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DUAL PRESSURE OILING SYSTEM FOR TURBINES

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Fig. 1.

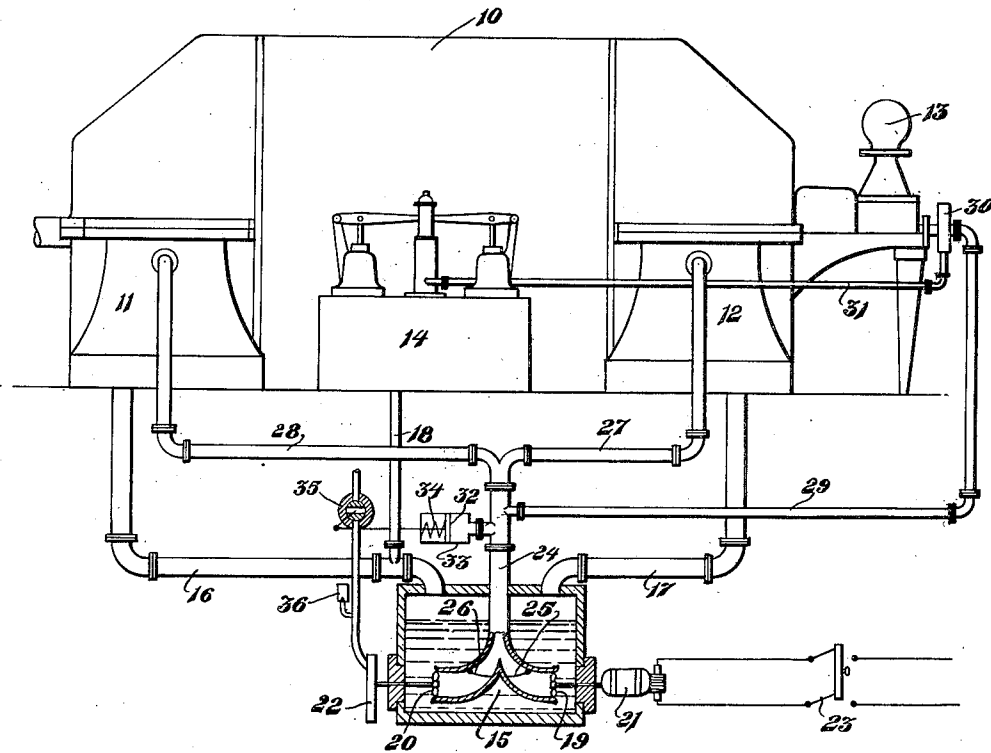
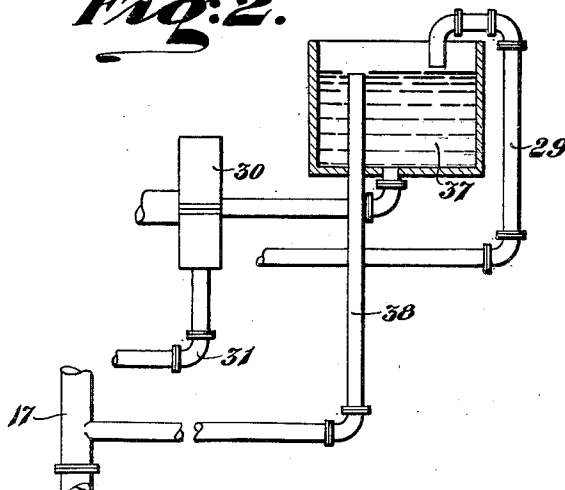


Fig. 2.



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DUAL-PRESSURE OILING SYSTEM FOR TURBINES.

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To all whom it may concern:

Be it known that I, HENRY F. SCHMIDT, a citizen of the United States, and a resident of Swarthmore, in the county of Delaware and State of Pennsylvania, have invented a new and useful Improvement in Dual-Pressure Oiling Systems for Turbines, of which the following is a specification.

My invention relates to turbine lubricating systems of the dual-pressure type, that is to say, wherein relatively low pressure oil is supplied to the bearings and relatively high pressure oil to the oil relay system, and it has for its object to provide apparatus of the character designated which at all times insures an adequate supply of oil to the respective pumps, at the same time insuring the complete circulation of all oil in the system.

