

Nov. 3, 1953

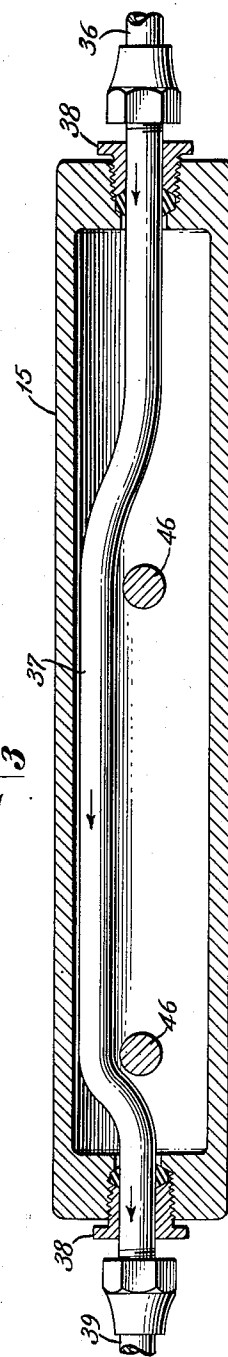
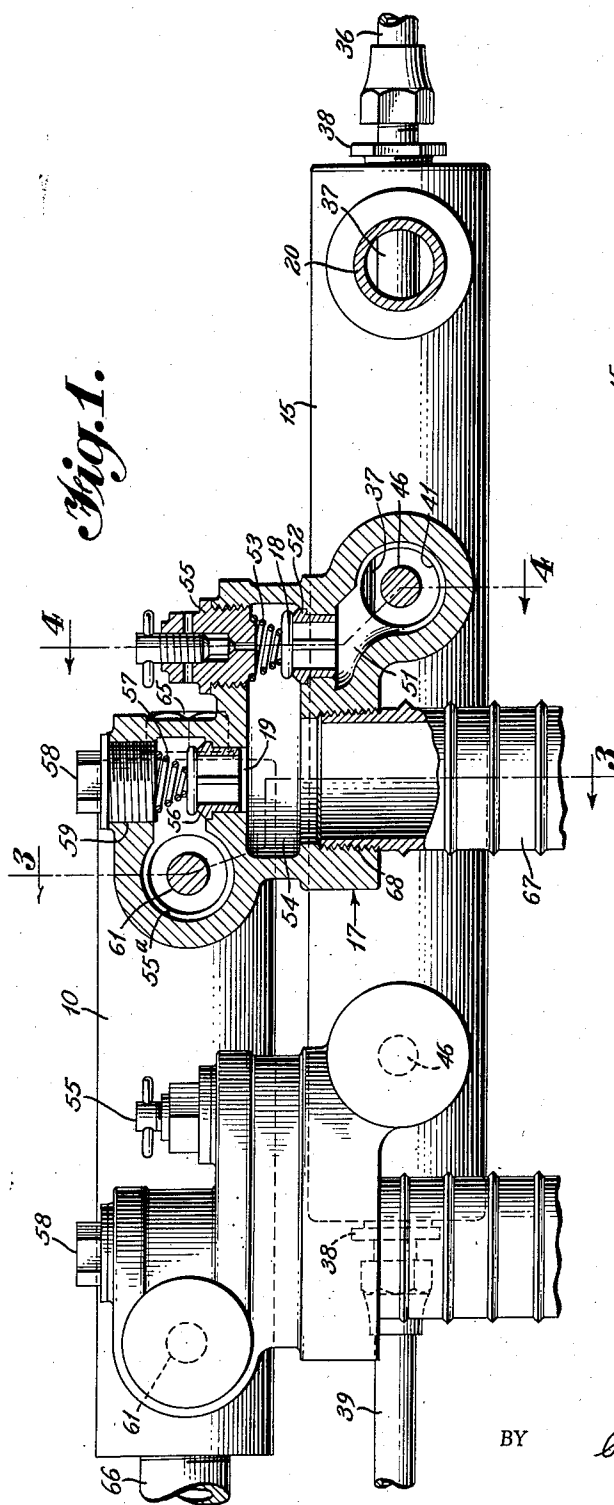
P. ARANT

