P. DIETRICH & W. MILLIES.

INJECTOR.

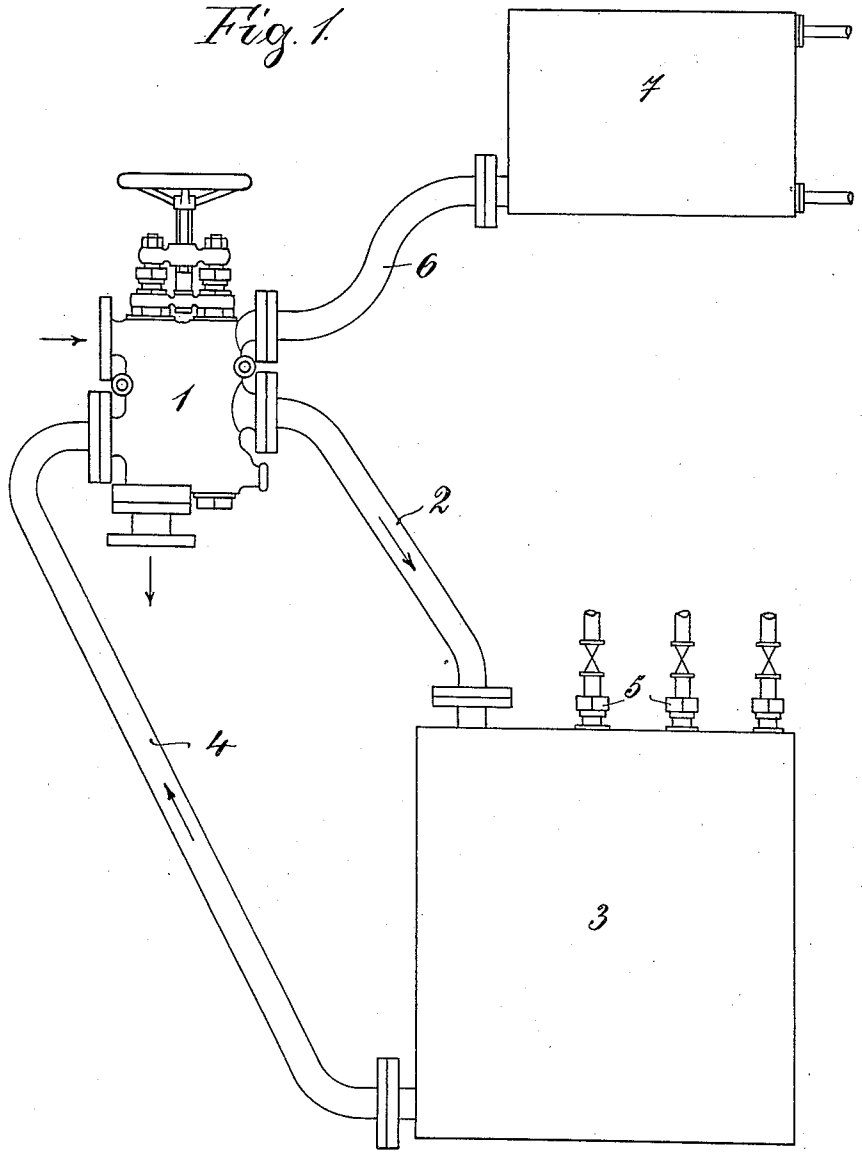
APPLICATION FILED NOV. 20, 1911.

1,042,095.

Patented Oct. 22, 1912.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
L. Hoskinson
C. S. Brown.