Figure 1 of the accompanying drawing is a side view, partially in section and partially in elevation, of a steam turbine together with various elements of the oiling system all arranged and constructed in accordance with my invention and Figure 2 is a detail view of a modification of a portion of the apparatus shown in Figure 1.

It has been the usual practice hitherto to supply the bearings of steam turbines with oil in copious quantities but at relatively low pressure and to supply the oil relay system with relatively small quantities of oil at relatively high pressure. The high pressure oil has sometimes been supplied by a pump of the impeller type mounted directly on the turbine shaft, this pump drawing from the common reservoir. It has been the usual practice to locate the oil reservoir at a relatively low point in order to receive all the returned oil by gravity and it has therefore frequently happened that the high-pressure impeller pump lost its suction, cutting off the oil supply to the oil relay system.

According to the present invention, I locate one or more relatively large-volume, low-pressure pumps in the bottom of a depressed reservoir or sump, either of these pumps being capable of supplying the entire amount of oil used by the turbine at relatively low pressure. This oil is piped directly to the bearings and is furthermore piped to the intake of a high-pressure impeller pump mounted on the turbine shaft, thus insuring a copious oil supply to said

high-pressure pump without the possibility of losing the suction. As preferably arranged, one of said low-pressure pumps normally operates to supply the entire oil supply from the sump and upon a decrease in the pressure of the oil in the low-pressure system below a predetermined minimum, the other low-pressure pump is automatically energized to supply the system.

Referring to the drawing for more detailed understanding of my invention I show the body portion of a steam turbine at 10 having bearings 11 and 12, a governor 13, and a steam chest 14, all of usual form and requiring no detailed description inasmuch as they form no part of the present invention.

A main oil reservoir or sump 15 is mounted at a lower level than the turbine and receives the oil drainage from the bearings 11 and 12 through conduits 16 and 17 and receives the oil drainage from the governing relay system through a conduit 18.

Two pumps, preferably of the propeller type, are shown at 19 and 20, the pump 19 being driven, for example, by a motor indicated at 21 and the pump 20 by a small turbine shown at 22, although the form of prime mover used for these pumps is entirely a matter of choice, as both may be steam driven or both may be electrically driven if so desired. The motor 21 is under the control of a switch 23 and the turbine 22 under the control of a throttle valve 35 hereinafter described. The pumps 19 and 20 discharge into a common conduit 24 through suitable check valves 25 and 26 and the conduit 24 branching to the bearings 11 and 12 through conduits 27 and 28. A further branch 29 leads from the conduit 24 to the intake of an impeller pump 30 mounted on the main turbine shaft and supplying oil to the oil relay system through a conduit 31. Obviously a high-pressure oil pump of any other type may be employed if found desirable.

In the normal operation of the oiling system the pump 19 is employed, the motor 21 being operated by the closure of the switch 23. Under these conditions, the oil pressure in the conduit 24, for example five pounds per square inch, is sufficient to push a piston 32 mounted in a cylinder 33 connected to the conduit 24 to the left against a spring 34,

holding the throttle valve 35 in the closed position. The pressure of five pounds per square inch in the conduit system 24, 27, 28, 29 is sufficient to thoroughly lubricate the main bearings and furthermore insure a copious supply of oil at the intake of the pump 30 from whence oil is delivered to the relay system at, for example, seventy-five pounds per square inch.

Upon a decrease in the pressure in the conduit 24 below a predetermined amount, for example five pounds per square inch, from any cause, as by the burning out of the motor 21 or the failure of the current supply, the check valve 25 closes, preventing the back-flow of oil and the decreased pressure in the conduit 24 permits the piston 32 to move to the right under the influence of the spring 34, opening the throttle 35 and energizing the small turbine 22, whereupon the pump 20 starts into operation, opening the check valve 26 and supplying oil as desired to the conduit 24. If desired, an alarm may be sounded as the blowing of a steam whistle 36 connected to the turbine supply line below the throttle valve.

