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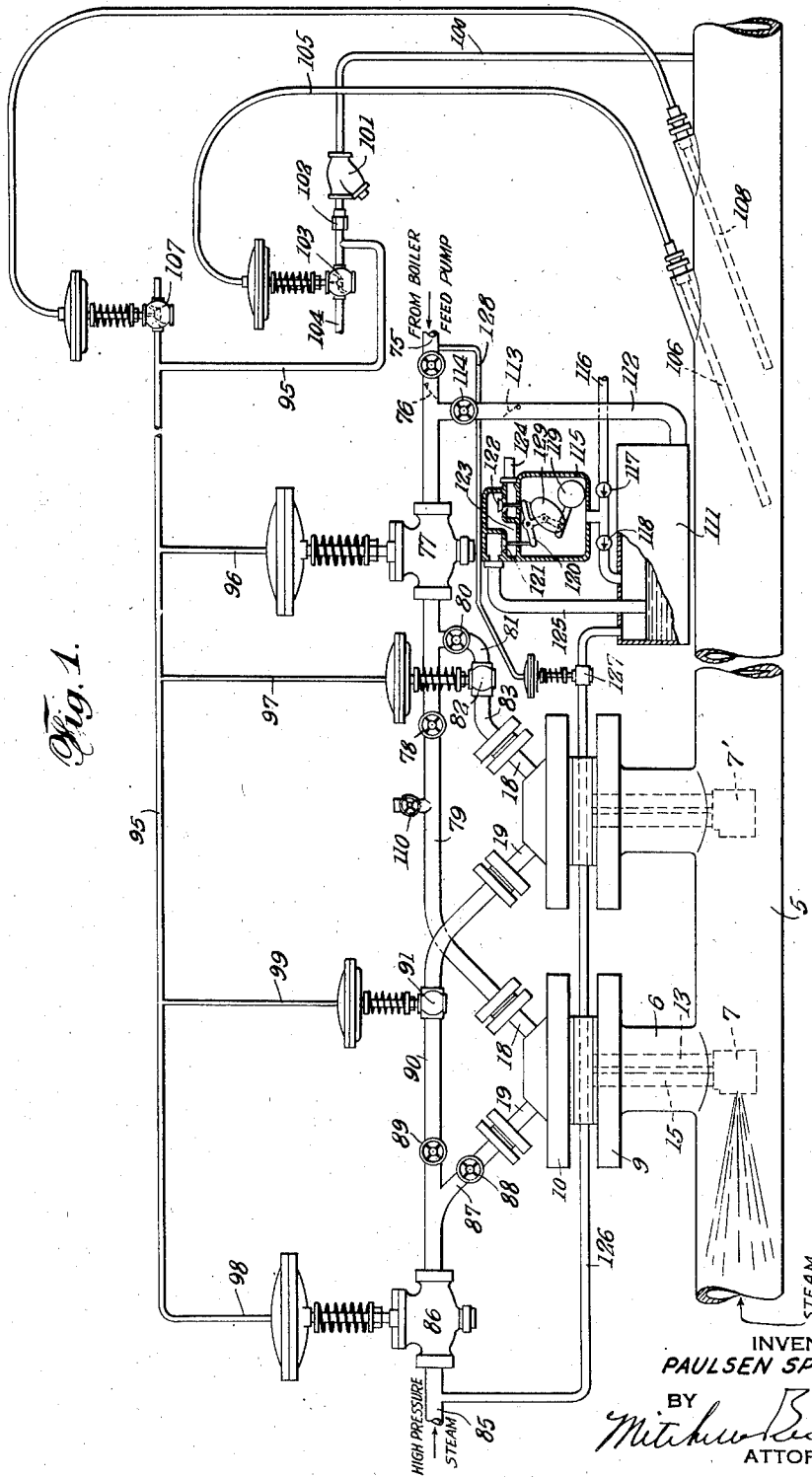
P. SPENCE

2,293,314

DESUPERHEATER

Filed Aug. 6, 1938

2 Sheets-Sheet 1



Aug. 18, 1942.

