

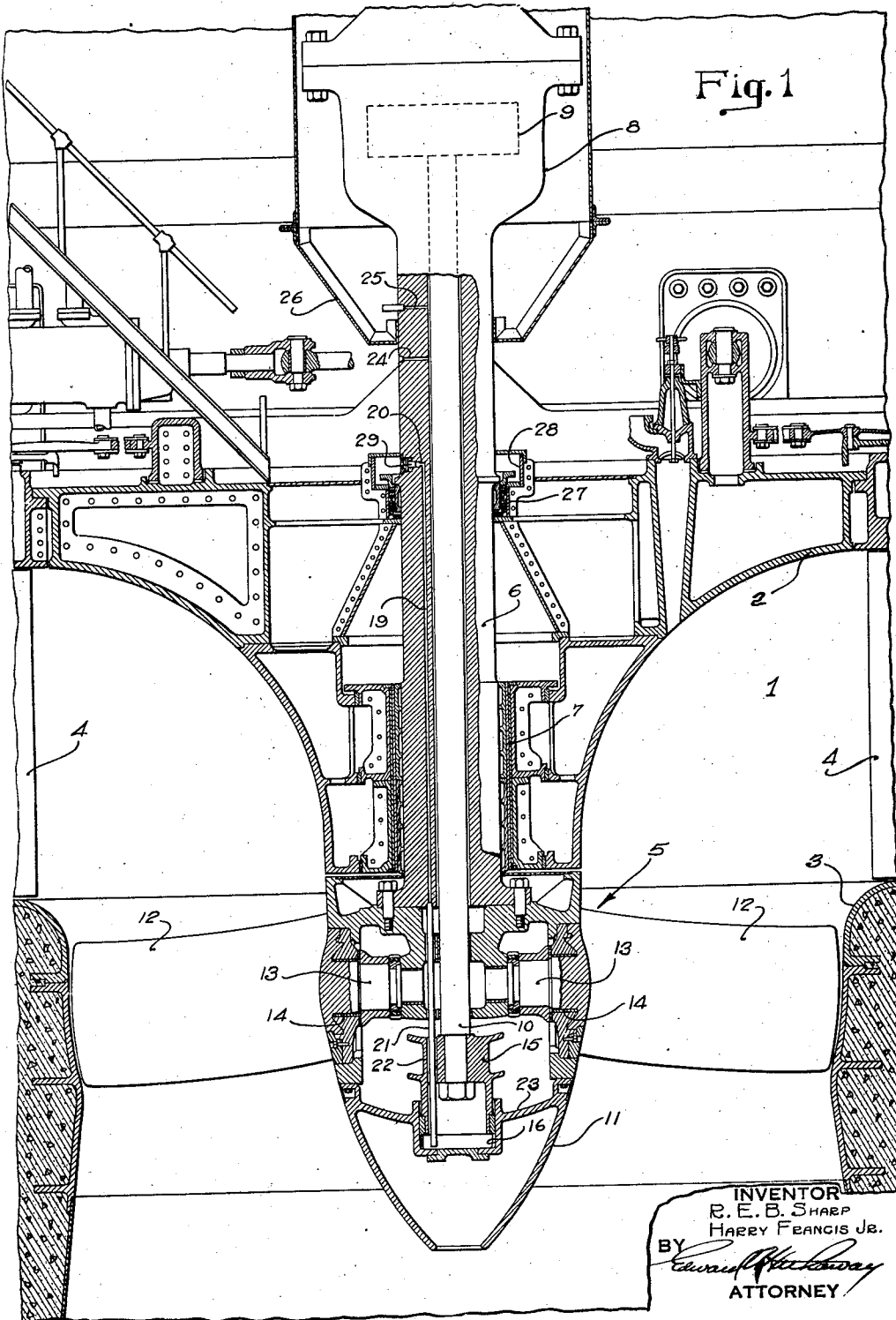
June 15, 1943.