In the arrangement shown in Fig. 2, a reservoir 37 is mounted above the intake of the pump 30 and connected thereto and receives oil from the conduit 29, any excess being returned to the conduit 17 through an overflow conduit 38. Thus a copious supply of oil is assured for the pump 30.

It will be observed that by the use of the foregoing structure the sump 15 may be located at any desired low position, even at some considerable distance from the turbine. The location of the pumps 19 and 20 near the bottom thereof insures an adequate supply of oil even if but a relatively small amount of oil remains in the sump. Furthermore, it is not necessary that suction be relied upon to any extent in supplying oil to the high-pressure pump 30, and thus an adequate supply of high-pressure oil is at all times insured as is necessary for the proper functioning of the governing system.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:—

1. In a dual-pressure oiling system, the combination with bearings to be lubricated, an oil reservoir, and a primary pump operating therefrom and supplying a relatively large amount of oil at a desired pressure to the bearings, of a secondary pump supplied from said primary pump and op-

erable to supply a relatively small amount of oil at a higher desired pressure.

2. In a dual-pressure oiling system, the combination with an oil reservoir, of two primary pumps operable therefrom to supply a relatively large amount of oil at the lower desired pressure, one of said pumps normally operating to supply said pressure and means for energizing the other of said pumps when said pressure falls below a predetermined minimum amount, and a secondary pump supplied from said low-pressure supply and operable to supply a relatively small amount of oil at the higher desired pressure.

3. In a dual-pressure turbine oiling system, the combination with an oil reservoir located to receive all oil drainage from said turbine by gravity, a low-pressure pump operable in said reservoir to supply oil to the bearings of said turbine, and a high-pressure pump supplied from said low-pressure pump and adapted to supply relatively high-pressure oil to the oil relay system.

4. In a dual-pressure turbine oiling system, the combination with an oil reservoir located to receive all oil drainage from said turbine by gravity, an independently driven low-pressure oil pump operable in said reservoir and connected to supply the turbine bearings directly with low-pressure oil, and a high-pressure pump mounted directly upon said turbine shaft and supplied from said low-pressure pump, said high-pressure pump being connected to supply oil to the oil-relay system of said turbine.

5. In a dual-pressure turbine oiling system, the combination with an oil reservoir located to receive all oil drainage from said turbine by gravity, two independently-driven low-pressure pumps operable in said reservoir to supply oil to a low-pressure piping system, one of said pumps normally operating to supply said pressure and means for automatically energizing the other of said pumps upon a decrease in the pressure in said system below a predetermined amount, and a high-pressure pump supplied from said low-pressure system and operable to supply oil to the high-pressure piping system of the turbine.

6. In a dual-pressure turbine oiling system, the combination with an oil reservoir located to receive all oil drainage from said turbine by gravity, two independently-driven low-pressure pumps operable in said reservoir to supply oil to a low-pressure piping system, one of said pumps normally operating to supply said pressure and means for automatically energizing the other of said pumps upon a decrease in the pressure in said system below a predetermined amount, and a high-pressure pump mounted upon the turbine shaft and supplied from

said low-pressure system and operable to supply oil to the high-pressure piping system of the turbine.

7. In a dual-pressure turbine oiling system the combination with an oil reservoir located to receive all oil drainage from said turbine by gravity, an independently driven low-pressure oil pump operable in said reservoir and connected to supply the turbine bearings directly with low-pressure oil, and an impeller pump adapted to supply relatively high pressure oil, mounted directly on the turbine shaft and supplied from said low-pressure pump, said high-pressure pump being connected to supply oil to the high-pressure oil piping system of said turbine.

8. The method of insuring an adequate oil supply to a high-pressure impeller oil

pump mounted on the shaft of a steam turbine having a low-pressure bearing oiling system which comprises supplying oil from said low-pressure system to the intake of said pump.

9. The method of circulating oil in a dual-pressure turbine lubricating system which comprises collecting oil in a depressed sump, pumping the entire oil supply therefrom at relatively low pressure and passing a portion of the oil so supplied through an additional pump for the imparting of a relatively high pressure thereto.

In testimony whereof, I have hereunto subscribed my name this 22nd day of September, 1921.

HENRY F. SCHMIDT.