Inventors:
Paul Dietrich, Wilhelm Millies
by:
Foster Freeman Watson & Coit
Attorneys

P. DIETRICH & W. MILLIES.

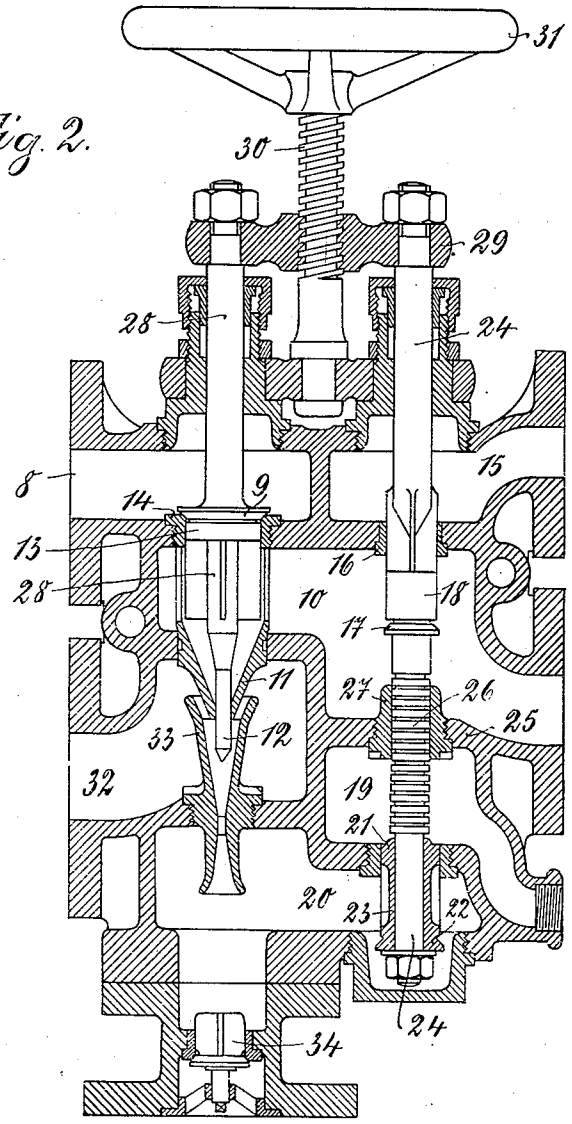
INJECTOR.

APPLICATION FILED NOV. 20, 1911.

1,042,095. Patented Oct. 22, 1912.

2 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
L. Hockmeyer
C. S. Brown.

Inventors:
Paul Dietrich, Wilhelm Millies
by:
Foster Freeman Watson & Coit
Attorneys

UNITED STATES PATENT OFFICE.

PAUL DIETRICH AND WILHELM MILLIES, OF LINDEN, NEAR HANOVER, GERMANY, ASSIGNORS TO COMPANY "GEBR. KOERTING AKTIENGESELLSCHAFT," OF KÖRTINGSDORF, NEAR HANOVER, GERMANY.

INJECTOR.

1,042,095. Specification of Letters Patent. Patented Oct. 22, 1912.

Application filed November 20, 1911. Serial No. 661,308.

To all whom it may concern:

Be it known that we, PAUL DIETRICH, a subject of the King of Prussia, and resident of 51 Davenstedterstrasse, Linden, near Hanover, in the German Empire, and WILHELM MILLIES, a subject of the King of Prussia, and resident of 22 Weberstrasse, Linden, near Hanover, in the German Empire, have jointly invented an Improved Injector, of which the following is a specification.

This invention relates to injectors, more particularly intended for feed water supply in connection with steam boilers and the like.

Hitherto in injectors for this purpose it has only been possible to feed water when the temperature of the same was not more than 60 or 70° C. as, at higher temperatures, the superheated steam resulted in a partial vaporization of the water in the injector taking place and this destroyed the necessary vacuum and occasioned failure in the operation of the injector.

According to the present invention the water is supplied to the injector at a higher pressure than that of the atmosphere, whereby owing to the consequent rise in the temperature of vaporization caused by the increased pressure, it is possible to supply water by the injector at any desired temperture without vaporization of the same taking place in the injector, thus obviating the hereinbefore mentioned deficiencies. This is particularly desirable in cases where the water, which may be supplied through steam traps or the like is at a temperature of more than 70° C., it being unnecessary to cool the water down to this temperature before supplying it to the injector, and thus loss in heat is thereby obviated.

