No. 627,252. Patented June 20, 1899.

N. A. CHRISTENSEN.

MEANS FOR LUBRICATING ELECTRIC MOTORS.

(Application filed Mar. 8, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 2.

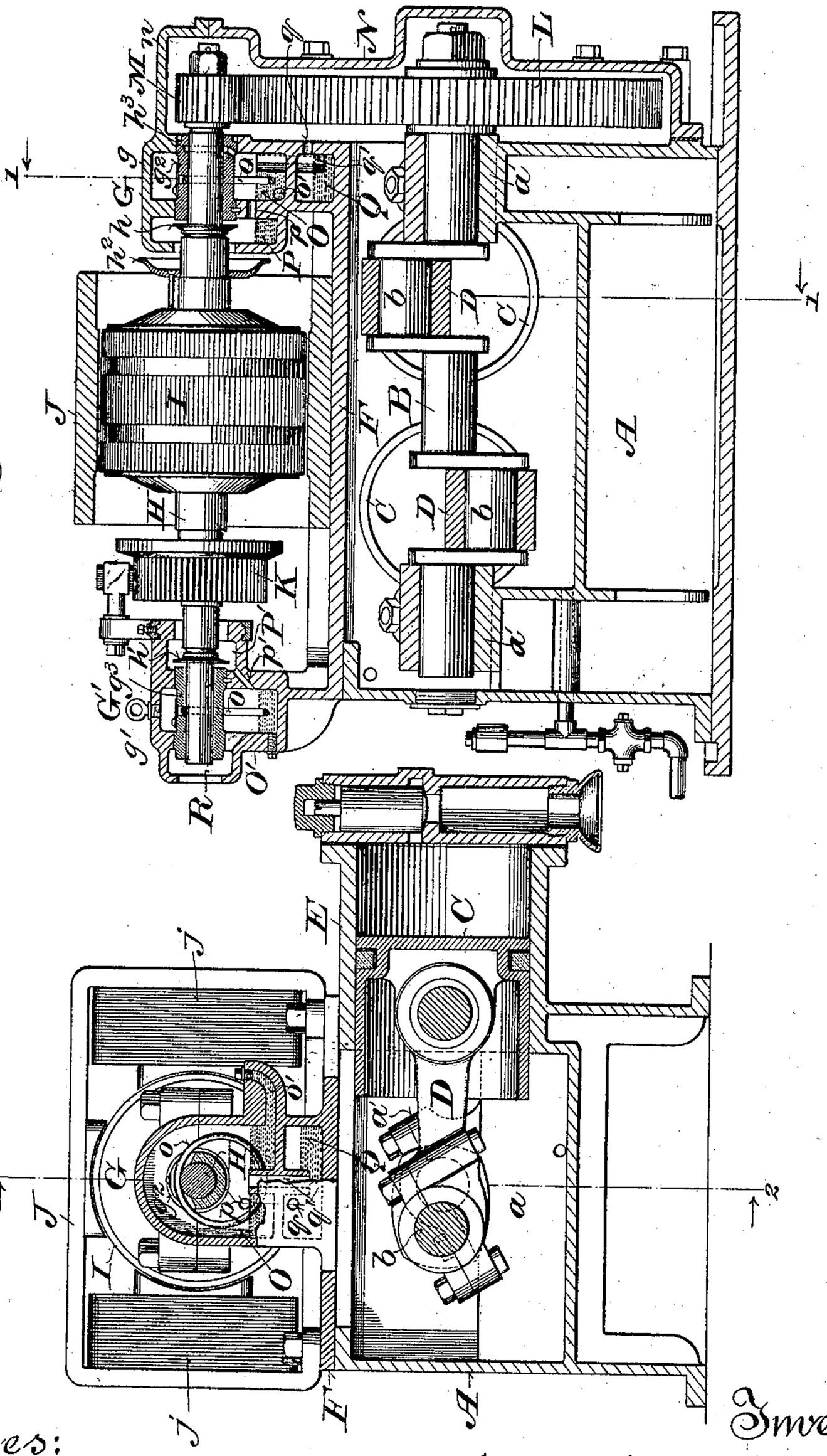

Fig. 1.

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Fig. 4.

