwed pins which bear upon the gland ring and may be adjusted from the exterior for the purpose of applying pressure upon the gland ring. Such screwed pins may be disposed parallel with the axis of the pump equipment and bear directly upon the gland ring, or they may be set at right angles or some other convenient angle to the axis and may bear upon inclined seatings formed upon the gland ring or upon a pressure member applied to the said gland ring.

According to the invention, moreover, the closure member is advantageously provided with a terminal chamber for the reception of a terminal housing or box fitted to the supply cable carrying the leads by which the current supply to the motor is effected, such terminal housing being packed in the terminal chamber to form a liquid-tight joint.

According to the invention, moreover, the terminal housing of the cable is advantageously provided with a terminal plate or block carrying terminals to which the cable leads are connected, the said terminals extending outwardly for engagement with corresponding terminals provided upon the bearing member and connected into the motor circuit. The said terminals may take the form of plug and socket terminals, one member of which is provided upon the block or plate of the terminal housing and the other member upon the bearing member.

According to the invention, moreover, the lower bearing member is also provided with a housing for the reception of ball or roller bearings by which the stator shaft may be carried, such housing being provided with a closure member of a form serving to determine the position of the ball or roller bearings within the housing of the bearing member. The housing may be closed at the lower end and be provided to receive the closure plate at the upper end, but it is preferred to provide the housing open at the lower end at which the closure plate is applied.

According to the invention, moreover, the lower bearing member may be provided to engage, as by means of a screw thread, the wall of the motor casing and similarly to engage a flange member applied at the end of the motor casing, whereby connection may be made with the casing of the air chamber or pump or with an intervening distance member, but the lower bearing member may be provided to fit within the motor casing and to be maintained in position by means of a flange member extending inwardly of the motor casing and secured thereto or provided to form part of the casing of the air chamber or pump.

According to the invention, moreover, the connection between the lower end of the motor casing and the casing of the air chamber or pump is effected by providing one of the contacting surfaces with a rib which is received into a corresponding channel or recess formed in the second contacting surface in such manner as to afford a clearance space in which packing material may be introduced under pressure. For this purpose the contacting surfaces are held in engagement by means of screw or like engaging pins or bolts by which the contacting surfaces may be drawn closely into contact with the rib entering the recess and causing the extrusion of some of the packing material between the contacting faces.

According to the invention, moreover, the heads of the screw pins or bolts may themselves be received into recesses formed in the part through which they are introduced, and such recesses may be adapted also to receive packing material which is compressed by means of plugs applied for the closure of the said recesses.

According to the invention, moreover, the contacting surfaces may be provided respectively upon annular flange members mounted upon the lower end of the motor casing and upon the upper end of the air chamber casing. The said flange members may be so provided that the flange member for the motor casing extends inwardly and is retained in position partly by the lower bearing member which is screwed or otherwise caused to engage both with the casing of the motor and with the flange member which may also be secured to the motor casing by welding; or the bearing member may be received wholly into the casing of the motor and may be retained therein by the inner portion of the flange applied to the casing of the air chamber or pump.

According to the invention, moreover, where it may be desirable to mount the parts of the motor within an auxiliary jacket adapted to be received into the casing of the motor, such jacket may be positioned between the upper and lower bearing members by means of distance members, and in such a construction relative rotation of the parts may be prevented by the stepping or equivalent formation of the meeting faces of the jacket, the distance members and the bearing members.

The invention further comprises the features of construction hereinafter described.

The invention is illustrated by way of example in the accompanying drawings which illustrate several constructions of motor casing and the parts contained therein according to the invention.

Figure 1 is a longitudinal section of a motor according to the invention.

Figure 2 is a longitudinal section of a modified construction of motor.

Figure 3 is a longitudinal section of a further modification of construction of the motor.

Figure 4 is a detailed cross-section taken through the terminal box of the construction represented in Figure 3.

Figure 5 is a longitudinal section of a further construction of motor.

Figure 6 is a sectional elevation of a lowering and hoisting coupling for use with the pump equipment provided according to the invention.

Figure 7 is a plan view of a pawl member of the coupling shown in Figure 6.

Figures 8, 9 and 10 are longitudinal sections of further modifications of construction of the motor according to the invention.

Figure 10A is a detail sectional view, to an enlarged scale, of a stuffing box or gland for the upper end of the cable fitted to the equipment shown in Figure 10.

In carrying the invention into effect according to the construction represented in Figure 1 of the accompanying drawings, the motor casing comprises a length of tubing **1** internally screw-threaded at the upper end for engagement with a screw thread formed on the outer periphery of a flange ring **2** of a substantially L-shaped cross-section, of which one limb of rectangular cross-section extends radially inwards with reference to the casing to serve as the flange and of which the other limb, the outer surface of which is provided with the screw-thread, extends upwardly beyond the end of the casing for a purpose hereinafter described and is provided on the inner face of a shouldered form also for a purpose to be hereinafter described. The flange portion of the flange ring **2** is provided on the upper surface with a shallow rib **3** of rectangular cross-section extending throughout the length.

At the lower end the outer periphery of the casing is screw-threaded for engagement with a screw thread provided on the inner periphery of a flange ring **4** adapted to extend outwardly from the casing. Such flange ring is provided in the lower face with a shallow channel **5** of rectangu-

lar cross-section and in the upper face is formed with a plurality of circular recesses 6 which at the bottom are bored to form clearance holes for bolts 7 which are passed downwardly through the said holes so that the screw threaded portions are positioned at the middle of the cross-section of the annular channel 5. Each circular recess 6 has the upper part of the wall screw-threaded for the reception of a closing plug 8 adapted to conceal the head of the bolt 7 which is sunk into the recess 6. The purpose of this construction will be hereinafter described.