According to the present invention the feed water supply inlet to the injector is connected with a pressure water pipe or tank so that the feed water is supplied to the injector under pressure.

The invention also comprises the provision of a connection between said tank and the steam supply pipe of the injector for the purpose of putting or maintaining the feed water in said tank under pressure during the action of the injector, said tank being connected through suitable valves with the atmosphere or with a condenser for the purpose of relieving the pressure or condensing the steam in said tank and feed water supply pipe when required.

The invention also comprises certain other details of construction which will be hereinafter referred to in reference to the accompanying drawings, whereon is shown by way of example, the preferred construction of injector.

Figure 1 is a side-view showing the injector and its connections with the pressure water tank and condenser; Fig. 2 is a vertical section through the injector.

Referring to Fig. 1 of the drawings: 1 designates the injector which is connected by means of a pipe connection 2 with a pressure water tank 3 which is likewise provided with a return pipe connection 4 to the injector 1. Hot water at a temperature of say from 90 to 100° C. may be supplied to the pressure water tank 3 from a steam trap or other suitable source and either under pressure or not, through any suitable type of connections 5. The hot water from the pressure tank 3 is fed to the injector 1 by way of the pipe 4 while steam may be supplied from the injector 1 to the pressure tank 3 by way of the pipe 2 in order to put the feed water 3 under pressure and thereby effect or assist the feed water supply to the injector 1. On the pressure water tank 3 being emptied, the pressure in the latter is adapted to be relieved and the steam therein condensed by opening communication between the pressure tank 3 and the atmosphere, or, as shown in the drawings, through the injector 1 to a pipe 6 which is connected to a pressure compensating device 7 which is preferably in the form of a condenser, the connection between the pressure tank 3 and condenser 7 being cut off during the operation of the injector 1.

Referring now more particularly to Fig. 2 of the drawings: Steam from any suitable source of supply is supplied to a chamber 8 within the injector casing, said chamber 8 being adapted to communicate, on a valve 9 being opened, with a chamber 10 connected to the pipe connection 2 leading to the pressure water tank 3. The orifice of the injector nozzle 11 is adapted to be closed by means of a needle valve 12 which is mounted on the spindle 28 of the valve 9 and which is adapted to maintain the orifice of the noz-

zle 11 closed for a certain movement of the spindle 28, which is also provided with a ring 13 fitting within the valve seat 14 of the valve 9 and which maintains non-communication between the chambers 8 and 10, for a partial movement of the spindle 28.

The pipe connection 6 connecting the injector 1 with the condenser 7 leads from a chamber 15 in the injector casing, which is adapted to communicate through a valve seat 16 with the chamber 10, communication between the chambers 15 and 16 being controlled by means of a valve 17 and a valve ring 18 adapted to fit on and within the valve seating 16 respectively.

If desired the chamber 15 may open direct into the atmosphere, but in this case would result in the entire loss of the steam present in the pressure water tank 3. 19 is an overflow chamber communicating with a chamber 20 in front of the injector nozzle, communication between the chambers 19 and 20 being controlled by means of valve rings 21 and 22 mounted on a valve sleeve 23 which is carried by the spindle 24 of the valve 17 and 18. At the part where the valve spindle 24 passes through the web 25 of the injector casing separating the chambers 10 and 19, a steam-tight joint of any suitable type may be provided, packing rings 26 being shown on the drawings adapted to slide through a packing sleeve 27. The spindles 24 and 28 are connected above to a cross head 29 which is adapted to be raised and lowered by means of a screwed spindle 30 passing therethrough and adapted to be rotated by means of a suitable hand-wheel 31. The valves 9 and 17 serve to limit the movement of the valve spindles 24 and 28, while the valve-rings 21 and 22 are adapted to respectively cut off communication between the chambers 19 and 20 in the raised and lowered positions of the spindle 24.

