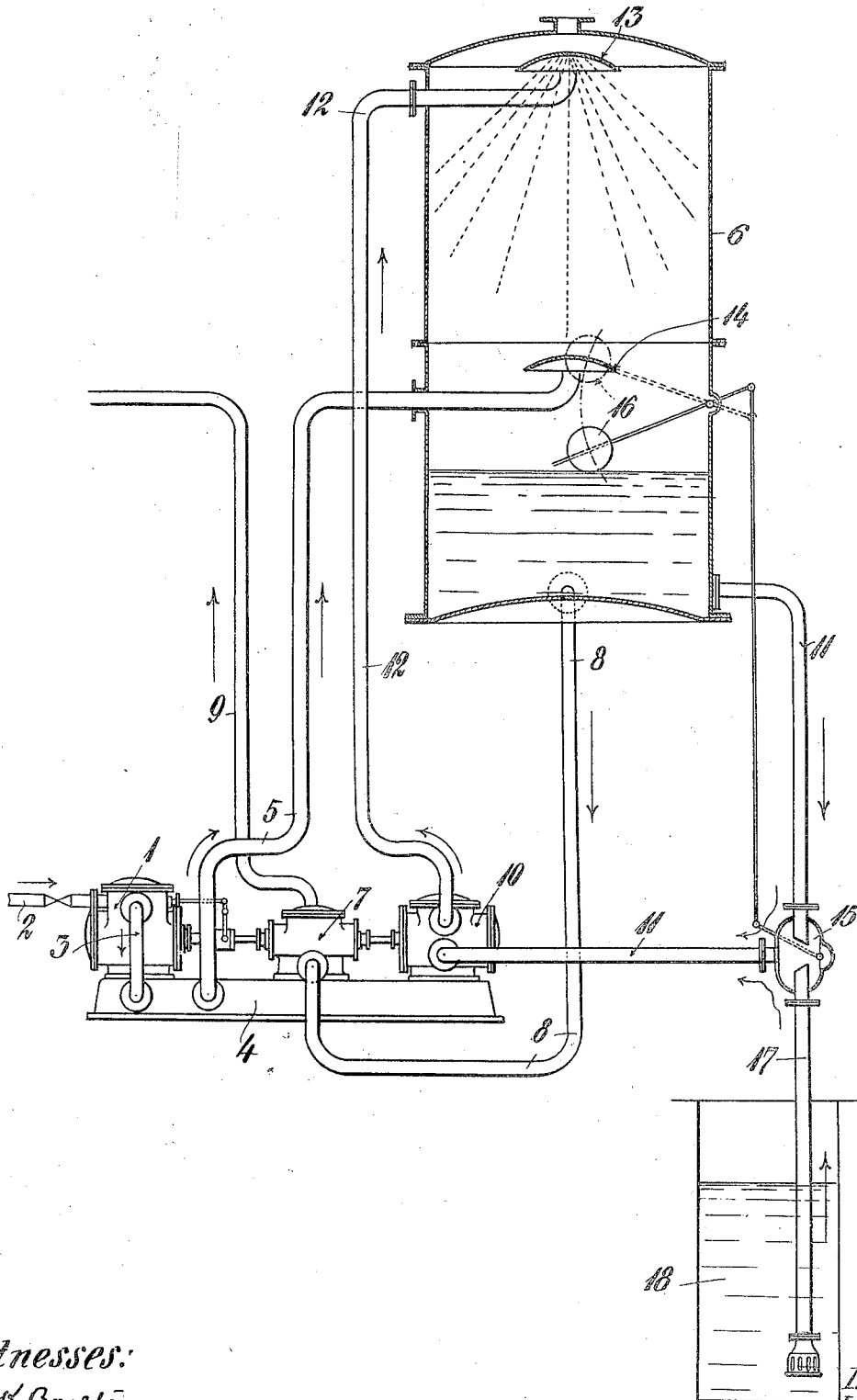


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FEED WATER HEATER.
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1,056,044.

Patented Mar. 18, 1913.



Witnesses:

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JOSEF MUCHKA, OF VIENNA, AUSTRIA-HUNGARY.

FEED-WATER HEATER.

1,056,044.