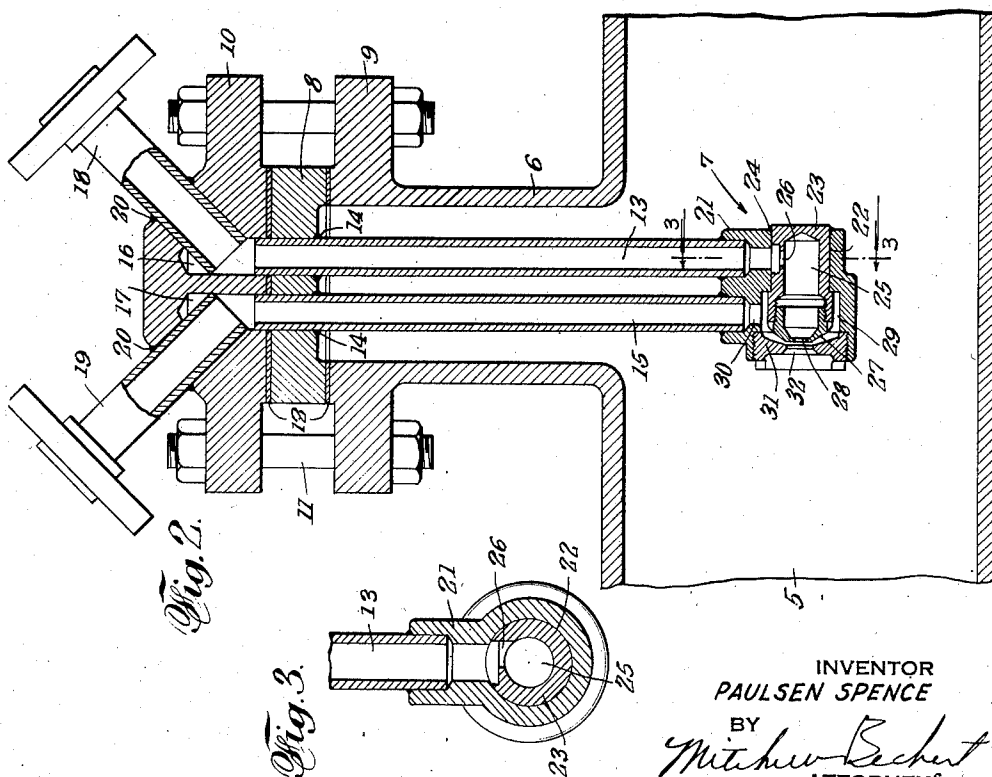
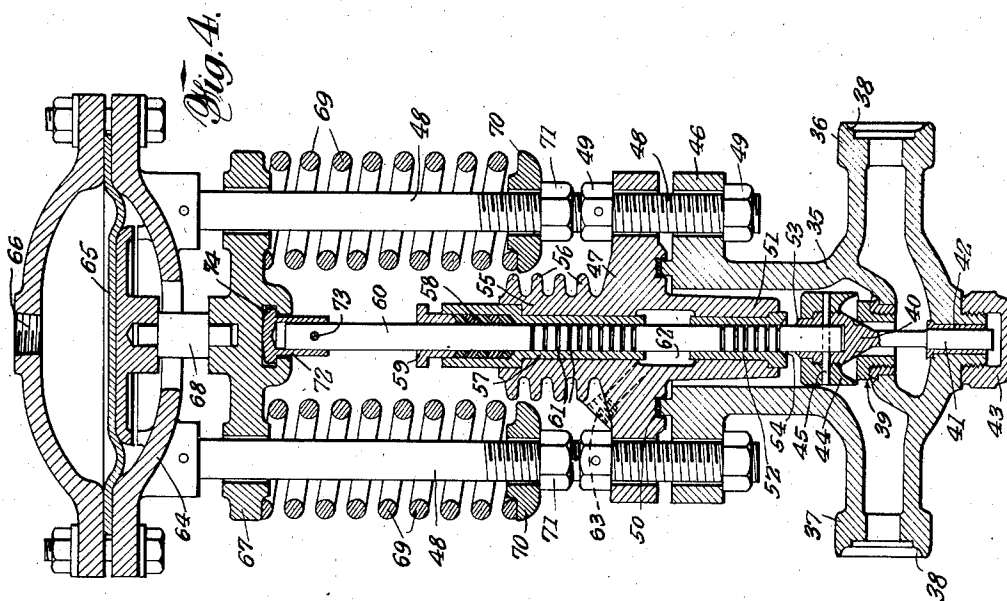
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DESUPERHEATER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,293,314