The stator 9 of the motor is formed upon a tubular jacket 10 adapted slidably to fit within the tubular casing 1 of the motor and to be keyed thereto in any suitable manner to prevent relative rotation. The annular laminations of the stator are confined in position upon the jacket by means of a rib 11 formed peripherally upon the inner surface of the jacket and by upper and lower retaining rings 12, the lower of which bears upon the said rib 11, while the upper is received into an annular groove or channel formed in the stator jacket near the upper end. The conductors 13 of the stator project upwardly and downwardly beyond the respective ends of the stator jacket. The latter is positioned within the motor casing by means of annular distance members 14, 15, the upper of which is of a substantially L-shaped cross-section and is adapted to bear with the one limb upon the under face of the flange ring 2 at the upper end of the casing 1 and has the second limb lying along the wall of the motor casing to form an abutment against which the stator jacket is received. The distance member is of massive formation and the cross-section is such that the inner surface follows closely around the outer side and the end face of the projecting conductors 13 so that the air space on the outer side of the said conductors and at the ends thereof is reduced to a minimum. At the lower end the distance member 15 is of a construction substantially similar to that of the upper distance member 14 and it is disposed between the lower end of the stator jacket and the lower bearing member 16 which is slidably positioned within the lower end of the motor casing and rests upon the inwardly projecting portion of a flange member 17 provided at the upper end of the casing of the air chamber 18 or other part of the pump equipment disposed immediately below the motor. The said flange member 17 affords a means of connection between the motor casing and the said air chamber or other part. For the purpose the upper surface of the flange is provided with a shallow rib 19 of rectangular cross-section adapted to fit within the shallow channel 5 of the flange ring 4 at the lower end of the motor casing 1, and the bolts 7 which are received into the recesses 6 of the flange ring of the motor casing are adapted to engage screw-threaded holes bored into the flange 17 of the air chamber or other part of the pump equipment, which holes are positioned on the middle line of the said shallow rib 19. The recesses 6 in the flange ring 4 may receive bitumen or like filling material in which the heads of the bolts 7 are immersed or embedded and the closing plugs 8 may be screwed down to the extent necessary to compact the filling and secure a liquid-tight joint. The plugs may, however, be provided with conical or like recesses in the lower ends and with screw-threaded holes extending axially to the upper surface, which holes are adapted to receive screws 20 by which also pressure may be applied upon the filling material within the recess. Similarly, the annular channel 5 in the flange ring and the annular rib 19 on the flange member 17 may be of different depths in order to provide a clearance space in which also bitumen or like filling material may be introduced.

The shaft 21 of the rotor 22 of the motor is carried at the upper and lower ends in ball bearings 23, 24 positioned within the corresponding bearing members. For this purpose the bearing member at the lower end is provided as an annulus comprising two cylindrical portions 25, 26 having an intermediate annular or disc-like connecting plate 16. The outer cylindrical portion 25 of the bearing member affords the means for determining the position of the lower distance member 15 and constitutes that part of the bearing member which is confined in position by the flange 17 of the air chamber 18 or other part of the pump equipment disposed immediately below the motor. The second inner cylindrical portion 26 of the bearing member is adapted to extend on the inner side of the projecting conductors 13 of the stator and to lie with its outer surface in close proximity to the said conductors, the said cylindrical portion being of massive formation in order to assist in the cooling of the motor.

For the ready fitting of the lower ball bearing there is provided a cylindrical sleeve or bush 27 to fit within the inner cylindrical portion 26 of the lower bearing member, its position being determined by an outwardly extending peripheral rim at the lower end which is received in a seating in the bearing member. At the inner end the said bush or sleeve 27 is provided with an inwardly directed flange, the inner periphery of which lies in close proximity to the outer surface of a loose collar or sleeve 28 provided upon the motor shaft 21 and confined in the upward direction by a collar 29 integrally formed upon the said shaft. The bush or sleeve is provided at a position immediately below the inwardly directed flange with a seating upon which the outer race of the ball or roller bearing 23 may be received, the seating being at such position as to lie in the same plane transverse to the motor shaft as the lower end of the loose sleeve or collar 28 upon the shaft, the said end of the loose sleeve or collar 28 serving to determine the position of the complementary race of the ball or roller bearing 23 carried by the shaft. The said race is confined in its position by means of a sleeve 30 screw-threaded at its inner periphery to engage a screw thread provided upon the shaft 21, while the outer race is maintained in position within the bush or sleeve 27 by means of a closing cup 31 provided with an outwardly directed flange at the lower end adapted to bear upon the lower face of the disc-like portion 16 of the bearing member and upon the lower end of the sleeve or bush 27. The closing cup 31 is secured in position by such means as screws or bolts applied through the flange and engaging the bearing member. The said closing cup is provided at a position intermediate its length with an inwardly directed flange 32 having at the inner periphery an upwardly directed cylindrical wall adapted to lie in close proximity to the shaft 21 with its outer face in sliding contact with the inner face of a cylindrical skirt provided upon the screwed-retaining sleeve 30 of the inner race of the ball or roller bearing 23.

