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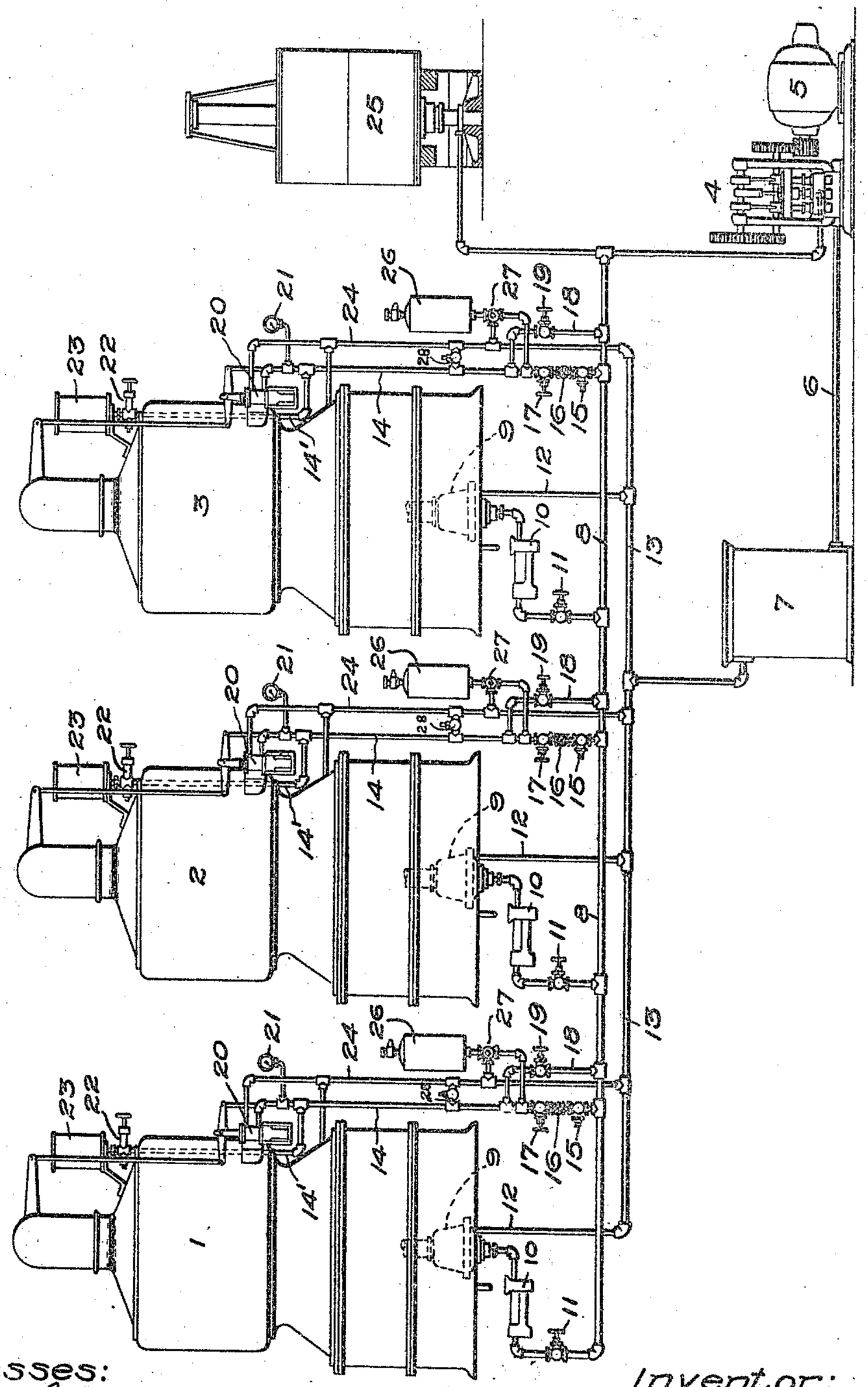
SYSTEM OF LUBRICATION FOR ELASTIC FLUID TURBINES.