R. E. B. SHARP ET AL
ROTARY HYDRAULIC MACHINE

2,321,950

Filed July 27, 1940

2 Sheets-Sheet 1



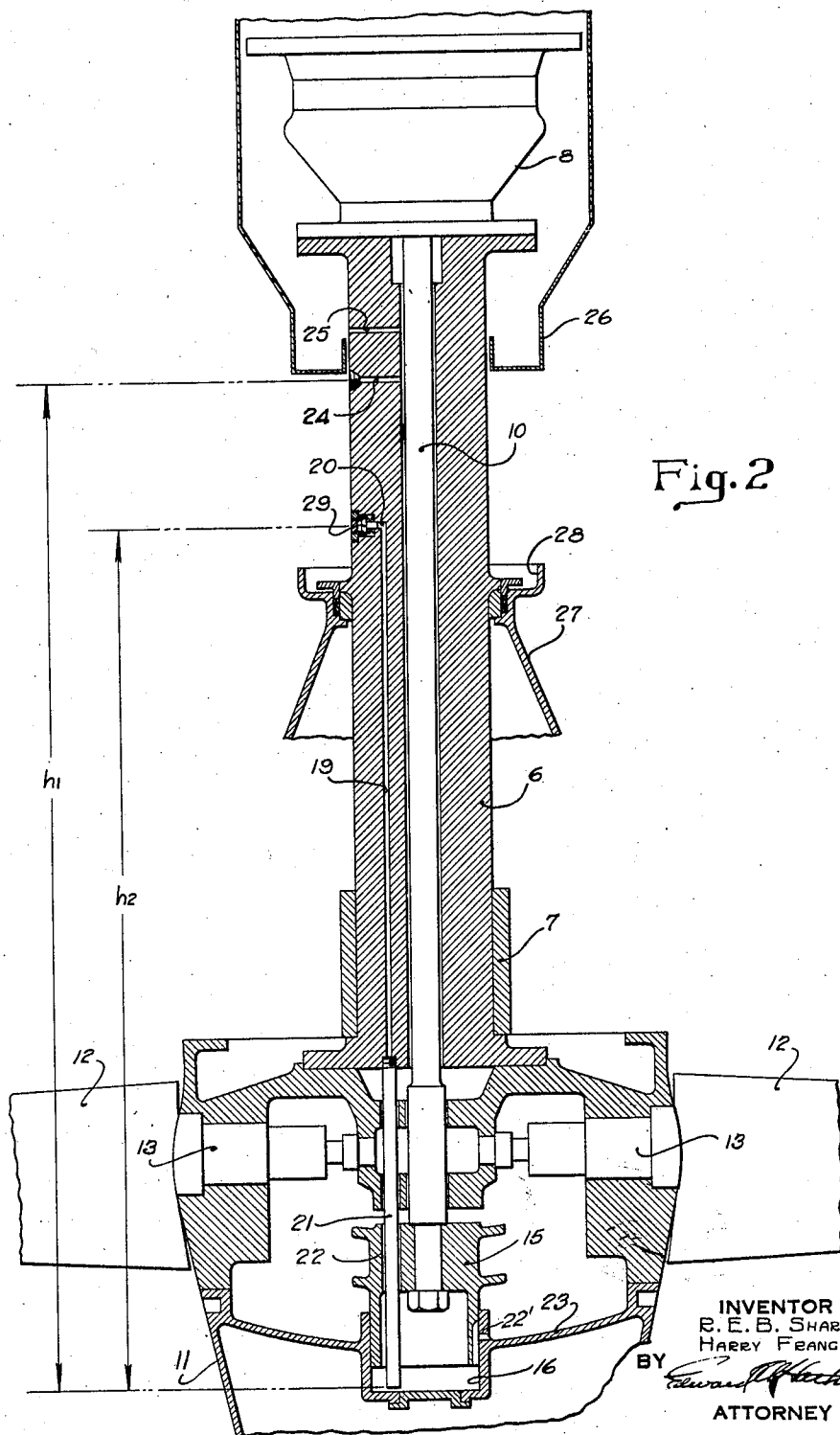
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UNITED STATES PATENT OFFICE

2,321,950

ROTARY HYDRAULIC MACHINE

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1 Claim. (Cl. 253—117)

This invention relates generally to rotary hydraulic machines of the type having adjustable blade runners and more particularly to improved means for removing water from within the runner hub.

In adjustable blade runners for turbines and pumps it is desirable to have the usual hollow runner hub filled with oil so as to properly lubricate the adjusting mechanism. However, water enters the hub at various points of leakage such as the blade shaft bearings, and due to the specific gravity of the water being greater than oil the water accumulates in the bottom of the hub and if allowed to remain would gradually rise so as to completely displace the oil within the hub.