The shaft 21 extends upwardly to the extent such that the upper end projects beyond the upper end of the stator and the shaft is adapted to receive the body of the rotor 22 in the form of annular laminations confined between retaining rings suitably held together as by bolts or rivets, the body of the rotor being seated at the lower end upon the integral collar 29 of the shaft and being prevented from rotation relatively to the shaft by means of a key or keys or other suitable means. For the support of the shaft at the upper end the corresponding bearing member 33 is provided as a substantially cylindrical body of massive form formed with a shoulder or outwardly extending flange at the upper end to fit over the inner periphery of the flange ring 2 applied to the motor casing 1. The outer periphery of the cylindrical portion of the bearing member is adapted closely to follow the line or surface formed by the inner edges of the projecting ends of the conductors 13 of the stator, and at the lower end the cylindrical portion of the bearing member follows closely the outline of the extremities of the conductors of the rotor and the connecting ring thereof. At the extreme lower end the bearing member 33 is provided with an inwardly directed flange which at the inner periphery has an upwardly extending cylindrical wall 34 adapted to lie in close proximity or in sliding contact with a portion of the projecting end of the shaft 21. The inner periphery of the bearing member is provided at a short distance from the lower end with a seating for the reception of the outer race of the ball or roller bearing 24, the inner race of which is seated upon a ring 35 of L-shaped cross-section, the inwardly directed portion of which is adapted to rest upon a shoulder formed by a reduction in the diameter of the shaft 21 at this particular position. The cylindrical portion of the ring 35 of L-shaped cross-section is adapted to lie with its inner surface in sliding contact with the outer surface of the cylindrical wall 34 of the bearing member. The outer race of the ball or roller bearing 24 is maintained in position by means of a bush or sleeve 36 adapted to be received into the bearing member 33 and provided at its upper end on the outer periphery with a shallow flange which is received in a seating of the bearing member such that the outer end of the bush or sleeve is flush with the upper face of the cylindrical portion of the bearing member 33. The bush or sleeve 36 is advantageously provided with an inwardly directed flange at the upper end. The inner race of the ball or roller bearing 24 is maintained in position by means of a nut 37 and lock nut 38 adapted to be received upon the screw-threaded extremity of the shaft 21.

For constraining the upper bearing member 33 in position together with the sleeve or bush 36 which retains the outer race of the ball or roller bearing 24, there is provided a closing plate or disc 39 adapted to rest for the major portion of its area upon the upper surface of the bearing member 33 and upon the upper end of the sleeve or bush 36. At the periphery the said closing plate or disc is provided with a downwardly projecting rib or flange 40 of massive form adapted to fit around the outer periphery of the flange at the upper end of the bearing member 33, and in the lower face the said rib or flange is provided with a shallow recess of rectangular cross-section which is adapted to receive the shallow annular rib 3 provided upon the flange ring 2 of the motor casing. The closed plate or disc 39 is secured to the said flange ring 2 in the manner similar to that described with reference to the fitting of the flange ring 4 at the lower end of the motor casing to the flange ring 17 at the upper end of the air chamber 18 or over part of the pump equipment immediately below the motor, that is to say, the upper surface of the closing plate or disc 39 is formed with a plurality of spaced cylindrical recesses having at the bottom clearance holes for the reception of the stems of bolts 41 adapted to engage screw-threaded holes provided in the flange ring 2 at the upper end of the motor casing, at the middle of the annular rib 3. The heads of the bolts are received into the said recesses and the recesses are closed by means of screw-threaded plugs 42 which serve for the purpose of applying pressure to bituminous or other filling material introduced into the recesses to form water-tight joints around the bolt heads. Similar bituminous filling material may be applied in a clearance space provided between the annular rib 3 of the flange ring 2 at the upper end of the motor casing and the bottom of the annular recess in the flange of the closing plate or disc. The outer periphery of the closing plate or disc 39 is for the greater part provided of a diameter to form between it and the upwardly extending portion of the flange ring 2 an annular space which may be packed with blue lead to form a metallic joint. This joint may extend to the surface of the flange ring 2 between the shouldered portion of the inner face of the upwardly extending part of the flange ring and a portion of increased diameter of the closing plate or disc immediately adjacent the flange ring.

Air ducts are advantageously formed between the motor casing, the stator jacket, the distance members and the outer cylindrical portion of the bearing member. For this purpose the motor casing or the other parts referred to may be grooved or channelled on their outer peripheries, as at 43, and at the upper end the ducts may communicate with the interior of the casing by way of passages 44 formed between the upper flange ring and the upper distance member, or alternatively in the body of the distance member, while at the lower end the ducts may continue through the flange of the air chamber or other part of the pump equipment immediately below the motor. Similarly, for the lubrication of the bearings there may be provided lubricating boxes 45, 46 respectively upon the upper face of the closing plate or disc 39 and at a suitable position on the outer periphery of the motor casing immediately adjacent the lower flange ring 4. Such boxes may comprise cylindrical fittings adapted to receive at the outer ends screw-threaded plugs which carry valves or like closure members for lubricating passages 47, 48 formed, at the upper end, through the closing plate and the bush or sleeve provided within the bearing member and, at the lower end, through the motor casing, the disc-like portion 16 of the bearing member and in the joint formed between the inner cylindrical portion of the bearing member and the sleeve or bush therein 27, or alternatively formed in the said sleeve or bush. It will be understood that in order to ensure the effective functioning of the air ducts and lubricating passages it is necessary that the various parts of the motor and the casing shall be adapted to be assembled in fixed relation. Thus, the parts may engage one with another in definite positions determined by locating pins, such as 49, or other suitable means of ensuring the desired and correct relation.