APPLICATION FILED JULY 24, 1907.

963,154. Patented July 5, 1910.



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UNITED STATES PATENT OFFICE.

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SYSTEM OF LUBRICATION FOR ELASTIC-FLUID TURBINES.

963,154. Specification of Letters Patent. Patented July 5, 1910.

Application filed July 24, 1907. Serial No. 385,287.

To all whom it may concern:

Be it known that I, OSCAR JUNGGREN, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Systems of Lubrication for Elastic-Fluid Turbines, of which the following is a specification.

This invention relates to turbines driven by elastic fluid such as steam, and it has especial reference to those in which the shaft is upright.

The object of the invention is to improve the distribution of liquid under pressure to lubricate the shaft bearings and to operate the motor in the governing mechanism by means of which the steam-valves are opened and closed. The liquid I prefer to use for this purpose is oil, which is forced under pressure to the bearings and to the cylinder of the valve-operating motor through a system of piping connected to a single source of pressure: preferably a pump driven by steam or electricity. The proper degrees of pressure for the several bearings and for the motor are determined by means of bafflers and reducing valves at suitable points. In order to provide for the varying demands of the valve-operating motor, an auxiliary supply of oil is stored in a tank under air pressure, so that it will automatically supplement the normal supply from the pump in case of necessity.

The accompanying drawing illustrates diagrammatically a system embodying my invention.

The system is peculiarly applicable to installations of two or more turbines; the problem of lubrication being complicated where more than one machine is to be taken care of by one oil-pump. In the present case there are shown three upright turbines, 1, 2, 3, of the Curtis type, and a single oil pump 4, driven preferably by an electric motor 5, and having its suction pipe 6 connected with a cooler 7. The high-pressure delivery main 8 is connected by branches with the step bearings 9 of the several turbines. A baffler 10 in each branch regulates the pressure of the oil supplied to the step bearing, while a stop-valve 11 in each branch enables the flow of oil to be cut off in case of necessity. A drain-pipe 12 leads from each step bearing to a common return-pipe 13 which conducts the oil back to the cooler 7.

The oil for lubricating the upper and middle guide-bearings of the turbine shafts, and also for driving the valve-operating motors, is led off from the main 8 by low-pressure pipes 14. Each of said pipes is provided with a check-valve 15, a pressure-reducing valve 16, and a stop-valve 17, all of which are shunted by an auxiliary supply-pipe or by-pass 18 containing a stop-valve 19 which is normally closed. This by-pass is used when the valves 15, 16, 17, need repairing. The pipe 14 connects directly with the valve-chest of the hydraulic motor 20, which rotates the cam-shaft by which the steam-valves are actuated,—a governing mechanism of this type being disclosed in my former patent, No. 848,106. A gage 21 shows the pressure in the pipe 14. A continuation 14′ of said pipe conveys oil to the upper shaft-bearing, where its pressure is still further reduced by a baffler. Instead of feeding directly to the bearings from the pipe 14′, I connect said pipe through the baffler 22 to an elevated tank 23 from which the oil feeds by gravity to the upper and middle guide bearings. The overflow from these bearings, and the exhaust from the valve-operating motor are conveyed by a drain-pipe 24 to the return-pipe 13.

