

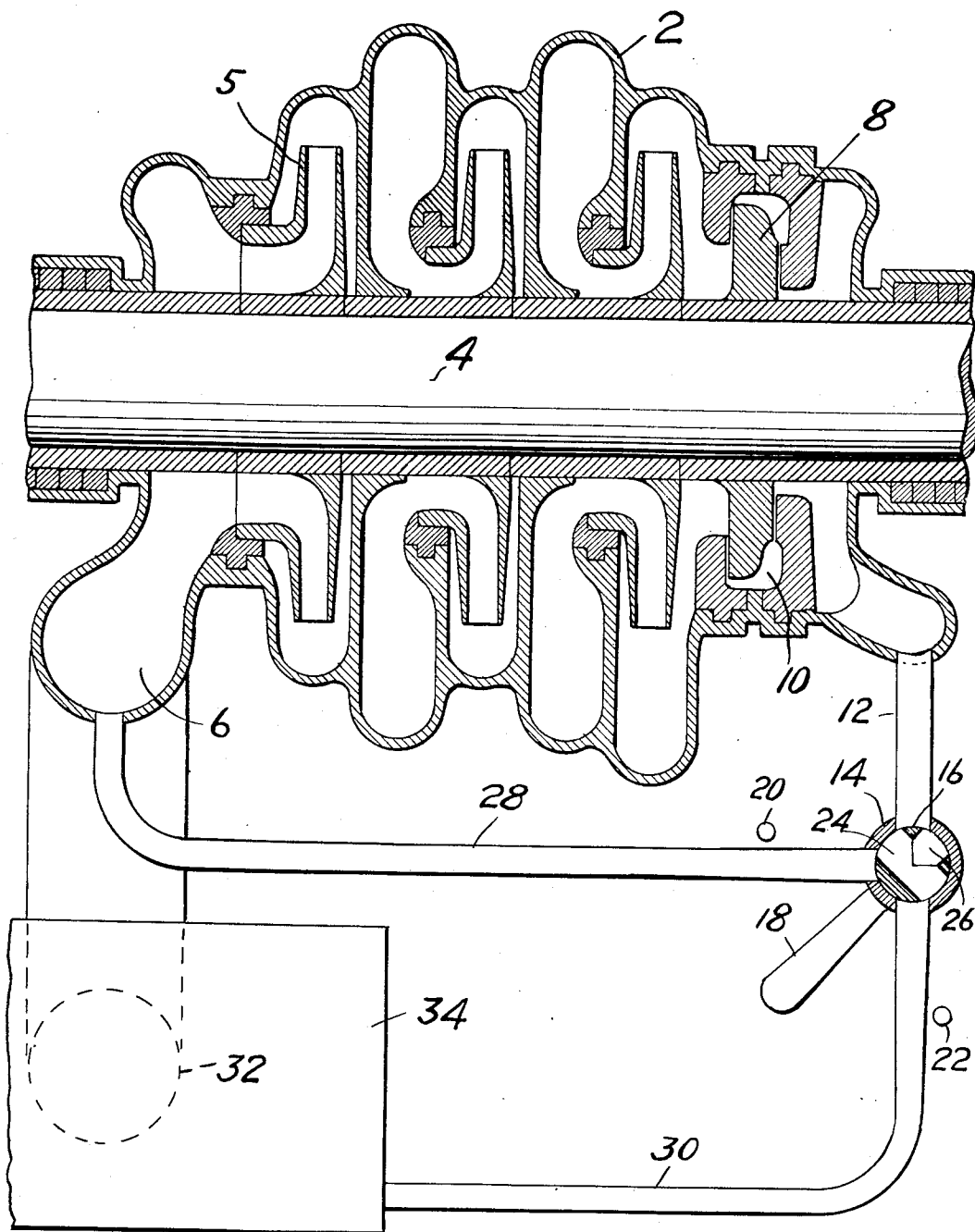
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CENTRIFUGAL PUMPING SYSTEM

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CENTRIFUGAL PUMPING SYSTEM

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4 Claims. (Cl. 103—112)

This invention relates to a centrifugal pumping system particularly designed for use in connection with centrifugal pumps handling hot water for boiler feeding purposes.

5 A high-pressure boiler feed pump when operating against closed discharge or at very low capacities will very quickly become vapor-bound due to the churning of the water within the pump which increases its temperature so that flashing
10 into steam will result. One of the reasons for this is that the water discharge from the balancing chamber is taken into the suction nozzle of most multistage pumps. As this water may be of appreciably higher temperature than the water
15 entering the pump the resultant temperature of water entering the first stage is often high enough to produce rapid evaporation at the reduced pressure of the suction. In order to improve the operation of such pumps at low capacities and
20 shut-off pressures, they are also provided with bypass connections from the discharge stage into the suction. However, this also causes higher-temperature water to mix with the water entering the pump and the same kind of trouble may
25 result. Furthermore, this system decreases the efficiency of the pump by an amount corresponding to the water that is bypassed.

