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FEED WATER BY-PASS SEAL FOR BOILER CIRCULATING PUMPS

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Fig. 1.

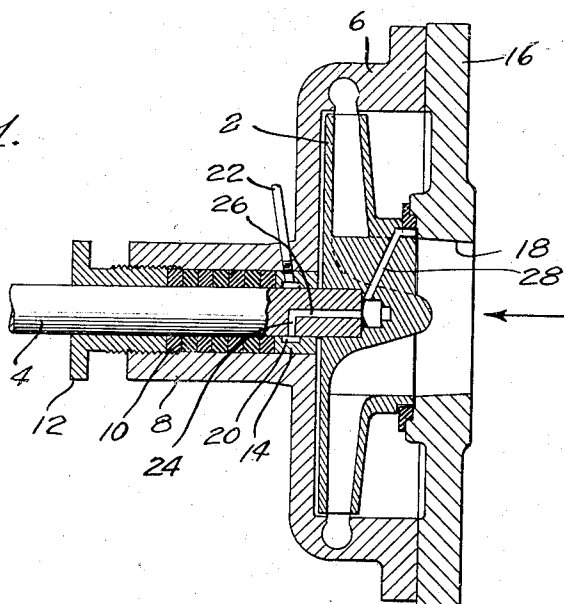
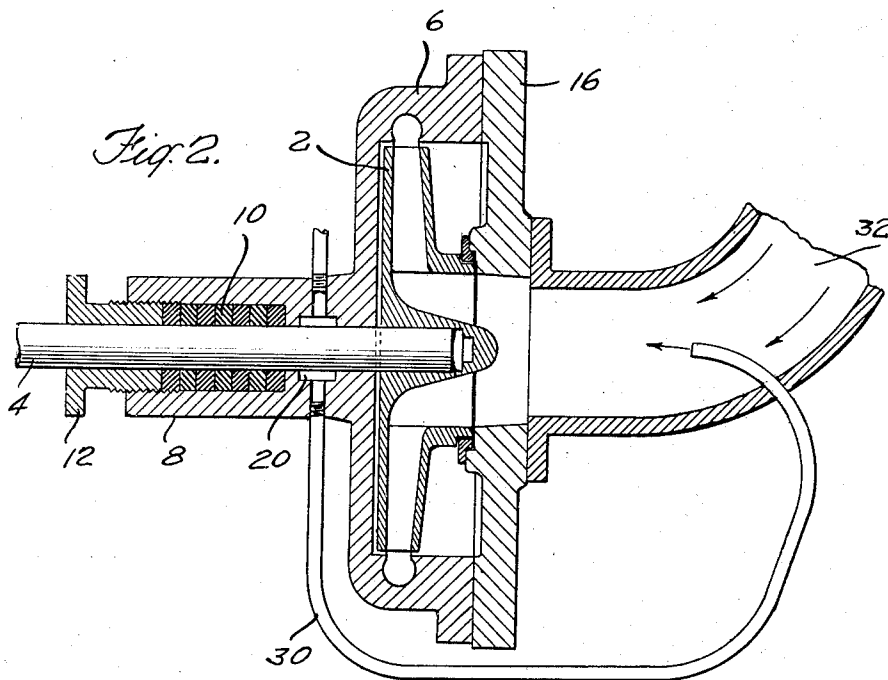


Fig. 2.



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FEED WATER BY-PASS SEAL FOR BOILER
CIRCULATING PUMPS

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1 Claim. (Cl. 103—111)

This invention relates to pumps which operate on liquids raised to relatively high temperatures and usually also under relatively high pressures. The invention relates particularly to circulating pumps for forced circulation boilers which must withstand both the pressure and the temperature of the boiler water.

In the design and construction of pumps for forced circulation boilers, although these pumps are generally for the most part of comparatively simple construction, it is necessary to give particular attention to the stuffing boxes, because of the high pressures and temperatures of the water which they circulate. It has been found in practice that injuries to the stuffing box packings which occur in the operation of such circulating pumps arise more from the high temperatures than from the high pressures. For this reason the stuffing boxes of hot liquid circulating pumps are generally cooled in some manner.