DESUPERHEATER

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Application August 6, 1938, Serial No. 223,444

10 Claims. (Cl. 261-18)

My invention relates to a desuperheater.

As is well known, in many power plants steam is generated under high pressure and is given a high degree of superheat. In such stations steam usually at a lower pressure and having a lower temperature, even down to the temperature of saturated steam, is often required for the operation of auxiliaries, heating systems, processing and the like. In many cases it is highly important that an uninterrupted supply of desuperheated steam be supplied and it is furthermore important that neither the temperature nor the pressure of the desuperheated steam shall exceed certain limits. A further requirement of a desuperheater in many cases is that it shall be adapted for the making of quick repairs or replacements. My improved desuperheater system in its complete form is believed to fully comply with all of the above requirements.

It is an object of my invention, therefore, to provide an improved form of desuperheater in which shut-downs for repairs or replacements will be reduced to a minimum.

It is another object to provide an improved desuperheater system having means for automatically supplying desuperheating water from an auxiliary source should the normal source of supply fail or be inadequate.

Another object of the invention is to provide an improved desuperheater system embodying a plurality of desuperheater units so arranged that, should one fail to operate, another will be automatically put into operation, all without interruption of the supply of desuperheated steam.

Another object is to provide a desuperheater wherein the temperature of desuperheated steam may be quite accurately regulated between relatively close limits.

A further object is to provide a desuperheater which is simple in construction, not likely to get out of order, and serviceable in use.

Another object is to provide an improved desuperheater unit which may be very quickly removed from the line for making repairs or renewals and again quickly returned to the line.

Another object is to provide an improved form of desuperheater in which the water is divided into very fine particles so as to be readily vaporized by the superheated steam.

Still another object is to provide an improved form of valve for controlling the high pressure water and high pressure steam to the desuperheater.

Other objects and various features of novelty

and improvement will be hereinafter pointed out or will become apparent to those skilled in the art.

In the drawings which show, for illustrative purposes only, a preferred form of the invention—

Fig. 1 is a more or less illustrative or schematic view of a part of the desuperheated steam line and my improved desuperheater associated therewith;

Fig. 2 is a central, sectional view through a part of the desuperheated steam line and one form of my improved desuperheater;

Fig. 3 is a fragmentary, sectional view taken substantially in the plane of the line 3-3 of Fig. 2;

Fig. 4 is a central, sectional view of an improved form of valve for handling high pressure or high temperature fluids.

Briefly stated, my invention in its complete combination form includes a plurality of desuperheater units, one of which preferably normally is inoperative while the other supplies the necessary water for desuperheating the steam. If for any reason the operative desuperheater should fail to maintain the desuperheated steam at the requisite temperature, the second desuperheater unit would automatically be rendered operative so as to furnish an alternate or an additional supply of water for maintaining the desired temperature in the desuperheated steam line. The desuperheater unit or units will ordinarily be supplied from a source of high pressure water such as from a boiler feed pump. I preferably provide, in addition, an auxiliary source of high pressure water for supplying either or both of the desuperheaters should the normal source of water supply as from the boiler feed pump fail or for any reason be inadequate.

While my invention in complete combination form has been herein shown, it is to be understood that a highly satisfactory desuperheating system may be provided by using only a part of the complete system, that is to say, a single desuperheater unit and a single source of water supply will normally serve to desuperheat the steam supply in the desuperheated line and the second unit and alternate water supply have been shown as constituting safety devices to assure constant operation if for any reason the main desuperheater should fail to function properly.