The part of the cylindrical portion of the flange ring 2 at the upper end of the motor casing which extends beyond the extremity of the motor casing 1 is adapted to receive a cylindrical element 50 having screw-threads in the inner periphery respectively above and below a shallow inwardly directed flange 51 of considerable depth. The cylindrical element 50 is thus screwed upon the upper end of the flange ring 2 until the lower end of its flange abuts against the upper end of the said upwardly extending portion of the flange ring. The screw thread in the upper portion of the said element serves for the reception of a lifting member comprising a cylindrical portion 52 screw-threaded on the periphery and adapted to be received into the said element and to fit at the lower end upon the upper end of the flange of the said element, a disc-like member 53 at the upper end, and a centrally disposed upwardly extending bush 54 screw-threaded on the inner periphery for the reception of a screw-threaded stem at the lower end of a lifting head 55. The lifting member may conveniently be provided of separate parts which are engaged one with another by means of screw-threads and welded joints and may be strengthened where desirable by means of radial web plates. The said cylindrical element 50 or the disc of the lifting member may be perforated as at 56 for the admission of liquid from the exterior to the space above the closing plate or disc 39 of the motor casing so that the liquid may thus serve to assist in the cooling of the motor.

The supply of current to the motor is effected by way of a cable 57 which is connected to a cable box provided upon the lifting member. This conveniently comprises a base portion in the form of a base plate with an upstanding cylindrical socket screw-threaded on the inner periphery, and a metal cylinder 59 closed at the lower end except for an upwardly coned opening at the centre and screw-threaded on the outer periphery to engage the screw thread of the socket. The cable 57, which is carried downwardly and into the upper end of the cylinder before referred to, is provided with a constraining wire 60 which is extended downwardly through the opening in the bottom of the cylinder 59 and is riveted into a conical plug 61 adapted to fit in the conical opening of the lower end of the cylinder 59. The upper end of the cylinder is closed by a cap 62 fitting closely around the cable and having a cylindrical skirt at the outer edge which is screw-threaded on the inner periphery to engage a screw thread upon a portion of the cylinder 59 at the upper end which is of reduced diameter. The upper end of the cylinder, together with the closing cap and cable are advantageously enveloped in a rubber sleeve 63 extending downwardly along the wall of the cylinder 59 for a considerable distance. The conductors of the cable are diverted outwardly from the cylinder through an inclined opening in the wall in which is welded or otherwise secured a tube 64 extending downwardly at the exterior of the motor casing and adapted to receive and protect the conductors. At the lower end the said tube is advantageously received into a bore provided in the flange 4 at the upper end of the air chamber or other part of the pump equipment immediately below the motor, and the conductors are there coupled by suitable coupling members 65 to the leads from the stator which extend downwardly through the middle portion 16 of the lower bearing member. It will be understood that the conductors may be provided in a single tube 64 and distributed as required within the lower end of the casing or within the air chamber, or there may be provided distinct tubes for each conductor leading directly to a position adjacent the point of connection to the motor. It will further be understood that the connections may be made otherwise than as hereinbefore indicated. Thus, a connection may be made of the tube bearing the conductor or conductors through the flange of the motor casing in such manner as to confine the conductors and the leads exterior to the air chamber. It will further be understood that the entry of the tube bearing the conductor or conductors may be made by way of stuffing boxes or the like adapted to ensure against the entry of liquid; or alternatively the tubes may be welded or otherwise securely jointed to the motor casing, the flange ring or some other part of the motor.

It will further be understood that the joints between such parts as the flange rings and the tubular casing itself may be welded. Similarly, a welded joint may be provided between the flange ring at the upper end and the cylindrical element which receives the lifting member.

In the construction of pump equipment represented in Figure 2, the motor casing 1 is provided as a length of tube adapted directly to receive the laminations of the stator 9 in fixed position between split positioning members 12 let into grooves in the wall of the tube. The laminations are also keyed longitudinally of the casing. The shaft 21 of the rotor is carried in ball bearings 23, 24 by bearing members provided in the casing above and below the stator. The upper bearing member 66 has a cylindrical flange 67 and is received upon a shoulder formed in the casing 1 of the motor and is provided with a central downwardly or inwardly directed cylindrical sleeve 68, which at the lower end is formed with an inwardly directed portion carrying a cylindrical flange 34 adapted to form a bearing surface or guide for the rotor shaft 21. The said sleeve 68 is provided with a shoulder upon which is received the outer race of the ball bearing 24 surrounding the shaft, the inner race of the ball bearing being seated upon an annular distance or packing element 35 of angular cross-section having a cylindrical flange which slidably fits over the flange 34. The inner race of the ball bearing is maintained in position by means of a nut 37 and lock nut 38 screwed upon the shaft, while the outer race of the ball bearing 24 is maintained in position upon the shoulder of the cylindrical sleeve 68 by a disc-like closure member 69 fitting upon the bearing member 66 and provided with an outer cylindrical flange 70 closely fitting the interior surface of the flange 67 of the bearing member 66. The cylindrical flange 70 of the closure member is provided with a peripheral rib 71 at about the middle of the depth adapted to seat upon the upper end of the cylindrical flange 67 of the bearing member 66 and to fit within the casing of the motor. The annular space left above the rib 71 is adapted to receive lead caulking or other suitable packing 72, such as a rubber or like packing, adapted to provide a liquid-tight fit under the conditions of service. At the upper end of the cylindrical flange 70 of the closure member there is provided an inwardly directed flange 73 which is supported from the body of the closure member by web members provided at intervals. The said flange serves to receive resting thereon a lifting cap 74 of conical form fitted