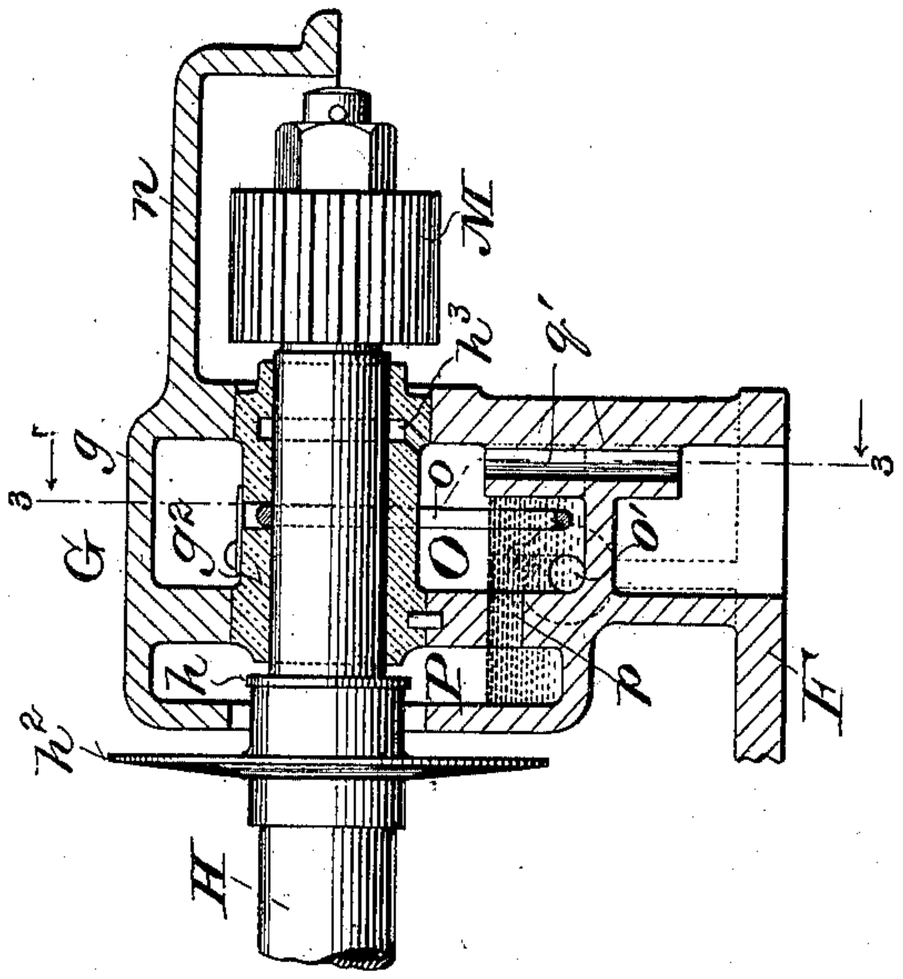
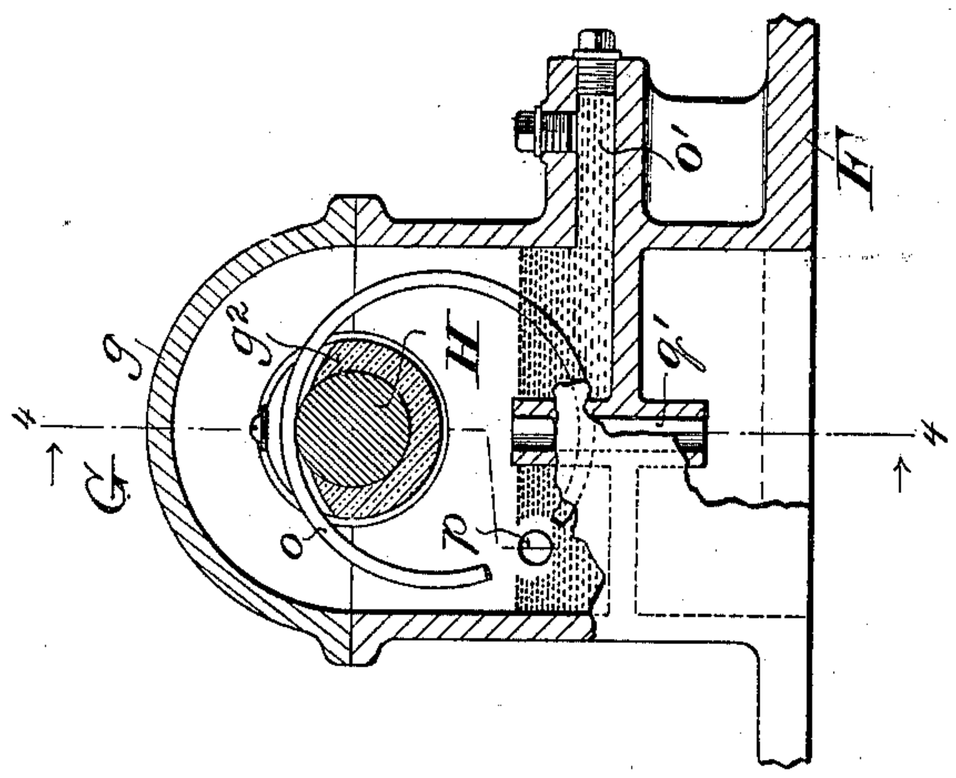


Fig. 3.