It has been proposed heretofore to create a sealing ring or circuit in the stuffing box with the aid of feed water in such manner that the feed water, under the same pressure or under a higher pressure than the boiler water, has a pressure drop in the stuffing box through a throttling pass. One advantage of this has been that a positive pressure drop takes place in the stuffing box. It is, however, necessary, with this arrangement, to cause the feed water which has been put under pressure to flow back again into the feed water supply, thus making special conduits necessary. Moreover, under this arrangement the feed pump has a higher loading.

In accordance with the present invention it is proposed to seal the stuffing box of a circulating pump by means of the colder feed water and then to conduct this feed water to the circuit in which the boiler water is circulating under the boiler pressure. Advantageously, according to the present invention, the colder feed water, after performing its function of sealing the stuffing box, is conducted into the suction conduit of the circulating pump, thus serving to shut off any tendency to steam formation in the suction conduit, an important feature of the invention being an arrangement for the discharge of the sealing water at the point where there is the most marked tendency to steam formation.

Other objects and important features of the invention will appear from the following description and claim when considered in connection with the accompanying drawing, in which

Figure 1 is a vertical section through a circulating pump embodying the present invention, this figure showing the provision for discharge of the feed water through an axial passage in the pump rotor shaft, and

Figure 2 is a vertical section through a similar pump showing an arrangement for discharging the sealing water through a special conduit entering the suction conduit to the pump outside the pump proper.

In Figure 1 of the drawing the pump rotor 2, mounted on the shaft 4, is shown as surrounded by a pump housing 6 having a boss 8 in which the shaft 4 has its bearings and in which the stuffing box is located. The stuffing box comprises packing 10 and a removable combined gland and bearing 12 between which and the stationary bearing 14 the packing 10 is confined. A removable cover 16 for the housing 6 is provided with an inlet or suction-opening 18 through which the water to be circulated enters the pump.

The inner bearing 14 for the shaft 4 is provided with an annular passage 20, adjacent to the shaft 4, through which the sealing water can circulate. A tube 22, extending through the boss 8 and into communication with the annular passage 20, provides for the introduction of the sealing water into the passage 20, and a radial passage 24, communicating with an axial passage 26 in the shaft 4, which in turn communicates with an approximately radial passage 28 through the hub of the rotor 2, provides for discharge of the sealing water into the suction side of the pump and advantageously into those places in the rotor where it will take part in the circulation, that is, at the entrance edge of the rotating blade as well as at the surrounding outer and inner annular surfaces of the rotor entrance, since at these places steam formation first takes place because the friction between the surrounding parts and the entering water effects a considerable development of heat.

Since the feed water will be under higher pressure than the circulating water and since naturally it is colder than the circulating water, when the feed water is used for the sealing water and is introduced into the passage 20 through the tube 22 it not only will tend to cool the inner bearing 14 but by its sealing action it will prevent hot circulating water from traveling along this bearing into contact with the stuffing box packing 10. If, therefore, the temperature of the feed water is sufficiently low, any other cooling of the stuffing box becomes unnecessary.

In the form of the invention illustrated in Figure 2, the sealing water, instead of being conducted away from the annular passage 20 through the center of the shaft and through the rotor hub, is carried through an outside conduit 30 into the suction conduit 32 leading to the suction opening 18 and is thus introduced into the circulating water on the suction side of the pump at a point outside the pump proper.

It will be understood that the invention is not limited to conveying the sealing water, after it has performed its sealing and cooling function, into the circulating water of the boiler immediately on the suction side of the pump but that, if desired, this sealing water may be introduced into the boiler water at some other point in the circuit, for example, into the drum of a forced circulation boiler.

What is claimed as new is:

In a forced circulation boiler, a rotary pump for circulating the boiler water, said pump comprising a housing, a rotor, a rotor shaft and a stuffing box through which the shaft passes and in which it has its bearings, and means, including a conduit from a source of feed water supply, for introducing feed water into the suction side of said pump, said conduit including an annular passage in the pump housing, adjacent to the rotor shaft and between the rotor and the stuffing box, and a passage through said shaft and through a part of said rotor, arranged to discharge the cold feed water substantially at the entrance edge of the rotor blade.

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