To all whom it may concern:

Be it known that I, JOHN A. WINTROATH, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Deep-Well Turbine Pump, of which the following is a specification.

This invention relates to turbine pumps of the type employed for raising water from deep wells. For the purpose of raising water from deep wells, multi-staged turbine pumps are employed. The impellers of these pumps are ordinarily driven through a vertical shaft which extends to the surface of the ground, and is surrounded by a tubular oil casing through which lubricating oil is delivered to bearings supported in the casing and by which the shaft turns.

The lower end of the oil column, in the standard form of turbine pump, is in communication with the water column of the pump, it being impractical to maintain a perfectly tight joint about the shaft at this point. A certain amount of leakage of oil at this point does no harm, since the oil is carried upwardly with the water and discharged therewith, and the leakage is made evident by a lowering of the upper surface of the oil level in the casing, which can be observed and compensated for by the addition of more oil. Any leakage of water into the casing through the bottom thereof is, however, a bad thing as this water displaces the oil and seriously interferes with lubrication. If the leakage is gradual the oil may be replaced with water through a greater portion of the casing without the operator becoming aware of this fact.

It is an object of my invention to prevent water from entering the casing and displacing the oil therefrom, and this object I accomplish by subje...
in the passage 29, 50 pounds per square inch; and the pressure in the passage 30, 75 pounds per square inch. This pressure in the uppermost bowl 19 is above the static pressure of oil in the space 35 between the shaft 15 and the shaft casing 16.

The difference in pressure between the oil and water would, unless my invention was employed, result in the passage of the water inwardly, as indicated by the arrow 38 in Fig. 2, between the impeller and the core 39 of the bowl 19, the water displacing the oil in the space 35. This, however, is prevented by the employment of a pressure relief chamber 42 formed in the casting of the core 39 at a point immediately above the impeller 23. The pressure within the chamber 42 is maintained, at a value somewhat less than the static head of the oil, by the employment of an equalizing pipe 44 which communicates between the pressure relief chamber 42 and the passage 28 of the lower bowl or housing 17, in which a pressure of 25 pounds per square inch is held by the impeller 21. By this inter-communication the pressure within the pressure relief chamber 42 is held at the same pressure as the passage 28, namely 25 pounds per square inch, which is considerably lower than the pressure of 75 pounds per square inch created in the passage 30 by the combined action of the impellers 21, 22 and 23. Any water which is forced between the impeller 23 and the core 39 and upwardly will pass through small openings 47 in the bearing into the pressure relief chamber 42, from whence it is carried through piping 44 to the lower stage passage 28.

By the use of this arrangement, an ample supply of oil may be at all times maintained in the bearings of the pump, owing to the fact that the water cannot rise within the oil column and cause the displacement thereof, thus eliminating the necessity of frequently adjusting the packing member 48, Fig. 1, which must be done in the ordinary type of turbine pumps in order to prevent the forcing of the oil upward in the oil column by the water pressure at the lower end thereof.

It will be immediately evident that by maintaining positive lubrication, the life of the pump bearings may be very materially increased. The arrangement herein shown produces this greatly desired result.

I claim as my invention:

1. In a turbine pump, the combination of: a plurality of stage housings; impellers in said stage housings; a shaft for driving said impellers; a tubular casing surrounding said shaft for supporting a column of lubricating oil; walls enclosing a pressure relief chamber around said shaft at a point adjacent to the uppermost of said impellers; and a tubular member communicating between said relief chamber and the fluid passage of one of said stage housings in which a pressure is existent during operation, substantially in balance with the static head of the lubricating oil column.

2. In a turbine pump, the combination of: an impeller housing; a bearing at the upper end of said housing; a shaft extending upwardly through said bearing to a driver; an oil tube extending upwardly from said housing and surrounding the shaft; an impeller on said shaft within said housing; and means for releasing the water collected at high pressure between the upper face of said impeller and the lower end of said bearing so as to prevent upward displacement of said oil by said water.

3. In a turbine pump, the combination of: a plurality of stage housings; impellers in said stage housings; a shaft for driving said impellers; a tubular casing surrounding said shaft for supporting a column of lubricating oil; bearing means at the upper end of said group of stage housings, said bearing receiving said shaft and being adjacent to the column of lubricating oil; and means for releasing the water collected under pressure between the upper end of said impellers and the lower end of said bearing so as to prevent upward displacement of said oil by said water.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 22d day of September, 1923.

JOHN A. WINTROATH.