with a lifting stud 55. Such lifting cap is provided at the lower end with a cylindrical portion 75 which is adapted to engage an annular locking member 76 in the form of a cylindrical body screwed on the periphery to engage a screw-thread provided on the interior surface of the motor casing 1, the said locking member having a central opening through which the conical lifting cap 74 projects and the inner periphery of the locking member being recessed on the under face at 77 to form a seating for the upper edge of the cylindrical portion 75 of the lifting cap. Thus, by the screwing down of the locking member 76 into the motor casing the several parts forming the closure of the motor casing and for the support of the bearings of the rotor shaft are rigidly held in position.

The closure member 69 is provided at a suitable position with a terminal chamber 78 enclosed by an upstanding wall formed at an intermediate position on the interior with a shoulder 79 for the reception of a terminal box 80 provided with an outstanding or lateral flange to fit upon the said shoulder and to leave an annular space around the box into which may be introduced lead caulking or other suitable packing 81. The closure member 69 is open at the bottom of the terminal chamber 78 and the bearing member 66 is also open in a corresponding position, a seating being formed between the two parts for the reception of an insulating block or plate 82 carrying terminal sockets connected with the windings of the motor (see also Figures 3 and 4). The terminal box 80 is also provided with a plate or block 83 of insulating material fitted at the lower end and supported against projections or lugs 84 provided upon the wall of the terminal box above the upper surface of the plate or block 83. The supply leads 85 are carried in a suitable insulated cable 86 and are connected to plug terminals carried in the said insulating plate 83. The cable is also provided with a steel wire 87 to relieve the supply leads of tension, and such wire is anchored to the plate or block 83. The terminal box is provided with an upwardly extending sleeve into which the cable is received, and such sleeve and the cable are surrounded by a rubber protective sleeve 88 forming an effective closure against the ingress of liquid. The cable is maintained away from the lifting stud by means of a bracket 89 supported upon the lifting stud.

At the lower end of the motor casing there is provided a shoulder or seating for the reception of the lower bearing member 90 which has a cylindrical flange 91 at the periphery and an upwardly directed conical portion 92 adapted to support a downwardly extending cylindrical portion 93 carrying at the lower end an inwardly directed portion 94 which is provided with a cylindrical flange to form a sliding fit with the rotor shaft 21. The cylindrical portion is formed with a shoulder to receive the outer race of the roller bearing 23, while the inner race of the roller bearing is positioned between a sleeve 30 screwed upon the motor shaft 21 and having a cylindrical portion in sliding contact with the cylindrical flange of the bearing member 90, the ball race being positioned by means of a distance ring 28 seated upon a shoulder 29 of the shaft 21. The cylindrical portion 93 is closed at the upper or inner end by a disc-like cover plate 95 having a central opening, the wall of which is in sliding contact with the distance ring 28, and a cylindrical flange to fit the wall of the cylindrical portion of the bearing member and to confine the outer race of the roller bearing 23.

For its connection to the casing 18 of the air chamber the motor casing 1 is provided with an outwardly directed flange 4 screwed upon and welded to the exterior of the motor casing and provided with an annular recess 5 in the under face to receive a corresponding annular rib 19 or projection upon a flange member 17 similarly screwed and welded into position upon the air chamber casing. The said flange has an inner diameter such that its inner portion bears upon and maintains in position the cylindrical flange 91 of the lower bearing member 90. The flange 17 of the air chamber casing is provided with a series of screwed studs or bolts 7 extending through the annular rib 19 and adapted to be received in clearance holes provided in the flange 4 of the motor casing, which clearance holes are provided at the bottom of circular recesses 6 serving for the reception of the nuts of the studs 7, such circular recesses being closed by screwed plugs 8. In making the joint, the annular recess 5 of the flange 4 of the motor casing is filled with jointing medium, such as white lead, and the flange 17 of the air casing is brought into position. On the tightening up of the nuts upon the studs 7, the jointing medium is compressed so that some is forced out between the studs and the clearance holes leaving a thin layer of jointing medium under considerable pressure at the bottom of the recess. The nut recesses 6 are then also filled with jointing medium and the plugs 8 closing the recesses forced down, thus making an effective joint around the nuts and studs 7 under considerable pressure.

The joint between the air casing and the pump casing may be similarly formed.

In the construction represented in Figures 3 and 4, while the construction and mounting in position of the upper bearing member, closure member and other associated parts substantially follows that hereinbefore described, the lower bearing member presents differences in detail of construction and also in the manner in which it is mounted. Thus, the bearing member 96 is provided with the cylindrical portion 97 extending upwardly and formed at the upper end with an inwardly directed flange 98 which is formed with a cylindrical bearing surface 99 adapted slidably to fit the distance ring 28 seated on the rotor shaft against the collar 29 and determining the position of the inner race of a roller bearing 23 the outer race of which is seated in the cylindrical portion 97 against an annular shoulder or seating positioned towards the upper end of the said cylindrical portion. The inner race of the roller bearing is constrained in its position upon the shaft by the locking ring 30 screwed upon the shaft 21 and provided with a downwardly extending cylindrical skirt or sleeve distanced from the shaft. The cylindrical portion 97 of the bearing member 96 is closed by a closure member 100 of annular form screwed to the lower face of the bearing member 96 and having a cylindrical wall 101 adapted to fit within the cylindrical portion 97 of the bearing member 96 and to abut against the outer race of the roller bearing 23 while at the inner periphery the closure member 100 is formed with a cylindrical sleeve 102 slidably fitting between the shaft and the skirt or sleeve of the locking ring 30.