It is an object of our invention to provide improved means for removing water from a runner hub. A further object is to provide an improved system and apparatus for removing water from a runner hub in a manner that is relatively simple in construction, operation and maintenance and is readily accessible and convenient.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a vertical section through an adjustable blade rotary hydraulic machine, specifically a turbine, of a type adapted to employ our invention; and

Fig. 2 is an enlarged fragmentary vertical section through a portion of the runner hub and shaft embodying our invention.

In the particular embodiment of the invention such as is disclosed herein merely for the purpose of illustrating one specific form among possible others that the invention might take in practice, we have shown in Fig. 1 a usual adjustable blade unit having generally an annular water passage 1 formed by a head cover 2 and distributor ring 3. In the case of a turbine the water flows inwardly past a set of adjustable guide vanes diagrammatically indicated at 4 and is turned in an axial direction to flow through an adjustable blade runner generally indicated at 5. The runner has a hub 11 secured to a shaft 6 which, in turn, is journaled in a suitable bearing 7 while the upper end of the shaft is connected in the case of a turbine to a generator, not shown, or to a motor in case of a pump. In either case, however, the shaft coupling is provided with a well-known operating cylinder 8 containing a piston 9 which is connected by an axially movable operating rod 10 to the blade ad-

justing mechanism contained within the runner hub.

The runner blades 12 are provided with shafts 13 journaled within suitable bearings 14 formed in hub 11. The inner ends of shafts 13 are connected preferably by crank arms and links to a crosshead 15 secured to the adjusting shaft 10, the lower end of the crosshead being vertically guided in a cylindrical crosshead guide and recess 16. The details of construction of the connecting arms and links are well-known in the art and as this mechanism does not per se constitute a part of our present invention it, therefore, need not be further described.

The drainage system includes a passage 19 part of which is drilled in the runner shaft 6 but terminating at its upper end in a lateral outlet 20 while its lower end is formed of a pipe 21 threaded into shaft 6. The pipe 21 extends through the hub interior and then through an opening 22 in the crosshead 15 terminating near the bottom of cylindrical recess 16. This recess has communication through suitable openings 22' with the interior of the hub and preferably projects slightly below the cap wall 23 so that all water within the hub will drain to the lowest point of recess 16. Oil is supplied to the hub from any suitable source of supply through a lateral inlet 24 which communicates with an axial shaft bore through which operating rod 10 extends. An overflow lateral port 25 also communicates with the interior of the shaft bore while a stationary oil catcher 26 is provided for runner hub oil when its level rises due to water getting in the hub. A usual stuffing box 27 is provided with a catcher 28 for discharge of liquid through a spring-loaded check valve 29 placed in lateral passage 20.

Operation.—An oil supply pipe is connected to lateral inlet 24 thereby creating a head on the liquid within the hub 11 equal to the specific gravity of oil multiplied by the head h_1 . The water outlet 20 is positioned at a head such as h_2 so that the product of h_2 multiplied by the specific gravity of water will be less than the product h_1 multiplied by the specific gravity of oil thereby causing water in the hub to be forced upwardly through passage 19 to discharge through lateral passage 20. The water, of course, always seeks the lowermost portion of the hub. If desired, the spring-loaded check valve 29 may be removed during this draining operation but thereafter it is replaced to keep oil in the hub from flowing out during runner rotation. It is desirable that any overflow of oil should occur

through overflow outlet 25 into catcher 26 where it may be returned to the source of oil supply.

If it is impossible by reason of a limited shaft length to have h_2 multiplied by the specific gravity of water less than h_1 , multiplied by the specific gravity of oil, then the water may be removed at 20 by means of a suction pump (not shown).

From the foregoing disclosure, it is seen that we have provided an extremely simple and effective means for removing water from a runner hub merely by connecting an oil supply pipe to inlet 24. It is not necessary to bring any structural elements into alignment or to require any other tedious or painstaking adjustments. The operation and construction are extremely simple, convenient and expeditious while still being highly effective.

It will of course be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claim.

We claim:

A rotary hydraulic machine having an adjustable blade runner provided with a hollow hub whose walls have bearings and adjustable blade shafts journaled therein and said hub having a central support in which the inner ends of said shafts are journaled comprising, in combination, a shaft on which said hub is supported, a passage extending axially through said shaft to a lateral opening therein, said central support having an axial opening, a pipe connected to the lower end of said passage and extending substantially straight through said axial opening for the entire axial length of said central support to the lower portion of said hub, and means forming a second passage extending axially through said shaft to said hub whereby water may be forced from said hub through one of said passages when sufficient oil pressure is supplied through the other of said passages.

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