Dec. 26, 1933. A. E. AVERRETT 1,941,335

SUBMERGIBLE APPARATUS

Filed Oct. 28, 1931

Fig. 2.

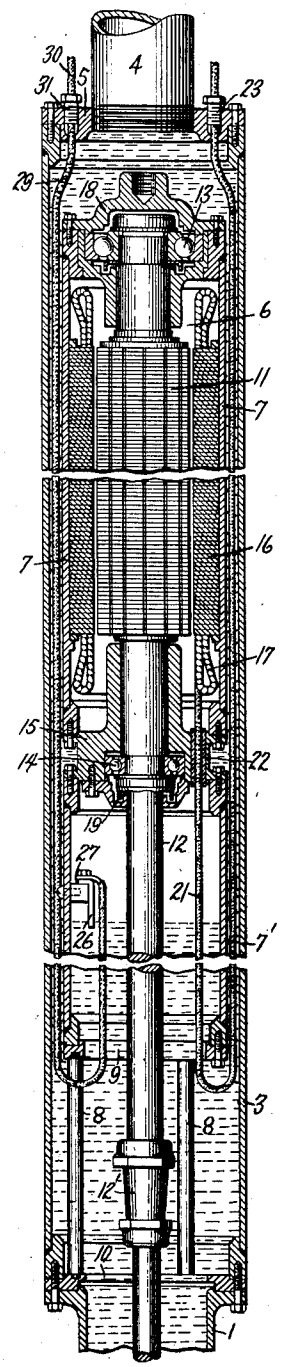
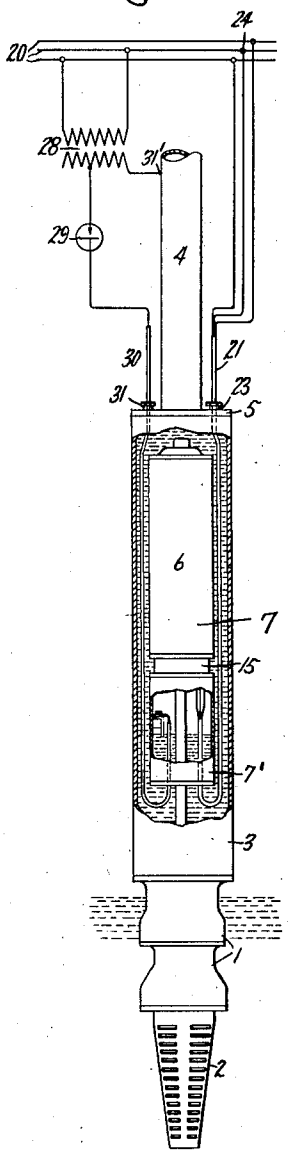


Fig. 1.



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SUBMERGIBLE APPARATUS

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7 Claims. (Cl. 172—36)

My invention relates to submergible apparatus of the type having a casing filled with gas at a pressure sufficient to oppose the pressure of the liquid in which the apparatus is submerged and thereby to exclude water from the apparatus.

It has been proposed, heretofore, to provide a submergible casing of this type for a motor, which is open at the bottom and extending below the winding and bearings of the motor, so that when the motor was submerged the air or gas within the casing was compressed sufficiently to exclude the liquid. This arrangement is subject to the disadvantage that the gas or air is gradually absorbed by the liquid in which the motor is submerged, so that if it is desired to operate the motor below the liquid level for a time it must frequently be raised to the surface to replenish the gas or air in the enclosing casing. It has also been proposed to supply gas or air under pressure to the casing of such a motor, but this requires pipe connections from the casing extending to the surface of the ground and regulating equipment to maintain the desired gas pressure within the casing.

The object of my invention is to provide a submergible apparatus adapted to operate in a gaseous atmosphere such as a motor, which can be operated for a considerable length of time while submerged without the necessity of removing it from the liquid, and without the necessity of pipe connections and regulating equipment for maintaining the desired pressure within the enclosing casing of the motor. I accomplish this by providing a submergible casing having an arrangement for generating a gas therein so as to exclude therefrom the liquid in which the casing is submerged.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In the drawing Fig. 1 diagrammatically illustrates the electrical connections and an elevation view, partly broken away, of a submergible motor embodying my invention in which a pump is arranged below the motor; and Fig. 2 is a sectional view of the motor and casing shown in Fig. 1.

Referring to Fig. 1 of the drawing, I have shown my invention in connection with a pump 1 which is adapted to be arranged in a well so that the strainer intake 2 of the pump is below the water level in the well. The pump 1 is suspended from a section of pipe 3 which is connected by a cap 5 to a discharge pipe 4 of slightly smaller size than the pipe section 3. The discharge pipe 4 extends to the top of the well and is supported in any suitable manner.