It is the broad object of the present invention to provide a pumping system designed to handle
30 water at relatively high temperatures which will avoid the objections of the systems heretofore in use. Briefly, the invention involves running the balancing leakage water into the usual heater where the temperature cannot be higher than
35 that corresponding to the pressure in the heater. Such bypass accomplishes two advantageous results. First, it provides a bypass when the pump is operating at low capacities or shut-off pressures. Secondly, it prevents high temperature
40 water from entering the suction of the pump which would be detrimental even when operating at comparatively large capacities. The bypass furthermore does not decrease the efficiency of the pump in the manner a bypass from the discharge chamber into the suction or into the
45 heater would.

More specifically, it is the object of the invention to provide an arrangement which will take care of various conditions of operation as will be
50 more clearly understood from the following description read in conjunction with the accompanying drawing in which the figure illustrates in axial vertical section, and diagrammatically, a pumping system in accordance with the invention.
55 tion.

The casing of a multistage centrifugal pump of the type used for boiler feed purposes is illustrated at 2. Mounted in this casing is the shaft 4 carrying the impellers 5 arranged in series in the usual manner. The first stage receives water
60 through the suction inlet 6. In order to secure proper operation a balancing arrangement indicated at 8 is provided including a balancing chamber 10 into which some liquid from the discharge
65 passes and out of which liquid leaks in the usual fashion to provide a proper axial balance of the rotary parts against the tendency to move towards the suction.

The leakage water from the balancing chamber enters a suitable annular chamber connected
70 with an outflow pipe 12 which opens into a valve casing 14, the valve in the present instance being of the plug variety. The plug 16 is provided with passages 24 and 26 as illustrated, the passage 24
75 extending diametrically through the plug while the passage 26 extends at right angles through one side of the plug from the passage 24. A handle 18 connected to the plug provides for its manual
80 manipulation, suitable stops 20 and 22 being provided to limit the motion of the plug in the present instance to a right angle. Communicat-
85 ing with a port the center of which is 90° from the port opening from pipe 12 is a pipe 28 which connects the valve casing with the suction inlet 6. A second pipe 30 extends from a port located
90 diametrically opposite the entrance port and connects the interior of the valve casing with the inflow conduit 32 leading to the heater 34 located between the source of water and the suction of the pump.

The sizes of the passages 24 and 26 are so made that at no time will the flow through 12
be interrupted. That is, either the passage 24 or 26, or both, are at all times in communication
95 with the entrance port communicating with pipe 12. Likewise, one of the other of the ends of the passage 24 is at all times in communication with one or both of the discharge ports, so that
100 the water from 12 is either passing through pipe 28 or pipe 30, or both. The stops 20 and 22 are provided to insure that the flow of water from the balancing chamber is never interrupted, since if this flow were stopped destruction of the pump might quickly result.

The heater 34 may be of any usual type either
105 having large storage space or being open to the atmosphere. Since the water that is admitted through the balancing pipe to the heater is quite small in amount as compared with the volume of water in the heater, there will be practically
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no temperature rise of the aggregate water entering the pump and therefore no evaporation. If the heater is of the closed type and a large amount of hot water entered, there would immediately be a release of vapor. On the other hand, if the heater were of the closed type, the pressure would rise slightly. The heater may be, as is generally the case, supplied with cold water by a separate pump. While the pipe 30 is shown as entering the main inlet to the heater it may obviously enter any part of the heater so long as the water entering through it will mingle with relatively large amounts of water in the heater prior to entrance into the pump.

If provision were made to run the balancing water into the heater alone the pump could not be shipped as a self-contained unit and could not be operated unless the pipe connection to the heater was provided. By the use of a three-way plug valve in the balancing line the balancing water may be bypassed either to the suction or to the heater. By the arrangement shown, the three-way valve may be used in any position to secure the proper operating conditions; that is, the flow may be apportioned in any desirable fashion between the pipes 28 and 30.

What I claim and desire to protect by Letters Patent is:

1. In combination, a centrifugal pump having a balancing chamber, an inlet passage to the pump, means for heating water entering the inlet passage, and means for leading leakage water from the balancing chamber directly into the

heating means and into admixture with the water being heated therein.

2. In combination, a centrifugal pump having a balancing chamber, an inlet passage to the pump, means for heating water entering the inlet passage, and means for leading leakage water from the balancing chamber either directly into the heating means and into admixture with the water being heated therein or into the inlet passage.

3. In combination, a centrifugal pump having a balancing chamber, an inlet passage to the pump, means for heating water entering the inlet passage, and means for leading leakage water from the balancing chamber either directly into the heating means and into admixture with the water being heated therein or into the inlet passage, said last named means including a valve operable to control the alternative flows.

4. In combination, a centrifugal pump having a balancing chamber, an inlet passage to the pump, means for heating water entering the inlet passage, and means for leading leakage water from the balancing chamber either directly into the heating means and into admixture with the water being heated therein or into the inlet passage, said last named means including a valve operable to control the alternative flows, the valve being so arranged that free passage for flow from the balancing chamber is assured at all times.

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