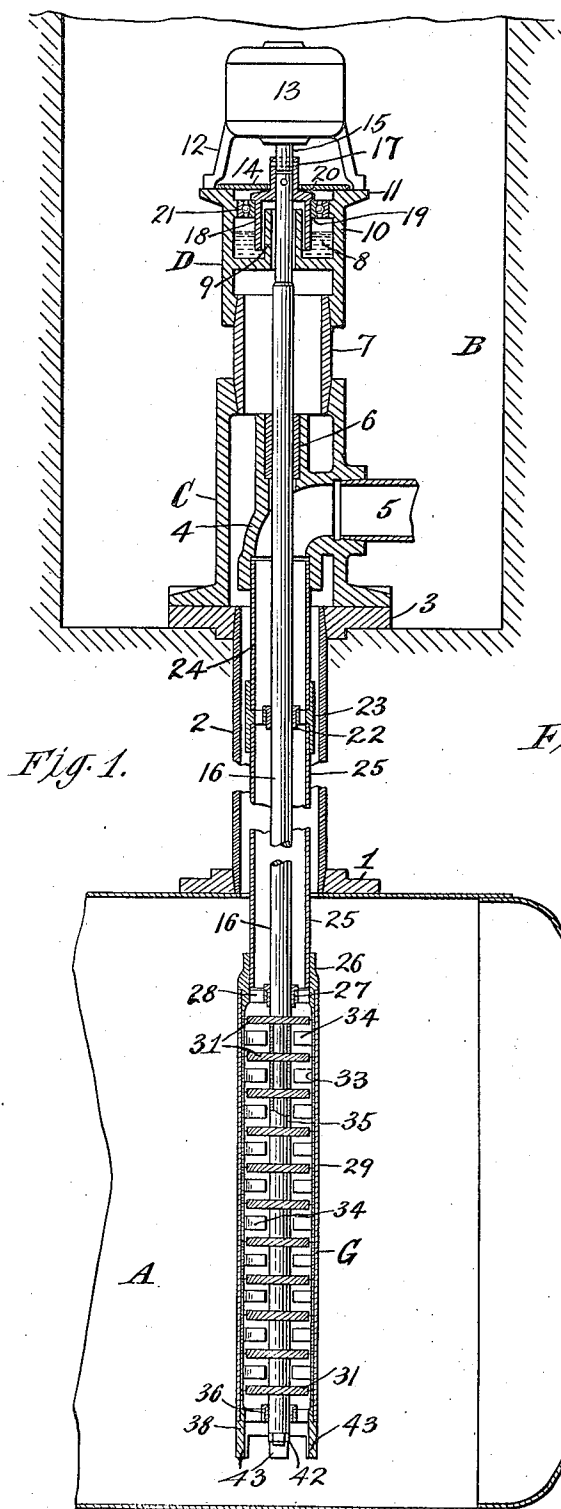
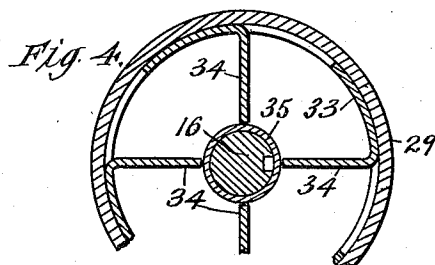
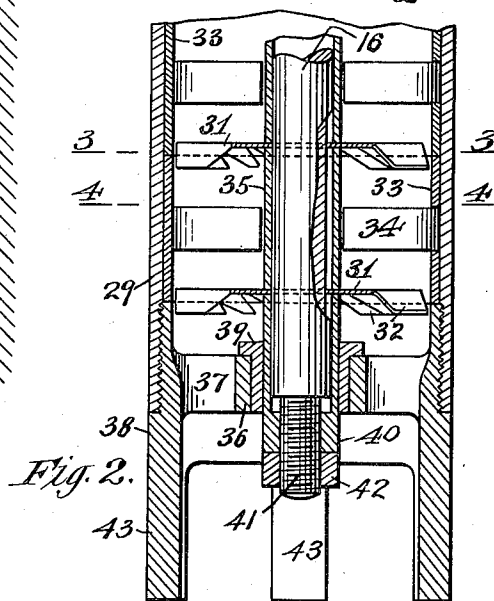
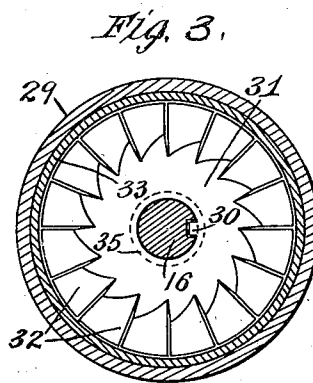


Feb. 13, 1923.