Specification of Letters Patent.

Patented Mar. 18, 1913.

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To all whom it may concern:

Be it known that I, JOSEF MUCHKA, a citizen of Austria, and resident of Vienna, in the Province of Lower Austria, Austria-Hungary, have invented certain new and useful Improvements in Feed-Water Heaters, of which the following is a specification.

The apparatus forming the subject of the present invention has for its object to enable the feed water for boilers to be heated to 100° C., by direct contact with exhaust steam freed from oil, or with fresh steam, with simultaneous purification of the water from mineral substances and gaseous products by forcing the water to circulate several times through the feed heater with intermediate periods of rest, so that the water comes repeatedly into contact with the exhaust steam, thus being progressively heated by the latter, a certain period of rest being allowed for the precipitation of mineral substances after the intimate commingling of the steam and water.

The circulation of water by means of a pump is already known in steam storage apparatus from which the water is withdrawn and again injected through spraying nozzles. The object of such apparatus is however, to obtain a rapid and intimate mixture of the steam with the water, for the purpose of producing and storing of saturated steam, which is used as such while the water theoretically constant in quantity is forced through the apparatus. It has also already been proposed in boiler feed apparatus to provide a feed heater in which the water can be forced several times through the feed heater. In known apparatus of this kind, however, the auxiliary pump acts in the manner above described, only when the quantity of water fed by the feed pump is smaller than the quantity of water supplied by the auxiliary pump, while, when the feed pump is working at full load the auxiliary pump cannot effect the repeated circulation of the water.

According to the present invention an auxiliary circulating pump of greater capacity than the boiler feed pump is utilized, which continues to remove water from the feed heater and return it when the feed pump is acting at full load so that if in consequence of a stoppage of the feed pump the water in the feed heater falls to a predetermined level the auxiliary pump will also draw in fresh water. In such installa-

tions where it is not possible to arrange to operate adjacent the feed pump a circulating pump of greater capacity, the exhaust steam for heating purposes or the like (or even fresh steam) is brought into contact directly with the water to be heated by the use of an injector-like nozzle and the kinetic energy of the steam is utilized in conjunction with the suction effect produced thereby to obtain repeated circulation of the water to be heated through the feed water heater.

The drawing shows a vertical section of a construction working with an auxiliary pump.

Referring to the drawing, 1 represents the steam cylinder of the feed pump, 2 the steam supply pipe for the pump, 3 the pipe for the exhaust which passes first through the oil extractor 4 and from there through the pipe 5 into the feed water heater 6; 7 represents the boiler feed pump, 8 its suction pipe leading from the feed heater 6, and 9 is the discharge pipe of the boiler feed pump leading to the boiler.

10 is the water supply pump which is advantageously coupled direct to the feed pump 7 and has a greater output (about one half more) than the latter; 11 is the suction pipe and 12 is the delivery pipe of the water circulating pump; the delivery pipe 12 leads to a point beneath a deflector 13 in the feed water heater 6. The exhaust pipe 5 which is provided with a deflector is also led into the heater, which has further connected to it the suction pipe 8 of the boiler feed pump 7, and the suction pipe 11 of the water circulating pump 10. In the suction pipe 11 is arranged a reversing valve 15 operated by a float 16 in the feed heater 6 and enabling the water circulating pump to draw direct from the well 18 through the suction pipe 17 connected to the reversing valve 15 when the water level in the feed heater is low; at high water level in the latter the suction pipe 17 is closed and the pump is only in communication with the suction pipe 11.

The operation of the apparatus is as follows:—When the pumps are started by opening the valve in the steam pipe 2 the boiler feed pump 7 runs free at first, as the feed heater from which alone the pump can draw water so far contains no water; during this starting period the boiler feed pump may be put out of operation by a valve con-

