

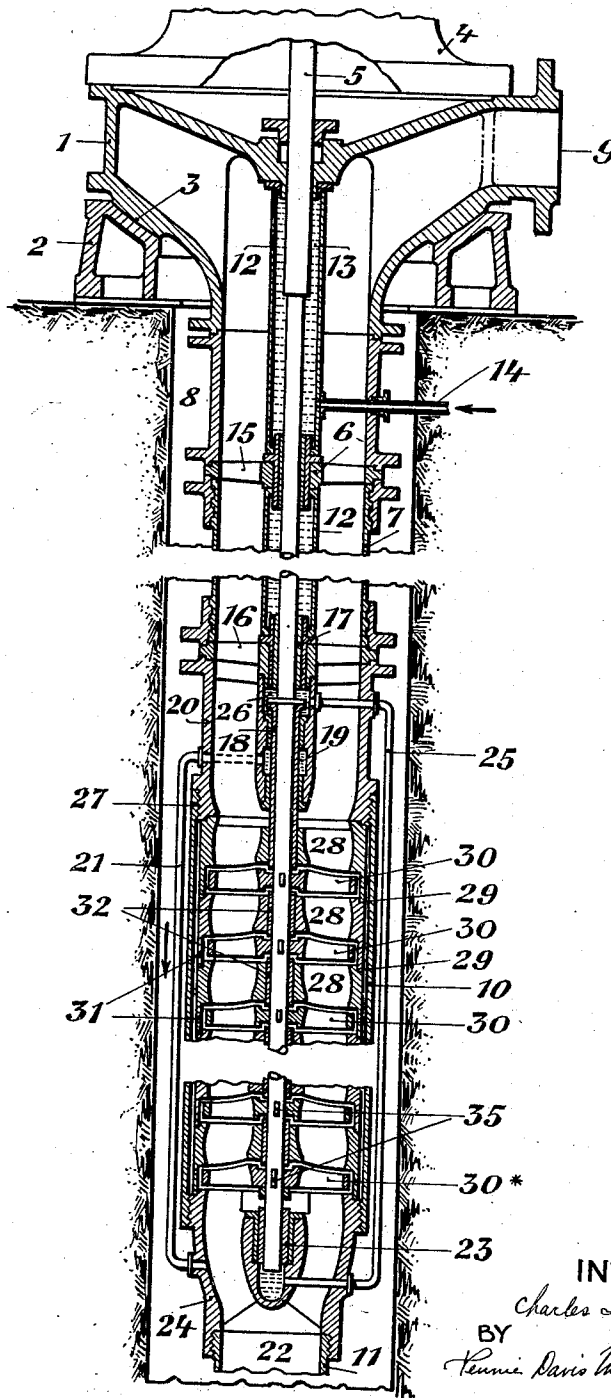
May 13, 1930.

C. SCHAER

1,758,175

BORE HOLE PUMP

Filed May 12, 1925



INVENTOR

Charles Schaer

BY

René Paris Invernizzi & Edmonde

ATTORNEYS

UNITED STATES PATENT OFFICE

CHARLES SCHAEER, OF LANGENTAL, SWITZERLAND, ASSIGNOR TO THE FIRM SULZER
FRÈRES SOCIÉTÉ ANONYME, OF WINTERTHUR, SWITZERLAND

BORE-HOLE PUMP

Application filed May 12, 1925, Serial No. 29,653, and in Switzerland July 11, 1924.

This invention relates to pumps for use in wells or bore holes and in particular to axial flow pumps of the multi-stage type.

The object of the invention is to provide a pump in which the various guide units for the impellers can be simply made and assembled, further objects of the invention being to protect the pump spindle and its bearings from injury due to foreign matter in the liquid under treatment whilst in addition, means are provided for facilitating the erection of the pump as a whole together with its driving unit so that the weight thereof is more uniformly distributed whatever circumstances may arise.