2,657,640

PUMP

Original Filed Aug. 28, 1943

2 Sheets-Sheet 1



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*Fig. 3.*

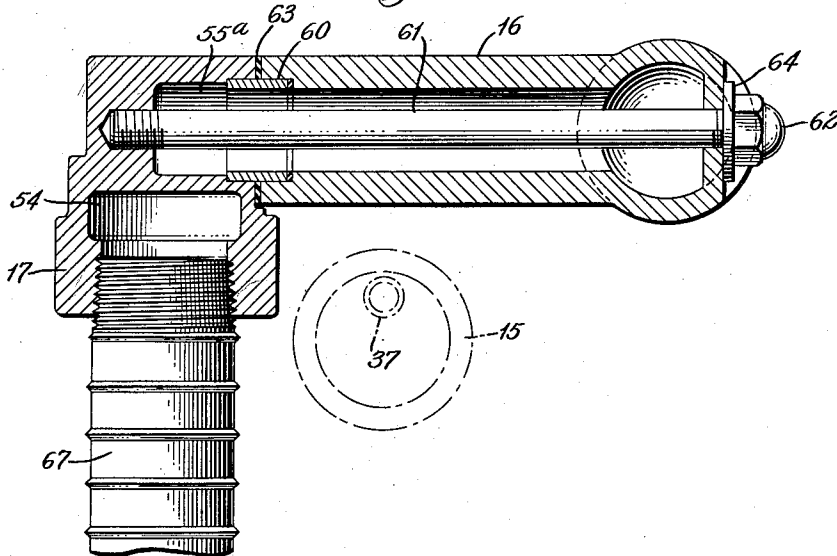
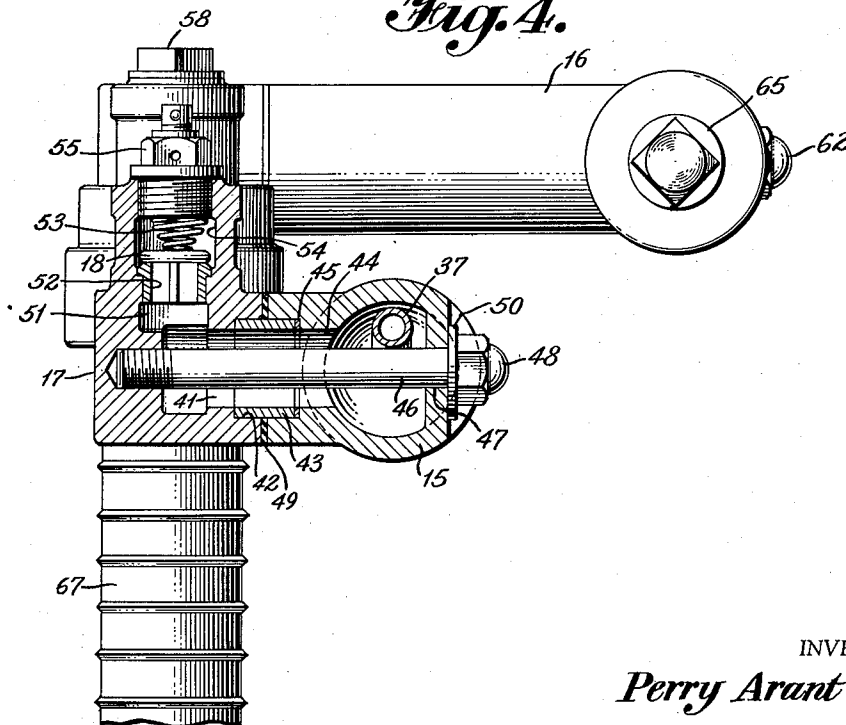


*Fig. 4.*



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## UNITED STATES PATENT OFFICE

2,657,640

## PUMP

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Original application August 28, 1943, Serial No. 500,413, Divided and this application May 6, 1947, Serial No. 746,189

2 Claims. (Cl. 103—203)

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The present invention relates to a feed water pump particularly adapted for use in a steam generating system, whereby a maximum of efficiency in operation can be attained.

This application is a division of my application Serial No. 500,413, filed August 28, 1943, now Patent No. 2,574,368, dated November 6, 1951, and entitled "Steam Generating Apparatus."

The principal object of the invention is to provide a feed water pump capable of handling heated liquid at vapor-forming temperatures without becoming vapor-locked.

Another object of the invention is to provide heat exchange means for condensing any steam that may be present in the intake manifold of a feed water pump to prevent vapor-locking of said feed water pump.

An important feature of the invention is the use of a centrifugal pump, in connection with a feed water pump, serving in the dual capacity of a make-up water pump and a circulating pump for the heat exchange means associated with the intake manifold of the feed water pump to prevent vapor-locking of said feed water pump.

Other objects and features of the invention will be apparent from the following description, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an enlarged view, partly in elevation and partly in section, illustrating the check valve arrangement associated with the intake chamber or manifold on the inlet side of the feed water pump;

Fig. 2 is a sectional view through the intake manifold, particularly showing the arrangement of the heat exchange tube for condensing any vapor that may be present in the intake manifold to thereby prevent vapor-locking of the feed water pump;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 1; and

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 1.

The feed pump includes an intake feed manifold 15 and an outlet feed manifold 16 interconnected by identical housings 17 containing inlet check valves 18 and 19 (see Fig. 1), which housings will be described in greater detail hereinafter. The intake feed manifold 15 is connected by a pipe line 20 with a source of hot feed water.

Referring now to Figs. 1 and 4, the check valve housings 17 are identical in construction and a description of one will therefore suffice for both. The housing 17 has an inlet opening 41 (Fig. 4) which is counterbored as indicated at 42 to receive

a bushing 43. The intake feed manifold 15 has an outlet opening 44 which is counterbored at 45 to receive the bushing 43. The bushing 43 thus serves to align the housing 17 with the intake manifold 15. A stud 46 is threaded into the housing 17 and projects through an opening 47 in the manifold 15. A cap nut 48 is mounted upon the outer end of the stud 46 and secures the housing and manifold together in assembled relation. Suitable sealing means 49 is interposed between the confronting faces of the housing 17 and manifold 15 to avoid leakage and a suitable gasket 50 is disposed between the cap nut 48 and the manifold 15.