The feed water supply pipe 4 is connected to a chamber 32 surrounding the injector nozzle 11 which is provided in the usual manner with an induction tube 33 opening into the chamber 32 at one end and into the chamber 20 at its other end, and the feed water supplied to the chamber 20 is adapted to be forced through a check-valve 34 therein.

The operation of the injector is as follows: In the position of the parts illustrated in Fig. 2, the injector is out of action while the pressure water tank 3 is connected to the condenser 7 through the pipe connection 2, chambers 10 and 15 and pipe connection 6, and it follows therefore that the water in the tank 3 and condenser 7 will be at atmospheric pressure or under pressure according to the temperature of the water therein. On rotation of the hand wheel 31 the valves 9 and 17 will first of all be simultaneously raised, thus raising the valve ring 13 out of the valve seat 14 and opening connection between the chambers 8 and 10, while at the same time the valve ring 18 on the spindle 24 will enter the valve seat 16. Thereupon steam from the steam supply pipe entering the chamber 8 will pass through the chamber 10 and pipe connection 2 to the pressure water tank 3 and force the hot water therein through the pipe 4 to the chamber 32 and around the injector nozzle 11 where it will flow through the induction tube 33 into the chamber 20 and in consequence of the valve ring 21 having been raised, the water will pass into and out from the overflow chamber 19. On further rotation of the hand wheel 31, the spindles 24 and 28 will be further raised, so as to raise the needle valve 12 and thus open the orifice of the injector nozzle 11 while simultaneously or directly thereupon, the valve ring 22 will cut off communication between the chamber 20 and overflow chamber 19. Steam will thereupon pass through the nozzle 11 and under its action will draw feed water from the chamber 32 and force the same through the check valve 34 into the feed water supply pipe to the boiler.

Upon the water tank 3 being emptied, the injector may be put out of action by screwing the valve 9 down upon its seat and simultaneously the pressure in the tank 3 relieved by again opening communication to the condenser 7, the parts being then again in the position shown in Fig. 2.

In cases where a constant supply of hot water to the tank 3 and a constant supply of feed water through the injector to the boiler or the like is to be effected it is desirable that the pressure water tank 3 be connected with a signaling device adapted to indicate when the tank 3 is filled or emptied so as to indicate to the operator that the injector should be put out of operation. Such a signaling device may be operated by means of a float or other suitable device provided in the tank 3. In this manner irregularities in the supply of water to the pressure water tank, which may be caused by the impossibility of the filled tank receiving a further supply of water or owing to the pressure of the steam entering the empty tank from the injector, may be reliably obviated.

In the succeeding claims the words "lifting injector" are to be understood as meaning any injector acting alone, and in the case of double injectors as meaning the first or induction injector.

We claim:—

1. In combination with a feed water lifting injector, means for subjecting the feed water to a pressure considerably above atmospheric pressure before supplying it to the injector, so as to enable the water to be fed to the injector at a high temperature

without vaporization of the water in the injector.

2. In combination with a feed water lifting injector, means for subjecting the feed water to a pressure considerably above atmospheric pressure before supplying it to the injector, by the pressure of steam supplied to the injector, so as to enable water to be fed to the injector at a high temperature without vaporization of the water in the injector.

3. In combination with a feed-water injector, a feed-water tank, means for maintaining the feed water in said tank at a pressure considerably above atmospheric pressure and a connection from said tank to the water-inlet of the injector.

4. In combination with a feed-water injector, a feed-water tank, a connection supplying steam from the injector to said tank so as to maintain the feed water in said tank at a pressure considerably above atmospheric pressure, and a connection from said tank to the water inlet of the injector.

5. In combination with a feed-water injector, a feed-water tank, means for maintaining the feed water in said tank at a pressure considerably above atmospheric pressure, a connection from said tank to the water-inlet of the injector, and means for enabling the pressure in said tank to be relieved.