To this end according to this invention each guide member for an impeller comprises a cylindrical member adapted to engage a similar cylindrical member immediately above or below it. Further, a spherical seating is formed between the main casing of the pump and the supporting member therefor so as to enable the weight of the pump to be uniformly distributed over the support even when these two members are relatively inclined to one another.

Moreover the pump spindle and its bearings are enclosed in a protective casing containing some lubricating liquid, for example water under pressure, and at the lower end of this casing a chamber is formed in which the pressure is less than that which obtains within the pump, so that the lubricant around the spindle is constantly changed by its gradual escape from this chamber.

A construction according to this invention is diagrammatically illustrated in the accompanying drawing in vertical section.

In the construction illustrated, the casing 1 of the pump is provided with a spherical surface 3 which cooperates with a correspondingly shaped bearing surface on the supporting member or base 2 which constitutes the supporting bed of the pump. The portion 1 of the casing carries an additional casing 4 which supports the bearings for the driving spindle 5 and also the motor or like prime mover (not shown) for this spindle.

At its lower end the casing 1 carries the delivery pipe 7 a suitable bearing 6 being

provided at the lower end of the casing for the shaft.

The delivery pipe 7 which is inserted in the well or bore hole 8 carries the pump proper 10, the lower end of which is provided with a suction pipe 11, the casing being provided at its upper end with an outlet branch 9. It will be seen that the casting constituting the main casing 1 is of approximately conical shape and therefore of considerable strength.

The spindle of the pump is enclosed within a liquid-tight protecting tube 12 within which the bearing 6, already referred to, is actually enclosed. The annular space 13 between the spindle 5 and the protective tube 12 contains a lubricating liquid constantly supplied from any suitable source through the pipe 14. Mounted within the delivery portion of the pump casing at suitable intervals in its length are spiders 15, 16, which not only serve as supports for the bearings 6, 17 on the pump spindle, but also carry the protective tube 12.

The pipe 14 through which lubricant is constantly supplied to the interior 13 of the protective tube 12, is preferably arranged above the upper bearing 6, whilst below the lower bearing 17 where the spindle projects through the lower end of its protective tube 12 is a sleeve or bush 18 provided with an annular chamber 19. If desired, the chamber 19 may be arranged at some other point in the length of the protective tube.

The chamber 19 is connected by a pipe 21 to the suction chamber 22 of the pump. The bearing 23 for the lower end of the shaft is mounted in the suction branch 24 of the pump and can, if desired, be fed with lubricant from within the protective tube 12. For example, an additional annular chamber 26 may be formed within the bearing 17 and connected by means of a pipe 25 with the bearing 23, the pipe passing through the wall of the delivery branch 20 and through the wall of the suction chamber 22.

The rotors or impellers of the pump are mounted within the casing of the pump proper 10 which can, if desired, be connected to the protective tube in some manner other

than that illustrated in the drawing. The protective tube 12 may be longitudinally adjusted and adapted to engage suitable packings on the bearing members or supports therefor. Such adjustment may be made on each length of tube at the bearing where the protecting casing is built up from a series of tubes which together form a continued water-tight protective casing round the spindle and its bearings.

In an alternative construction (which is omitted to prevent confusion) the chamber 19, which may be of any desired form and size, is connected to the atmosphere instead of to the suction chamber of the pump. With the construction illustrated such an arrangement would result in the pressure within the chamber 19 being always less than that of the lubricating liquid in the protective tube and always less than that within the pump with the result that lubricant would flow from the interior of the tube into the chamber 19.

The operation of the lubricating arrangement described will not depend on whether the pump is working or stationary. It is possible to supply through the pipe 14 sufficient lubricant to ensure that the uppermost bearing is always completely immersed therein.