The opening 41 in the housing 17 communicates with a passageway 51 (Fig. 1) controlled by the check valve 18 previously referred to. The check valve 18 is normally urged toward its seat 52 by a conical spring 53. The housing 17 is further provided with a chamber 54 and the check valve 18 controls the flow of liquid from the passage 51 into the chamber 54. A bleeder valve 55 is mounted in the housing 17 directly above the check valve 18 and provides a means for venting air from the chamber 54 when the pump means is first started.

The housing 17 is still further provided with an opening 55<sup>a</sup> (Fig. 1) adapted to communicate with the chamber 54 when the check valve 19 is raised from its seat 56. A spring 57 normally tends to maintain the check valve 19 closed. A removable plug 58 is disposed in an opening 59 directly above the check valve 19. As will be apparent from Fig. 3, the opening 55<sup>a</sup> communicates with the outlet feed manifold 16 and said manifold is aligned with the housing 17 by a bushing 60 similar to the bushing 43. A stud 61 is threaded into the housing 17 and a cap nut 62 on the outer end of the stud secures the manifold 16 to the housing 17. Suitable sealing means 63 is disposed between the confronting faces of the housing 17 and the manifold 16 and a suitable gasket 64 is disposed between the manifold 16 and the cap nut 62. One end of the outlet feed manifold 16 is closed by a plug 65 and its opposite end is connected to a pipe 66.

A standpipe 67 (Fig. 1) is threaded into an opening 68 in the housing 17 and communicates at its upper end directly with the chamber 54. Normally, the standpipe 67 is filled with water and provides a water column through which pulsations from a pump means are transmitted to any liquid contained in the chamber 54, as described in application No. 500,413. The pump

means may include any suitable elements, such as a diaphragm (not shown) for producing pulsations in the standpipe 67 to produce a pumping action.

It will be apparent from the description thus far, that the water introduced into the intake feed manifold 15 through the pipe 20 will enter the opening 41 in the housing 17 and flow into the passageway 51, the check valve 18 opening in response to the pressure of such liquid to admit the same into the chamber 54 between pulsations in the standpipe 67 and fill said chamber. Hence, upon the next pulsation imparted to the liquid column in the standpipe 67, a certain amount of the water will be displaced from the chamber 54 and forced past the check valve 18 into the opening 55<sup>a</sup> from whence it will flow into the outlet feed manifold 16 and into the pipe 65.

Due to the steam vapor accompanying the water delivered through the pipe 20 to the intake feed manifold 15, or to the flashing of the heated liquid as the result of a reduction of pressure, it is possible for some vapor to occasionally enter or to form in the intake feed manifold 15 and cause a vapor-lock at the inlet check valves 18. Ordinarily, the feed pump would remain vapor-locked only until the steam condensed, but such delay is undesirable and could prove detrimental to the operation of the steam generating apparatus because the interruption of a continuous flow of water to the heating coil would result in overheating and possible burning out of said coil. By circulating cooling water from the feed water tank through the heat exchange tube 37 (by means of the centrifugal pump) any steam vapor introduced into or formed in the intake feed manifold 15 is immediately condensed and vapor-locking of the feed pump is totally avoided. Incidentally, the heat absorbed by the liquid pumped through the heat exchange tube 37 is not lost because said liquid is returned to the feed water tank. Even a slight pressure drop in the intake feed manifold 15 will permit some of this liquid to flash into steam. On the other hand, the water which is passed through the heat exchange tube 37 is taken from the feed water tank which contains water at a relatively low temperature of about 175°, and this temperature is sufficient to condense any vapor in the manifold 15. As has been pointed out before, the discharge end of the heat exchange tube 37 is connected with

the feed water tank by the conduit 39 so that the centrifugal pump in effect circulates the feed water through the heat exchange tube 37.

I claim:

1. In a pump for pumping heated liquid at vapor-forming temperatures: an elongated, substantially cylindrical intake manifold, said manifold having a lateral inlet, and at least one lateral outlet spaced a substantial distance from said inlet; a housing having a pump inlet check valve communicating with said manifold outlet; means securing said intake manifold to said housing; and a heat exchange tube extending longitudinally through said substantially cylindrical intake manifold and through the ends thereof, and means for pumping liquid through said manifold and housing.

2. In a pump for pumping heated liquid at vapor-forming temperatures: an intake manifold having an elongated intake chamber, said chamber having an inlet adjacent one end thereof and an outlet opening spaced a substantial distance from said inlet; a housing having a pump inlet check valve communicating with said manifold outlet opening; a stud extending through said manifold outlet and securing said manifold to said housing said stud being smaller than said outlet opening; and cooling means in said intake chamber for condensing any vapors that may be present in said intake chamber to thereby prevent vapor-locking of said pump inlet check valve, and means for pumping liquid through said manifold and housing.

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