An accumulator 25 is connected with the delivery-main 8 to steady the flow of oil, and also to afford a source of supply in case the pump stops. In addition to the pump and the accumulator, each turbine is provided with means for meeting the intermittent demand of the governing mechanism beyond the normal rate of feed through the low-pressure pipe 14. I prefer to use a pressure-tank of some kind, such as the air-tight tank 26 connected to the low-pressure pipe 14 above the stop-valve 17. The pressure in said pipe causes a certain quantity of oil to flow into said tank, but the upper part of the tank is occupied by a volume of air under pressure, forced in by a hand pump or fed in from some other source of pneumatic pressure. The normal flow through the reducing-valve 16 is sufficient for ordinary service, but in case of continued operation of the governing mechanism through an unusual range of movement, the normal supply is automatically supplemented by that

in the pressure-tank. The tank fills again when normal conditions are resumed, the oil flowing in until the pipe-pressure is balanced by the air pressure. In this way, the governing mechanism is caused to operate satisfactorily under all circumstances, and sudden drafts upon the step-bearing system are prevented. It also insures the action of the governing mechanism even when the pump or the accumulator fails to operate. The air-tank is connected with the drain-pipe 24 by a three-way cock 27, so that its contents can be drawn off when desired.

Between the low-pressure pipe 14 and the drain-pipe 24 a relief-valve 28 is inserted, to prevent damage when the by-pass valve 19 is opened too wide, admitting full step-bearing pressure to the pipe 14.

What I claim as new, and desire to secure by Letters Patent of the United States, is:—

1. In a system of lubrication for one or more elastic fluid turbines having hydraulic motors for operating the governing mechanism, the combination of means for supplying lubricant under pressure to the turbines, conduits feeding lubricant from said means to the turbine shaft bearings, a conduit supplying lubricant from said means to operate the motors of the governing mechanism, and means for meeting the intermittent demand of said motors beyond the normal rate of feed through said conduit.

2. In a system of lubrication for an upright turbine, the combination of means for supplying lubricant under pressure, a main conveying lubricant under high pressure to the step bearing, a tank for feeding the guide bearings by gravity, a low pressure pipe leading from said main to the governing mechanism and to the tank, and pressure controlling devices governing the flow of lubricant to the step bearing, to the low pressure pipe and from said pipe to the tank.

3. In a system of lubrication for one or more upright turbines, the combination of a main conveying lubricant under high pressure to the step-bearing, a low-pressure pipe connected with the governing mechanism, a pressure-reducing device between the high-pressure main and said pipe, and pressure-reducing devices between said pipe and the guide-bearings.

4. In a system of lubrication for one or more upright turbines, the combination of a main conveying lubricant under high pressure to the step-bearing, a low-pressure pipe feeding the governing mechanism and the guide bearings, a pressure-reducing device between the high-pressure main and said pipe, and a controlled by-pass around said pressure-reducing device.

5. In a system of lubrication for one or more upright turbines, the combination of a main conveying lubricant under high pressure to the step-bearing, a low-pressure pipe feeding the governing mechanism and the guide-bearings, a pressure-reducing device between the high-pressure main and said pipe, a controlled by-pass around said device, a drain-pipe, and a relief-valve between said low-pressure pipe and said drain-pipe.

6. In a system of lubrication for an upright turbine provided with hydraulic governing mechanism, the combination of a high-pressure main conveying lubricant to the step-bearing, a low-pressure pipe leading from said main to the governing mechanism, and means for meeting the intermittent demand of said governing mechanism beyond the normal rate of feed through said pipe.

7. In a system of lubrication for an upright turbine provided with hydraulic governing mechanism, the combination of a high-pressure main conveying lubricant to the step-bearings, a low-pressure pipe leading from said main to the governing mechanism, and means for meeting the intermittent demand of said governing mechanism beyond the normal rate of feed through said pipe, comprising a pressure-tank connected with said pipe.

8. In a system of lubrication for an upright turbine provided with hydraulic governing mechanism, the combination of a high-pressure main conveying lubricant to the step-bearing, a low-pressure pipe leading from said main to the governing mechanism, and means for meeting the intermittent demand of said governing mechanism beyond the normal rate of feed through said pipe, comprising an air-tight tank connected with said pipe and containing a supply of lubricant and a volume of compressed air.

In witness whereof, I have hereunto set my hand this 23rd day of July, 1907.

OSCAR JUNGGREN.

Witnesses:
BENJAMIN B. HULL,
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