H. F. BENSON.
TANK PUMP.
FILED JAN. 28, 1921.

1,444,944.



Inventor:
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UNITED STATES PATENT OFFICE.

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TANK PUMP.

Application filed January 28, 1921. Serial No. 440,606.

To all whom it may concern:

Be it known that I, HARRY F. BENSON, a citizen of the United States, residing at Holyoke, county of Hampden, and State of Massachusetts, have invented certain new and useful Improvements in Tank Pumps, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to a pump, of the axial flow type, which is so constructed as to be especially adapted for use in connection with fluid storage systems wherein it is desired to dispense the stored fluid in relatively small quantities at varying intervals such, for instance, as in commercially handling gasoline and the like.

A particular object is to provide a pump of this type in which a series of impellers produced from sheet metal are assembled on a single shaft and are enclosed by a cylindrical pump barrel member receiving conversion or diffusion vanes also formed of sheet metal, thus providing a construction which, in addition to being simple, is inexpensive to manufacture by reason of low production cost of the component parts and ease of assembly.

A further feature of importance, especially in its combination with the liquid seal, consists in the use of a leakage space or chamber between the liquid seal and the pressure line which returns all leakage of fluid or vapors to the storage tank, effectively precluding the existence of any pressure against the liquid seal packing.

A further feature of the invention resides in combining the pump barrel, discharge head and pump driving means in such a manner that all leakage of fluid and vapors is retained within the pump casing by a liquid seal which further functions as the lubricating chamber of the thrust bearing of the pump.

Another feature consists in providing a discharge head or T in axial alignment with but separate from the driving head and thrust bearing member taking the pump load, whereby the total length of the connection between the discharge head or T and the thrust bearing member may be varied to suit conditions.

In the drawings:

Figure 1 is a vertical central section showing a pump and storage tank embodying the present invention.

Figure 2 is an enlarged vertical central section of the lower end of the pump barrel.

Figure 3 is a horizontal section on the line 3—3 of Figure 2.

Figure 4 is a horizontal section on the line 4—4 of Figure 2.

Referring to the drawings:

The pump, as herein shown, is in connection with a storage tank A of the type usually placed under ground. This tank A carries the saddle flange 1 into which one end of a cylindrical casing 2 is fitted, the other end of said casing being received by an aperture in the foundation plate 3 located on the floor of the pit B directly above the saddle flange 1. The foundation plate 3 forms the bed for the discharge head C above which is mounted the driving means D which is connected with the pump G located within the storage tank A.

The discharge head C is a substantially cylindrical casting having a flanged base resting on the foundation plate 3. On the interior of the cylindrical casting is an elbow 4 having its discharge opening in the side of said cylindrical casting and adapted to receive a pipe 5 for conveying away the fluid discharged by the pump. The elbow 4 has a vertically disposed bearing 6 concentric with the cylindrical casting and with the downwardly directed opening of said elbow.

The upper end of the cylindrical casting receives the lower end of a spacing nipple 7, the upper end of which carries the driving head D comprising an annular thrust bearing chamber having an inner wall 9 and an outer wall 10 forming also a lubricant reservoir. The outer wall 10 is flanged as at 11 to receive the supporting legs of a driving motor 13, said legs being indicated at 12 and resting on the flange. A top cover plate 14 also rests on the flange 11 and closes the upper side of the oil or lubricant chamber. The shaft 15 of the motor has fixed thereto a sleeve 17 which is also fixed to the upper end of the vertical pump shaft 16. The sleeve 17 has the skirt

18 provided with the shoulder 20, said skirt telescoping over the inner wall 9 and extending well below the surface of the lubricant in the annular lubricant chamber indicated at 8. Laterally extending ball races 19 and 21, the former of which is seated against the shoulder 20 while the latter is carried by the outer wall 10, together with the balls located therebetween, comprise the thrust bearing, the race faces of said races 19 and 21 being in a vertical plane.