The bearing member 96 is screw-threaded upon its outer periphery and is adapted to engage partly in a shouldered and screw-threaded recess in the

end of the motor casing and partly within a screw-threaded cylindrical wall provided upon the outer periphery of an annular flange member 103 which is thus applied to and where necessary welded to the motor casing 1, and extends over the under face of the bearing member 96. Such flange member is secured to a corresponding flange member 104 provided upon or formed as part of the air casing 18 or pump casing or of a distance or coupling member.

In the further modification of construction represented in Figure 5, the stator 9 of the motor is mounted within a tubular auxiliary jacket 105 adapted slidably to fit within the tubular casing of the motor which is advantageously formed with annular bearing surfaces 106 at suitable positions along the length of the jacket for engagement with corresponding bearing surfaces upon the jacket. The jacket is locked against rotation by keys or the like 107. In such construction the bearing members 108, 109 are advantageously not provided to be positioned upon seatings formed in the motor casing, their position in relation to the jacket 105 of the stator being determined by distance rings 110, 111, and for the purpose the peripheral cylindrical flanges 112, 113 of the bearing members are directed towards the jacket. Relative rotation of the several parts is prevented by stepping the meeting surfaces or edges of the jacket, the distance rings and the bearing members, as at 114.

The closure member 115 of the upper bearing member is advantageously provided with the cylindrical portion or flange 116 which is received into the cylindrical portion 117 of the bearing member 108 in the form of a separate cup which is adapted to confine the outer ball race of the ball bearing 24 and is maintained in position by the closure member proper 115. The closure member further extends directly across the motor casing and is provided with the cylindrical wall 118 extending upwardly at a distance from the wall of the casing 1 to form an annular space which may be adapted to receive resilient packing 119 such as rubber packing. The packing is subjected to the pressure of a gland ring 120 advantageously of angular cross-section slidably fitted within the motor casing 1, and between the motor casing and the cylindrical wall 118 of the closure member 115. For the adjustment of the pressure of the gland ring upon the packing, the locking ring 121 is provided to receive a plurality of adjusting bolts 122 which extend from the exterior through the locking

sleeve 128 mounted in position upon the shaft 21, instead of being a sliding fit upon the shaft.

The closure members of each bearing member are conveniently provided with lubricating passages 129 closed by removable plugs 130 whereby a grease gun may be applied for the introduction of lubricant to the bearings. In the case of the lower bearing member the lubricating passage may extend by means of a tube to a plugged inlet 131 provided in the flange member 132 of the casing 18 of the air chamber, the pump or a distance member. Such means of lubricating the bearings may be provided in any construction of the motor.

It will be understood that the invention is not limited to particular details of construction as hereinbefore described. For example, the form of the terminal chambers and of the terminal boxes for use therewith may be modified according to requirements, and similarly the terminals of the terminal box and of the adjacent bearing member may take any suitable form. In all constructions of the pump equipment according to the invention it is preferred to provide the lifting cap with a bracket 89 (Figures 2 and 6) by which the electric supply cable 86 may be diverted to a position sufficiently far removed from the axis of the pump equipment to permit the operation of the lowering and lifting tackle. Such tackle may, as represented in Figures 6 and 7, conveniently comprise a frame member 133 having a central opening of a diameter to pass over with clearance the knob of the stud 55 of the lifting cap and provided to support upon the upper surface pivoted pawls 134, of which the forked inner ends, when the pawls rest upon the frame, extend inwardly sufficiently to engage under the knob of the lifting cap. The pawls are mounted under the action of tension springs 135 which are connected to a second frame member 136 distanced from the first by supporting pillars 137 and having mounted therein a lifting ring 138 for attachment to the lifting and lowering cable. The disposition of the upper frame member is such that in the lowering of the pump equipment with the pawls engaged with the knob of the lifting cap, when the equipment comes to rest upon the seating, the frame may be further lowered to the extent necessary to permit the pawls under the action of the tension springs to escape from below the knob. When it is required to lift the equipment it is sufficient to unhitch the tension springs and to permit the pawls to fall by gravity into the engaging position after

[redacted]

of lead joints for packing the
relation to the closure member may be avoided.
The packing of the bearing member within the motor housing and the manner of securing the bearing member in position by means of the lifting cap may be as hereinbefore described. It is desirable that the seat for the intermediate part **141** of the bearing member should be substantially of a diameter corresponding to the diameter of the inside of the stator coils, since this will allow of the withdrawal of the rotor for inspection or repair on removal of the closure mem-

and rubber
it at a pressure considerably
liquid pressure to which the cable and its enclosure will be subjected. Any suitable non-conducting solution may be used to surround the cable under the pressure indicated in such manner that the cable insulation is protected against further compression by liquid under pressure, and the possibility of leakage by way of the tube into the motor casing is prevented. At the upper

[redacted]

ing composition has
being positioned within the distance member, where such member is used, or within the motor jacket. The annular space within the stator coils around the upper bearing may be similarly provided with a filling and in this way the air space below the bearing member may be reduced to a minimum.