6. In combination with a feed-water injector, a feed-water tank, means for supplying steam to said tank so as to maintain the feed-water therein under pressure, a connection from said tank to the water inlet of the injector, a condenser, a connection between said condenser and tank, and valves for cutting off the supply of steam to said tank while said tank and condenser are in communication with one another and for cutting-off communication between said tank and condenser while steam is being supplied to said tank.

7. In combination with a feed-water injector having a casing, a steam-inlet chamber therein, a nozzle, a valve-spindle, a needle valve thereon adapted to close the orifice in said nozzle, and a feed-water induction chamber around the nozzles; a feed-water tank communicating with said induction chamber, a steam outlet chamber in said injector casing communicating with said tank and through a valve opening with said steam-inlet chamber, a valve mounted on said needle valve spindle adapted to close said valve opening, a pressure reducing chamber in said injector casing and communicating through a second valve opening with said steam outlet chamber, a second valve spindle, a valve mounted thereon and adapted to close said second valve opening, and means for simultaneously actuating said valve spindles so as to open the valve controlling communication between said steam inlet chamber and said steam outlet chamber simultaneously with the closing of the valve controlling communication between said steam outlet chamber and pressure reducing chamber and vice versa.

8. In combination with a feed-water injector having a casing, a steam-inlet chamber leading to the nozzle, a needle valve adapted to close the orifice in the nozzle, a feed-water induction chamber around the nozzle, and a feed-water discharge chamber; means for supplying feed water to said induction chamber under pressure, an overflow chamber communicating through a valve-opening with said discharge chamber, a valve adapted to close said valve opening and means for simultaneously actuating said valves so as to open communication between said discharge and overflow chambers while the nozzle orifice is closed and vice versa.

9. In combination with a feed-water injector having a casing, a steam inlet chamber therein, a nozzle, a valve spindle, a needle valve thereon adapted to close the orifice in said nozzle, a feed-water induction chamber around the nozzle and a feed-water discharge chamber; a feed-water tank communicating with said induction chamber, a steam outlet chamber in said injector casing communicating with said tank and through a valve opening with said steam inlet chamber, a valve mounted on said needle valve spindle adapted to close said valve opening, a pressure reducing chamber in said injector casing and communicating through a second valve opening with said steam outlet chamber, a second valve spindle, a valve mounted thereon and adapted to close said second valve opening, an overflow chamber communicating through a third valve opening with said discharge chamber, a double valve adapted to close said third valve opening and mounted on said second valve spindle, and means for simultaneously actuating said valve spindles so as to open the valves controlling communication between said steam inlet and outlet chambers and between said discharge and overflow chambers respectively simultaneously with the closing of the valve controlling communication between said steam-outlet chamber and pressure-reducing chamber and so as to thereafter reclose communication between said discharge and overflow chambers.

10. In combination with a feed-water injector having a casing, a steam inlet chamber therein, a nozzle, a valve spindle, a needle valve thereon adapted to close the orifice in said nozzle, a feed water induction chamber around the nozzle and a feed-water discharge chamber; a feed-water tank communicating with said induction-chamber, a steam outlet chamber in said injector

casing communicating with said tank and through a valve opening with said steam inlet chamber, a valve mounted on said needle valve spindle adapted to close said valve opening, a pressure reducing chamber in said injector casing and communicating through a second valve opening with said steam outlet chamber, a condenser communicating with said pressure-reducing chamber, a second valve spindle, a valve mounted thereon and adapted to close said second valve opening, an overflow chamber communicating through a third valve opening with said discharge chamber, a double valve adapted to close said third valve opening and mounted on said second valve spindle, and means for simultaneously actuating said valve spindles so as to open the valves controlling communication between said steam inlet and outlet chambers and between said discharge and overflow chambers respectively simultaneously with the closing of the valve controlling communication between said steam-outlet chamber and pressure-reducing chamber and so as to thereafter reclose communication between said discharge and overflow chambers.

In witness whereof we have hereunto set our hands in the presence of two witnesses.

PAUL DIETRICH.
WILHELM MILLIES.

Witnesses:
JOHANNES EBERDING,
WILHELM BAARS.