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UNITED STATES PATENT OFFICE.

NIELS A. CHRISTENSEN, OF MILWAUKEE, WISCONSIN.

MEANS FOR LUBRICATING ELECTRIC MOTORS.

SPECIFICATION forming part of Letters Patent No. 627,252, dated June 20, 1899.

Application filed March 8, 1899. Serial No. 708,212. (No model.)

To all whom it may concern:

Be it known that I, NIELS A. CHRISTENSEN, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Means for Lubricating Electric Motors, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates particularly to electric motors designed to be directly connected with pumps, compressors, or other machines with which they are to be used by incased gearing running in oil. Its main objects are to provide for thorough and continuous lubrication of the armature-bearings and to prevent the oil therefrom or oil-vapor from the incased driving connections reaching and injuring or affecting the armature-coils.

It consists of certain novel features in the construction of the armature-bearings and lubricating devices, as hereinafter particularly described, and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in all the figures.

Figure 1 is a vertical section of a combined compressor and motor to which my improvements are applied, the plane of the section being indicated by the broken dotted line 1 1, Fig. 2. Fig. 2 is a vertical section cutting the machine lengthwise of the motor and crank-shafts, as indicated by the broken dotted line 2 2, Fig. 1. Fig. 3 is a vertical section on the line 3 3, Fig. 4, corresponding with Fig. 1, but on a larger scale, of one of the armature-bearings, showing a modification of the lubricating and sealing device; and Fig. 4 is a section on the line 4 4, Fig. 3.

For the purpose of illustration I have shown my improvements as applied to an electric motor combined with a pump or compressor; but they may be applied to electric motors employed in connection with other machines with which they are connected in a like or similar way.

Referring to Figs. 1 and 2 of the drawings, A designates the compressor frame or case, which is formed with a chamber *a* to inclose and protect the working parts and driving connections of the compressor and to hold oil for their lubrication. It is also formed or provided with boxes *a' a'*, which open at their ends into said chamber.

B is a crank-shaft supported in said boxes and formed or provided with cranks *b b*, with which the compressor-pistons C C are connected by pitmen D D.

E E are the compressor-cylinders, which open at one end into the chamber *a* and in which said pistons are adapted to work.

F is the motor-base, which is mounted upon the compressor case or frame A and forms a cover or closure for the chamber *a* therein. It is formed or provided on its upper side with supports and housings G G' for the armature-bearings, in which the shaft H of the armature I is supported parallel with the crank-shaft B. The upper halves or caps *g g'* of said housings are made detachable to facilitate the removal of the armature and access to its bearings.

J designates the field-frame and armature-housing, which is mounted upon the base F and is provided with the field-magnets *j j*.

K is the commutator of the motor, mounted on the shaft H between the armature I and housing G'.

The crank-shaft B and armature-shaft H are extended at one end of the machine outside of the main frame or case A and are provided, respectively, with a gear L and pinion M, which mesh with each other. Said gear and pinion are inclosed and protected by a case N, the larger part of which is attached to the end of the main frame or case A, while the upper smaller part *n* is formed with or attached to the cap *g* of the adjacent housing, so as to be moved therewith and afford access to the pinion M as well as to permit the removal of the armature without disturbing the main part of the gear-case.

The housings G and G' are provided with boxes or bushings g^2 and g^3, which are fitted and held therein and which constitute the bearings for the journals of the armature-shaft H. O O' are chambers and oil-wells formed in said housings around and below said bushings, and *o o* are rings hanging loosely over the journals of the armature-shaft in transverse slots through the upper sides of said bushings and dipping into the oil contained in said wells. Said housings G

and G′ are also formed at and around the inner ends of said bushings with chambers P and P′, which communicate with said wells through openings $p\,p'$. In these chambers the armature-shaft is provided with rings h and h', by which the surplus oil working through the inner ends of said bushings is thrown off from the armature-shaft by centrifugal force and is prevented from following said shaft to the commutator and to the armature-coils. The oil thus thrown off by said rings is caught in the chambers P P′ and flows therefrom through the openings p and p' back into the wells O and O′. To further insure the protection of the armature-coils from any oil or oil-vapor that might possibly escape from the chamber P, the shaft H is provided between the armature and housing G with a shield or guard h^2. The housing G is formed below the well O with a chamber Q, which has an overflow-opening q into the gear-case N. A tube or passage q', opening out of the well O at the level at which the oil is to be held therein, extends into the chamber Q below its overflow-opening q, so that the lower end of said tube or passage will be sealed by the oil contained in said chamber, thus preventing oil-vapor escaping from the chamber a and gear-case N and coming into contact with and injuring or affecting the armature-coils. This passage also prevents the oil from rising in the well O above the desired level.