The arrangement of the skirt 18 of the shaft sleeve 17 telescoping over the inner wall 10 and extending below the surface of the lubricant in the annular reservoir 8 provides, in addition to a lubricating chamber for the thrust bearing, a liquid seal for the upper end of the pump casing as will be hereinafter described and which effectively prevents the escape of any vapors from the pump casing.

The shaft 16 extends downwardly through the bearing 6 and also through the bearing 22 formed in the drop pipe coupling member 23 connecting the drop pipe sections 24 and 25, the said coupling member 23 being webbed as shown to permit upward passage of the fluid pumped.

On the lower end of the drop pipe section 25 is a coupling member 26 having the bearing 27 receiving the shaft 16 and connecting with the coupling member through webs 28. This coupling member 26 receives the upper end of the pump barrel 29 which is of cylindrical form. The length of the shaft 16 which extends through this pump barrel 29 is reduced in size to provide an upper shoulder against which there is seated an impeller 31 which is keyed to the said shaft as at 30. This impeller is produced from a sheet metal disc radially slitted to form axial flow vanes or blades 32 bent downwardly with respect to the upper face or discharge side of the impeller. After this impeller 31 has been properly seated against the shoulder on the shaft 16 the guide vane member 33 is slipped into the pump barrel 29 and consists of a cylindrical sleeve having radially directed guide vanes 34 cut out from the said sleeve in the form of tongues bent inwardly in a radial direction with respect to the axis of the shaft 16. These tongues or vanes 34 are of less width than the sleeve. The said guide vane members 33 are also of sheet metal and the cylindrical sleeve arrangement provides for properly spacing the guide vanes between the impellers, the uppermost guide vane resting against the lower end of the coupling member 26.

The impellers are all indicated as 31 and are assembled to the lower end of the shaft 16 in the same manner as that previously described except that, in order to properly space the impellers along the shaft, spacing

thimbles 35 are slipped onto the shaft between the impellers. Between adjacent impellers guide vane members 33 are slipped into the pump barrel and the final guide vane member is held in the barrel by the threaded portion of the supporting coupling 38 screwed into the end of the barrel 29 and having webs 37 which carry the bearing member 36 receiving the bushing 39 through which the last spacing thimble 35 projects. This thimble is provided with a threaded portion 40 screwed on the threaded end 41 of the shaft 16 and locked against backing off by a jam nut 42. Legs 43 on the supporting coupling 38 ensure the proper spacing of the lower end of the pump barrel from the bottom of the storage tank A.

It is to be noted that the only weight which has to be supported against downward thrust from the driving head is the shaft 16 carrying the impellers 31 and their spacing thimbles 35, the remainder of the weight of the pump barrel being supported by the discharge casting by reason of the fact that the guide vanes are slipped into the pump barrel shell in the manner described.

In operation, the motor 13 driving the vertical shaft 16 rotates the impellers 31 thereby drawing fluid from the storage tank A in at the lower end of the pump barrel 29 and carrying it upwardly through the drop pipe and discharging it through the outlet pipe 5. The elbow 4, while cast integral with the discharge head casting C, nevertheless, is spaced from the cylindrical wall thereof in such a manner that the casing 2, discharge head casting C and nipple 7 form a return conduit directly to the storage tank A, the upper end of said conduit being liquid sealed by the lubricant in the thrust bearing chamber, therefore, any leakage past the bearing 6 is directly returned to the storage tank A and, by reason of the liquid seal, there is no opportunity for the escape of vapors. This construction makes the pump one which is admirably adapted to the handling of volatile liquids.

The separation of the thrust bearing chamber D from the discharge head C by interposing the nipple 7 therebetween permits the placing of the driving means at any desired height, dependent on conditions, by simply changing the length of the nipple 7 and, of course, providing the required length of vertical shaft 16.