In this construction the pump is driven by a motor 6 arranged directly above the pump 1 within the pipe section 3. As shown in Fig. 2, this motor is provided with a casing comprising two sections 7 and 7'. The casing is supported by a plurality of rods 8 secured at the upper ends thereof to an annular ring 9 attached to the bottom of the casing 7' and the lower ends thereof rest on an annular ring 10 secured between the enlarged pipe section 3 and pump 1. The motor 6 comprises a rotor 11 mounted on a shaft 12, the upper end of which is arranged in a ball bearing 13 and the lower end of which is arranged in a ball bearing 14 secured in an annular member 15 to which the two sections 7 and 7' of the casing are secured, the shaft being coupled at 12' to the shaft of the pump. A laminated stator 16 having a winding 17, is secured to the inner wall of the upper section 7 of the casing. The upper end of the motor is closed by a cap 18 and the lower end thereof is provided with a packing joint 19 for the bearing 14 about the shaft 12. The electrical connections from the motor 6 to an alternating current source indicated at 20 above ground is made through an insulated cable 21, which extends from the motor through water-tight connections 22 and 23 in the member 15 and cap 5 to the current source, indicated at 24.

In the operation of the pump water is drawn in at the intake 2 and discharged through the pipe section 3 around the sections 7 and 7' into the discharge pipe 4. This subjects the casing to the pressure of the surrounding water, which is dependent upon the total head of the water above the casing in which the motor is required to operate.

In accordance with my invention water is excluded from the motor 6 by generating gas within the motor casing. This may be done in any suitable manner. I prefer to generate the gas by electrolysis using the casing 7' as one electrode, the body of water as the electrolyte, and the plate 26 of suitable oxidizable metal such as lead or the like, as the other electrode which is secured to an insulator from the casing 7', as indicated at 27. The current for producing electrolysis is supplied from a transformer 28 having the primary and secondary thereof connected to one phase of the alternating current source 20. Unidirectional current is supplied to the plate 26

through a copper oxide rectifier 29, or other suitable type, which has one terminal thereof connected to the plate 26 by an insulated cable 30 extending through a water-tight connection 31 in the cap 5 and the other terminal thereof connected to the secondary of the transformer 28, the circuit being completed through the casing 7', rods 8 and the discharge pipe, which is connected to one terminal of the transfomer secondary is indicated at 31'. When the motor and pump are operated water rises in the lower part of the casing 7' through the open end thereof and raises the pressure of the air in the motor casing. Whenever the water level rises so that the water comes in contact with the plate 26, current flows through the water from the anode plate 26 to the casing 7', which is the cathode, and causes electrolysis to take place, as the water serves as an electrolyte. The water can be utilized as an electrolyte in this way, as water which has not been especially treated or purified contains enough salts to promote ionization when current passes through it. The oxygen is formed by the electrolytic decomposition of the water and combines with the oxidizable plate 26 to form an oxide coating thereon, and free hydrogen is liberated at the inside wall of the casing 7'. The hydrogen gas generated passes through the packing joint 19 and bearing 14 and mingles with the air within the sections 7 and 7' of the casing so that sufficient pressure of the air and gas is produced to exclude water from the casing. In this way when the water level in the section 7' of the motor casing rises to immerse the plate 26, gas is automatically supplied to the motor casing as required to exclude water.

Although I have shown my improved submergible motor supplied by gas generated by electrolysis, I do not desire my invention to be limited to the particular arrangement set forth, and I intend in the following claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. Apparatus adapted to operate in a gaseous atmosphere and having a submergible casing open below the apparatus to admit the liquid in which the casing is submerged, and means including an electrolytic gas generator within said casing below said apparatus and utilizing the liquid entering said casing for excluding from said apparatus liquid in which said casing is submerged.

2. Apparatus adapted to operate in a gaseous atmosphere and having a submergible casing open below the apparatus to admit the liquid in which said casing is submerged, and means including an electrolytic gas generator having a plurality of electrodes arranged within said casing below said apparatus and utilizing the liquid in which said casing is submerged for excluding from said apparatus liquid in which said casing is submerged.

3. A motor adapted to operate in a gaseous atmosphere and having a submergible casing provided with an opening below said motor, and means including an electrolytic gas generator having a plurality of electrodes arranged in said casing below said motor and utilizing the liquid within said casing as the electrolyte for preventing further entry of the liquid into said casing.

4. Apparatus adapted to operate in a gaseous atmosphere and having a submergible casing, and means including an electrolytic gas generator utilizing said casing as one electrode and the liquid within the casing as the electrolyte for preventing entry of the liquid into said casing.

5. A motor adapted to operate in a gaseous atmosphere and having a casing provided with an opening below the motor to admit the liquid in which the casing is submerged, and means including an electrolytic gas generator arranged in said casing below said motor and utilizing said casing as one electrode for dissociating the liquid entering said casing to exclude the liquid from said apparatus.

6. A motor adapted to operate in a gaseous atmosphere and having a submergible casing provided with an opening below the motor to admit the liquid in which the casing is submerged, and means including an electrolytic gas generator arranged in said casing having two electrodes extending below said motor and utilizing said casing as one electrode for dissociating the liquid entering said casing to exclude the liquid from said apparatus, the other of said electrodes being arranged within said casing in spaced relation to the side wall thereof.

7. A motor adapted to operate in a gaseous atmosphere and having a submergible casing provided with an opening below said motor, and means including an electrolytic gas generator having a plurality of electrodes arranged in said casing below said motor and utilizing the liquid within said casing as the electrolyte for limiting entry of the liquid into said casing.

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