The housing G′ is formed at its outer end around the end of the bushing g^3 with a chamber R, which communicates through an opening on its lower side with the oil-well O′, so that the surplus oil working outwardly through said bushing will flow back into the well O′.

The oil-well O is provided on one side of the housing G with a filling opening or passage o', which has a removable cap or plug and is so located as to gage the supply of oil in said well and prevent overfilling it.

The bushing g^2 is formed inside near its outer end with an annular groove h^3, which opens on the under side into the oil-well O. Surplus oil working outwardly through said bushing is caught in said groove and conducted back into said well. A portion of the oil taken up by the gear L finds its way through the outer end of said bushing into said groove, and the well O is partially replenished in this way, the deficiency being supplied through the filling-opening o'. In case the well O should be supplied in this way with an excess of oil the surplus will overflow through the passage q' into the chamber Q.

Referring to Figs. 3 and 4, illustrating a modification of the lubricating and oil-sealing device, the lower chamber Q is omitted, and the passage q' opens into the chamber a, or it may be made to open into the gear-case N. Any oil-vapor that might in this case find its way from chamber a or gear-case N through the passage q' into the well O would be prevented from escaping therefrom through the adjacent armature-bearing by the film of oil which constantly fills the space between the bushing g^2 and the journal of shaft H, particularly when the machine is in operation. The escape of vapor from the well O into the chamber P and thence to the armature may be prevented by making the opening p below the upper end of passage q', as shown. In other respects the oil chambers and passages are substantially like those shown in Figs. 1 and 2 in construction, arrangement, and operation, serving to prevent an oversupply of oil in the well O and the escape of oil-vapor to the armature through the adjacent bearing.

By means of the foregoing construction and arrangement of the armature-bearings and lubricating devices I am enabled to dispense with a stuffing-box which would otherwise be necessary between the housing G and the armature to prevent the escape of oil from the gear-case and adjacent bearing to the armature-coils. Such a stuffing-box in machines of this kind which are often placed in locations not easily accessible is objectionable, because if it is packed sufficiently tight to prevent leakage it is apt to bind and cause the armature-shaft to run hard and to become heated. It also requires constant care to keep it in proper working order.

I claim—

1. In an electric motor the combination with an armature-bearing of a lubricating device comprising an oil-well, means for conveying oil from said well to said bearing, means for replenishing said well with oil, and an overflow-passage leading out of said well above the bottom thereof at a level above which it is desired that the oil shall not rise therein, substantially as and for the purposes set forth.

2. In an electric motor the combination with an armature-bearing of an oil-well provided with a filling-opening at a level above which it is desired the oil shall not rise therein, means for conveying oil from said well to said bearing, means for replenishing said well with oil, and an overflow-passage leading out of said well at a level above which it is desired the oil shall not rise therein, substantially as and for the purposes set forth.

3. In an electric motor the combination with an armature-bearing of a lubricating device comprising an oil-well from which oil is supplied to said bearing, and a chamber below said well having an overflow-opening and a passage leading out of said well at the level at which the oil is to be maintained therein and extending into said chamber below its overflow-opening, substantially as and for the purposes set forth.

4. In an electric motor the combination with an armature-bearing of an oil-well provided with a filling-opening at about the level at which oil is to be held therein, means for conveying oil from said well to said bearing, a chamber below said well having an over-

flow-opening, and a passage leading out of said well above its bottom and extending into said chamber below its overflow-opening, substantially as and for the purposes set forth.

5. In an electric motor the combination with the armature-shaft and a bearing therefor, of an oil-well below said bearing, means for raising oil therefrom to said bearing, a chamber surrounding the armature-shaft at the inner end of said bearing, and communicating below it with said well, an oil-intercepting ring on the armature-shaft within said chamber, a chamber below said well having an overflow-opening and a passage leading out of said well above the bottom thereof, and extending into said last-mentioned chamber below its overflow-opening, substantially as and for the purposes set forth.

6. In an electric motor the combination with the armature-shaft, incased power-transmitting gearing, and a bearing for said shaft between said gearing and the armature, of an oil-well below said bearing, means for conveying oil from said well to said bearing, a chamber surrounding said shaft at the inner end of said bearing and communicating below it with said well, a ring on said shaft within said chamber, a chamber below said well having an overflow-opening above its bottom into the gear-case, and a passage leading out of said well above its bottom and extending into the last-mentioned chamber above its overflow-opening, substantially as and for the purposes set forth.

In witness whereof I hereto affix my signature in presence of two witnesses.

NIELS A. CHRISTENSEN.

Witnesses:

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KENT H. FLANDERS.