necting the suction space and the space behind the piston. The water circulating pump 10, however, at once comes into operation, drawing at first only cold water through the valve 15 from the well 18, delivering it into feed water heater 6 where it comes into contact with the exhaust steam of the feed pump from which steam the oil has been extracted. The steam is condensed and the heat of the steam is transferred to the cold feed water. The pump 10 draws water from the well 18 until the water in the feed heater has reached a certain level when the float operates the reversing valve 15 and connects the pump 10 with the feed heater alone. The pump will now only draw the heated water from the feed heater, delivering it back into the latter where it again comes into contact with the exhaust steam freed from oil absorbing its heat. This can be repeated until the temperature of the feed water has been raised to approximately 100° C. Before each new suction period the water may be allowed to come into a condition of rest in passing through a filtering medium which may be provided in the lower portion of the feed heater whereby the water is freed from foreign matter. If the boiler feed pump is then started it will receive highly heated and purified water from the feed heater. If the circulating pump works slowly, little exhaust steam will be available, however, as its output is greater than that of the boiler feed pump, the water supplied will circulate several times through the feed heater coming repeatedly into intimate contact with steam and consequently the steam itself will, at low load or with free running of the circulating pump be entirely utilized for heating and purifying the water. With a greater demand of boiler feed water and full duty of the circulating pump, the first demand for water is supplied from the store of the feed heater. The circulating pump, as soon as the water level in the feed heater has reached a certain depth, draws water from the well which water is then heated to any desired degree by the exhaust steam which is now plentiful. Should the exhaust steam not be sufficient to obtain the desired temperature of the feed water fresh steam is added. This is effected in known manner by means of a temperature-regulator, which is not shown in the drawing. The economy of the steam pump does not enter into the question, as all the exhaust steam is utilized. The efficiency of such a plant is, as will be apparent from what has been said, very high and is only affected by radiation losses of the pipes and the feed heater.

With piston pumps the output of which is limited but the delivery height of which is theoretically unrestricted, regulation is ef-

fectured as above described. With centrifugal pumps giving a constant pressure at a given number of revolutions and having an unlimited output, regulation may be effected by varying the pressure areas.

It is not absolutely essential that the water circulating pump should form with the boiler feed pump a unitary system but it can be worked entirely independently.

What I claim is:—

1. In an apparatus for heating boiler feed water by means of steam or exhaust steam the combination with a heater, of a feed pump, a circulating pump for forcing the water to be heated several times through the heater and a pipe leading from the collecting chamber of the feed heater to the circulating pump, a fresh water supply, a pipe leading from said supply, a reversing valve arranged in the pipe leading from the collecting chamber of the heater to the circulating pump and adapted when in one position to place the circulating pump directly in communication with the heater and when in the other position to place said circulating pump in direct communication with the fresh water supply through the medium of the pipe leading therefrom, and means controlled by the level of the water in the heater for automatically operating said reversing valve in the manner and for the purposes set forth.

2. In an apparatus for heating boiler feed water by means of steam or exhaust steam the combination with the heater, of a feed pump, a circulating pump having a greater capacity than the said feed pump and adapted to force the water to be heated several times through the heater, and a pipe leading from the collecting chamber of the heater to the circulating pump, a fresh water supply, a pipe leading from said supply, a reversing valve arranged in the pipe leading from the collecting chamber of the heater to the circulating pump and adapted when in one position to place the circulating pump directly in communication with the heater and when in the other position to place said circulating pump in direct communication with the fresh water supply through the medium of the pipe leading therefrom, and means controlled by the level of the water in the heater for automatically operating said reversing valve in the manner and for the purposes set forth.

3. In an apparatus of the character described the combination with the heater, of a feed pump, a circulating pump having a greater capacity than the said feed pump and adapted to force the water to be heated several times through the heater, said circulating pump being coupled directly with the feed pump, a pipe leading from the collecting chamber of the heater to the circulating pump, a fresh water supply, a pipe

leading from said supply, a reversing valve arranged in the pipe leading from the collecting chamber of the heater to the circulating pump and adapted when in one position to place the circulating pump directly in communication with the heater and when in the other position to place said circulating pump in direct communication with the fresh water supply through the medium of the pipe leading therefrom, and means controlled by the level of the water in the heater

for automatically operating said reversing valve in the manner and for the purposes set forth.

Signed at Vienna in the county of Lower- 15
Austria and State of Austria-Hungary this
third day of November A. D. 1910.

JOSEF MUCHKA.

Witnesses:

WILHELM BERGER,
ADELAIDE FUNK.