The space within the cylindrical sleeve **142** about and above the nuts **37**, **38** upon the end of the motor shaft **21** may be filled with grease.

In constructions involving the presence of an auxiliary motor casing or jacket, provision may be made for the circulation of air between the auxiliary jacket and the main housing in the manner illustrated with reference to Figure 1. Thus, air ducts may be made along the exterior of the auxiliary housing for the air which will

be of other suitable material, is secured
suitable position, in relation to or distanced from the entry position of the cable, upon the lower closure plate or bearing member by such means as bolts and is provided with recesses or cavities **155**, each for the reception of a plug or socket terminal to which the corresponding lead from the cable may be connected, the leads being bared of the outer rubber covering, the complementary terminal elements **156** being positioned upon the upper face of the terminal box and connected to the respective stator coils through apertures provided in the bearing member.

The bearing member may be provided in two concentric parts **157**, **158**, of which the outer part **157** is formed as a ring for reception within

the motor casing 1 and is provided to receive within it the inner part which is formed with the cylindrical flange or sleeve 159 in which the bearing 23 is positioned, the inner part of the bearing member being provided with a seating or securing flange 160 by which it may be mounted in position within the opening of the outer part. The outer part of the bearing member may be formed with a lug or lugs 161 for the reception of the bolts by which the terminal box 149 is secured in position, and in order that non-conducting filling material may be conveniently disposed on the inner side of the stator coils, the junction between the outer and inner parts of the bearing member may be positioned substantially in line with the inner face of the stator coils. The space to the outer side of the stator coils may be filled with a non-conducting filling in the manner hereinbefore described.

Where the supply cable is led into the motor jacket at the lower end as hereinbefore described, or at some position other than the upper end, a simplification of the closure member at the upper end may be effected. Thus, the two-part bearing member 123, 141 as hereinbefore described with reference to the last modification may be adapted to be seated with the outer member upon the upper end of the distance ring 110 maintaining the inner motor jacket 105 in position, and upon the outer motor casing 1 which at the upper end is provided with an exterior sleeve 162 in the manner hereinbefore described, for the reception within it of the parts forming the upper closure. The upper end of the outer motor jacket may be cut away, bevelled or otherwise formed at the outer periphery to provide a recess 163 in which may be received a gutta percha packing ring below the outer edge of the outer part of the bearing member which otherwise makes a metal to metal joint with the motor jacket and the distance member. At the upper surface of the bearing member adjacent the upwardly extending cylindrical wall 140 by which the packing space is provided the outer sleeve 163 of the casing may be reduced in thickness by an increase in the internal diameter in such manner that the packing space is formed partly within the said sleeve 163 and partly to the exterior of the said cylindrical wall 140 of the bearing member. The packing disposed in the space therefore is positioned with the junction between the outer part of the bearing member and the outer sleeve of the jacket approximately midway below the first ring 164 which may be of suitable packing material. The remainder of the packing, which is subjected to pressure by a gland ring in the manner hereinbefore described, may comprise alternate metal rings 165 and soft rubber packing rings 166. In the absence of a terminal box from the upper end of the motor the closure member 167 of the bearing member may now be provided merely as a disc which at the outer periphery is formed with a rim of sufficient thickness to permit the formation therein of the plug recesses for the reception of the securing bolts. By such a construction the free admission of liquid to the closure member is permited with a consequent cooling effect upon the upper bearing.

In the case of small size motors or in pump equipments in which the difference of diameter of the pump and the motor casing is insufficient to permit the use of a tube for the cable in the manner hereinbefore described, the conductors of the cable may be separated so that they may be passed individually through small tubes to the lower end of the motor and thence to the air chamber. Such tubes or ducts may be rendered liquid-tight with reference to the outer casing of the motor and would occupy only a portion of the available water space surrounding the motor so that the space for delivery of water is not reduced to any appreciable extent.

The connection of the supply leads to the motor at the lower end thereof has the advantage in conjunction with the particular construction of the bearing members that, by breaking the two joints of the bearing members, not only the rotor but also the stator may be withdrawn from the motor casing, while by reason of the position of mounting of the terminal box in relation to the motor casing the latter may be separated from the air chamber without disturbing the motor leads. If desired a stuffing box and gland packing device may be provided at the entry of the copper or steel tube into the boss or projection of the flange of the motor jacket.

I claim:

1. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending transversely across the casing, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said bearing housings and disposed in position upon seatings provided in said bearing housings, lining sleeves received into said bearing housings to confine said anti-friction bearings in position, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, said closure members being integral with said lining sleeves, and means for maintaining the assembled bearing members and closure members in position within the said motor casing.

2. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending across the casing, said bearing members being provided with axially directed bearing housings, one of said housings being separate from and seated in the corresponding bearing member, anti-friction bearings disposed in the bearing housings, and disposed in position upon seatings provided in said bearing housings, lining sleeves received into said bearing housings to confine said anti-friction bearings in position, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, and means for maintaining the assembled bearing members and closure members in position within the said motor casing.

3. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending across the casing, said bearing members being provided with axially directed bearing housings, one of said housings being separate from and seated in the corresponding bearing member, anti-friction bearings disposed in the bearing housings and disposed in position upon seatings provided in said bearing housings, lining sleeves received into said bearing housings to confine said anti-friction bear-

ings in position, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members and retaining in the one case the bearing housing in position, and means for maintaining the assembled bearing members and closure members in position within the said motor casing.

4. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending across the casing, said bearing members being provided with axially directed bearing housings, one of said housings being separate from and seated in the corresponding bearing member, anti-friction bearings disposed in the bearing housings and disposed in position upon seatings provided in said bearing housings, lining sleeves received into said bearing housings to confine said anti-friction bearings in position, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, one of said closure members being integral with the corresponding lining sleeve, and means for maintaining the assembled bearing members and closure members in position within the said motor casing.

5. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, flanges provided at the respective ends of the said casing, bearing members extending transversely across the casing, one of said bearing members being seated on the corresponding flange, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, one of said closure members being engaged with the said flange in which the bearing member is seated, the second flange of the motor casing being connected with the succeeding portion of the casing of the pump equipment, and means for maintaining the assembled bearing members and closure members in position within the said motor casing.

6. In a submersible bore hole pump equipment, a motor comprising a casing, a flange at the one end of the said casing, a corresponding flange upon the succeeding portion of the casing of the pump equipment, said flanges serving for the connection of the motor casing to the succeeding portion of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending transversely across the casing, one of said bearing members being maintained within the casing by the flange of the succeeding portion of the pump equipment, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, and means for maintaining the assembled bearing members and closure members in position within the said motor casing.

7. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator, a jacket for said stator closely fitting the casing, distance members positioned within the casing at the ends of the stator jacket, bearing members extending transversely across the casing and confining the distance members, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, and means for maintaining the assembled bearing members and closure members in position within the said motor casing.

8. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator, a jacket for said stator closely fitting the casing, distance members positioned within the casing at the ends of the stator jacket, bearing members extending transversely across the casing and confining the distance members, the distance members and bearing members being of massive construction to fill as closely as possible the space surrounding the projecting ends of the stator coils, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, and means for maintaining the assembled bearing members and closure members in position within the said motor casing.

9. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a flange at the one end of the said casing, a corresponding flange upon the succeeding portion of the casing of the pump equipment, said flanges being disposed in contact, one of said flanges having a rib of shallow cross-section upon the contacting surface, the second of said flanges having a channel of corresponding form to the said rib but of greater depth in its contacting surface, screwed fastening elements connecting said flanges and packing material disposed within the said channel for compression by the said rib.

10. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a flange at the one end of the said casing, a corresponding flange upon the succeeding portion of the casing of the pump equipment, said flanges being disposed in contact, one of said flanges having a rib of shallow cross-section upon the contacting surface, the other of said flanges having in its contacting surface a channel of corresponding form to the said rib, but of greater depth, screwed fastening elements secured in one of said flanges in the line of the rib and channel, clearance holes for said screwed fastening elements in the second of said flanges, recesses co-axial with said clearance holes in the outer surface of said flange, blocks for closing said recesses, and packing material applied within the said channel for compression by the rib and within the said recesses for compression by the plugs through the said clearance holes around the screwed fastening elements.

11. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator

fixedly mounted within the casing, a filling member extending transversely across the casing and provided with a housing for an anti-friction bearing, a rotor shaft support in said bearing, a rotor upon said rotor shaft, and a closure member applied to said bearing member, said closure member being provided with a contacting surface to engage a contacting surface adjacent the casing, said contacting surfaces being respectively formed with a rib of shallow cross-section and a channel of corresponding form but of greater depth, screwed fastening elements for mounting in the line of the rib and channel, clearance holes in the bearing member for the said fastening members, recesses co-axial with said clearance holes, plugs for closing said recesses, and packing material applied to said channel and within said recesses under pressure applied by said plugs.

12. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending transversely across the casing, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, and means for maintaining the assembled bearing members and closure members in position within the said motor casing, said means comprising a lifting member disposed at the end of the motor casing which in use is uppermost.

13. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending transversely across the casing, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, and a lifting member adapted to apply pressure upon one of the bearing members, the remaining bearing member being of fixed position within the motor casing.

14. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending transversely across the casing, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, a lifting member which bears upon the closure member applied to one of the bearing members, and a locking member engaging the motor casing and the lifting member, the second bearing member being of fixed position.

15. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending transversely across the casing, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, a lifting member, a gland ring upon which said lifting member rests, packing confined by said gland ring between the motor casing and one of the bearing members, and a locking member engaging the motor casing and retaining the lifting member in position, the second bearing member being of fixed position within the motor casing.

16. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending transversely across the casing, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, a lifting member which bears upon the closure member of one of the bearing members, a locking member engaging the motor casing and maintaining the lifting member in position, and packing disposed between the said closure member and the motor casing, the second bearing member being of fixed position within the motor casing.

17. In a submersible bore hole pump equipment, a motor comprising a casing adapted to form part of the casing of the pump equipment, a stator fixedly mounted within the casing, bearing members extending transversely across the casing, said bearing members being provided with axially directed bearing housings, anti-friction bearings disposed in said housings, a rotor shaft for coupling to the driven shaft, said rotor shaft being carried in said anti-friction bearings, a rotor upon said rotor shaft, closure members applied to said bearing members, means for maintaining the assembled bearing members and closure members in position within the said motor casing, a terminal box supported in fixed relation to one of the bearing members, and comprising disconnectible terminals, and a supply cable, the said cable being connected to one element of the disconnectible terminals and the stator coils being connected to the other of the disconnectible terminals.

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