The lubricant flows through the annular chamber 13 past the bearings which occur in the length of the tube down to the chamber 26. Thence some of the lubricant is drawn off and used to lubricate the lowest bearing 23 whilst another part of the lubricant escapes from the chamber 19 whence it passes through the pipe 21 into the suction chamber 22 of the pump. Thus the bearing above chamber 19 at the lower end of the protective casing is fluid-tight and prevents sand and other impurities from working into the bearings which are thus within a bath of lubricant and maintained free from impurities.

Some of the lubricant (which may be in the form of oil or filtered water) may be arranged to escape through the lower end of the protective tube whilst the rest is caused to flow in an upward direction by the freshly admitted lubricant. This portion of the lubricant can be made to flow through the protective tube in the same direction as the liquid being pumped and can again be withdrawn at the upper end and caused to circulate in the manner described.

At the lower end of the delivery pipe 7 a cylindrical pump casing 10 is connected to the delivery branch 20 by means of a screw-threaded joint 27, the guide units for the rotor members assembled within this tubular casing being held together by a clamping member at the other end of the pump, the clamping member being, if desired, also adapted to support the lowest bearing. The uppermost guide unit 28 comprises a cylindrical member which extends in the axial direction so as to engage a groove 29 concen-

tric with the shaft formed in the guide member 28 immediately below it, and below the first impeller 30. The second guide unit 28 is similarly connected by means of a collar 31 which extends below the next impeller 30 with a corresponding groove 29 in the third guide unit 28 and so forth.

Between each guide unit 28, the impellers 30 are keyed on the spindle 5 by keys 35, and spaced at the required distance apart by distance pieces 32 which also prevent losses along the spindle. Finally the lowermost guide unit 24 constitutes the suction branch to which is secured the suction pipe 11. If desired, the constructional details of the guide units may differ from that shown in the drawing without departing from the invention.

As will be seen, the invention provides a pump of which the diameter is hardly larger than that of the suction and delivery branches which is of the utmost advantage in sinking deep wells since it reduces the diameter of the borehole and the consequent cost. The assembling of the pump is a simple matter. First of all the bottom impeller 30* is keyed to the shaft 5; then the following guide unit with its distance tube 32 is placed above it. Thereafter the impellers and guide units are alternated until the necessary units have been assembled. The completed shaft can then be inserted in the casing 10 and the end pieces 20 and 24 screwed into place. The casing 10 may then be joined to the protective casing 12 and the outer casing 7.

Further, as the bearings of the spindle are protected from wear, the life of the pump is increased and its efficiency improved while finally the pump as a whole can readily seat itself upon its supporting base to suit the particular conditions which happen to prevail.

Claims:

1. In a bore hole pump, the combination of a casing having an outlet therein, a delivery pipe having a suction branch at the lower end thereof connected to said casing and adapted to extend into the bore hole, a protective tube within said casing and said pipe, a bearing within the lower end of said tube, said bearing having two chambers, a shaft rotatably mounted in said bearing, a rotor on the lower end of said shaft, means for circulating lubricant through said protective tube into said chambers, and means for maintaining the lubricant pressure in one of said chambers below that which obtains in the protective tube above said bearing and above that which obtains in the other of said chambers.

2. In a bore hole pump, the combination of a casing having an outlet opening therein, a delivery pipe having a suction branch at the lower end thereof connected to said casing and adapted to extend into the bore hole, a protective tube within said casing and said pipe, bearings within the lower end of said

5 tube and said pipe, said tube bearing hav-
ing two chambers, a shaft rotatably mounted
in said bearings, a rotor on the lower end
of said shaft, means for circulating lubricant
through said protective tube into said cham-
bers, a conduit connecting one of said cham-
bers with the bearing in the lower end of
said pipe, and means for maintaining the
lubricant pressure in said last mentioned
10 chamber below that which obtains in the
protective tube above said tube bearing and
above that which obtains in said other cham-
ber.

15 In testimony whereof I have affixed my sig-
nature.

CHARLES SCHAER.

20

25

30

35

40

45

50

55

60

65