With the use of this type of pump in connection with a storage system for volatile liquids, such liquids may be readily handled due to the fact that there is practically no suction head. Furthermore, if a valve is placed in the discharge head the design of the pump is such that it has a predetermined maximum or closed valve discharge pressure which does not increase even though the

pump is permitted to operate with the discharge valve closed. Also, this construction provides a pump in which no suction valve is used at the foot of the pump and consequently the pump barrel drains when not in use with the result that there is no pressure in the pump barrel when the pump is not in operation.

I claim:

1. The combination with a storage tank, of a pump comprising a hollow driving head closed at one end, a casing pipe connecting the open end of the driving head with said tank, and a pumping means within said tank and having a delivery passage enclosed within but independent of said casing pipe.

2. The combination with a storage tank, of a pump comprising a hollow driving head having a liquid seal at one end, a casing pipe connecting the other end with said tank, and a pumping barrel within said tank and having a delivery passage enclosed within but independent of said casing pipe.

3. The combination with a storage tank, of a pump comprising a thrust bearing head mounting a driving member, a hollow discharge casting having closed connection with said head and including a discharge elbow, a casing pipe connected at one end with said casting and at the other with said tank, and pumping means in said tank connected with said discharge elbow and driven from the driving member mounted on the thrust bearing head.

4. The combination with a storage tank, of a pump comprising a thrust bearing head having a liquid seal and mounting a driving member, a hollow discharge casting connected with and closed by said thrust bearing head and including a discharge elbow, a casing pipe connected at one end with said casting and at the other with said tank to form a leakage return to the tank, and pumping means in said tank and discharging through said elbow and driven from the driving member mounted on said thrust bearing head.

5. The combination with a storage tank, of a pump comprising a thrust bearing head formed with spaced annular walls forming a lubricant reservoir therebetween, driving means surmounting said head and having a shaft extending through the head and surrounded by the inner wall of the lubricant reservoir, a sleeve carried by said shaft and extended below the lubricant in said head to form a liquid seal, a discharge casting having closed connection with said head and tank to form a return conduit to the tank, and a pump barrel having a delivery passage in said closed connection and driven by said shaft.

6. In a pump, a thrust bearing head mounting a driving member, a discharge

casting, and a removable connection between the two whereby the space between the same may be varied by substitution of different length connections.

7. A pump barrel comprising a cylindrical shell, a discharge pipe coupling member at one end of said shell and having a bearing, a foot member at the other end having a similar bearing, a shaft mounted in said bearings, impellers in keyed relation with and spaced along said shaft, and sheet metal cylindrical sleeves slipped into said casing and confined between said coupling and foot members and having radially extending tongues cut therefrom and bent inwardly between each pair of impellers to form guide vanes.

8. A pump barrel comprising a cylindrical shell, a discharge pipe coupling member at one end of said shell, a foot member at the other end, an axially extending shaft, impellers in keyed relation with and spaced along said shaft, and sheet metal cylindrical sleeves slipped into said casing and confined between said coupling and foot members and having radially extending tongues cut therefrom and bent inwardly between each pair of impellers to form guide vanes.

9. A pump barrel comprising a cylindrical shell, a discharge pipe coupling member at one end of said shell, a foot member at the other end, an axially extending shaft, impellers in keyed relation with and spaced along said shaft and each comprising a sheet metal disc radially slitted to provide blades, said blades being bent downwardly on one side of the disc to impart the proper pitch, a spacing thimble on said shaft between each pair of impellers, and means retaining said impellers and spacing members against movement longitudinally of said shaft.

10. A pump barrel comprising a cylindrical shell, a discharge pipe coupling member at one end of said shell, a foot member at the other, bearings carried by said members, a shaft mounted in said bearings axially of said shell, impellers in keyed relation with said shaft and spaced therealong and each comprising a sheet metal disc radially slitted to provide blades, said blades being bent downwardly on one side of the disc to impart the proper pitch, a spacing thimble between each pair of impellers, and sheet metal cylindrical sleeves slipped into said casing and confined between said coupling and foot members and each having tongues struck out from the same and bent radially inward between the respective impellers to provide guide vanes.

11. A pump barrel comprising a cylindrical shell, a discharge pipe coupling member at one end of said shell, a foot member at the other, bearings carried by said members, a shaft mounted in said bearings

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with radially bent tongues forming spacing
pieces and combined guide and conversion 10
vanes.

In testimony whereof, I have hereunto set
my hand.

HARRY F. BENSON.