In the complete form shown in Fig. 1, 5 indicates a desuperheated steam line which will usually be maintained at a lower pressure than

the main boiler plant steam line and the steam in the line 5 will be desuperheated to the desired degree, even down to the temperature of saturated steam at the particular pressure under which the line 5 is held.

My present invention relates only to the desuperheating system and therefore only such parts as are necessary to that system have been shown, but it is to be understood that the line 5 will normally be connected through a regulating or reducing valve to the main high pressure superheated steam line from the boiler. A suitable reducing or regulating valve is that shown in my Patent No. 1,995,949, dated March 26, 1935. Such a regulating valve will normally maintain the desired pressure in the line 5, even though the main pilot operating the main regulating valve should be ruptured or damaged. Furthermore, the regulating valve shown in my said patent may be controlled by the temperature of steam in the desuperheated line 5 so as to shut off the regulating valve in case the temperature in the line 5 should for any reason reach a predetermined abnormally high limit. The desuperheater system in its preferred combination form will now be described.

The line 5 is provided with a T-fitting 6 through which the desuperheater unit 7 is dropped and held in the line 5 with the water nozzle facing into the oncoming steam. The improved desuperheater in its preferred form comprises a head or flange 8 (Fig. 2) which may fit upon the flange 9 of the T-fitting 6 and be rigidly held between said flange 9 and a cap flange 10 secured to the flange 9 as by means of flange bolts 11—11. Suitable gaskets 12—12 serve to make a steam-tight joint between the head 8 and the flanges 9—10. A water pipe 13 is rigidly secured in the head flange 8 preferably by means of a circumferential weld 14. A stem pipe 15 is similarly held to the head flange 8 as by a similar weld 14. The pipes 13—15 extend completely through the head flange 8 and into bores 16—17 in the cap flange 10. A water connection 18 and steam connection 19 is made to the flange cap 10 and pipes 18—19 extend into the bores 16—17 so that there is free communication between the steam pipes and the water pipes, as will be clear. The water and steam pipes 18—19 are preferably rigidly secured to the cap flange 10 by means of circumferential welds 20.

A desuperheater nozzle head 21 is secured to and carried by the lower ends of the pipes 13—15. The head 21 is preferably welded to the pipes as shown. In the form shown the head 21 has a longitudinal bore 22 for the reception of a water nozzle plug 23 which fits in the bore and may be secured therein as by a circumferential weld 24. The plug 23 has an axial bore or passage 25 therein and the port 26 entering the bore 25 and forming a communication with the water pipe 13 enters at an angle to the axis of the bore 25 and eccentrically thereto as will be clear from Figs. 2 and 3. In the forward end of the plug 23 is a removable water nozzle fitting 27 having a restricted water outlet 28. The purpose of the angular and eccentric relationship of the port 26 and the bore 25 is to cause the water in passing from the pipe 13 to the exit vent 28 to rotate or swirl in spiral form and issue from the water nozzle in the form of a spray cone so that the water may be in a finely divided state and thus be readily taken up by the superheated steam flowing against the spray cone. The nozzle head 21 is counterbored so

as to provide an annular space 29 about the water nozzle and a port 30 permits passage of steam from the pipe 15 to such annular space. A steam nozzle fitting 31 is removably secured in the end of the counterbore in the head 21 and is provided with an outlet passage 32 concentric with the passage 28 of the water nozzle. Thus, the water issuing in the form of a cone from the water nozzle will be further broken up by the steam and, in fact, atomized so that it may be quickly and readily vaporized. The steam atomizing effect on the water is quite important when there is but a slight flow of water, which slight flow has a lesser tendency to form a spray cone. If only a drip of water issues from the water nozzles, the steam will serve to atomize that drip. When a greater volume of water flows, the cone effect heretofore noted will result and the steam while now not so necessary will simply serve to more fully break up or atomize the water in the cone, all with the effect of providing a fine spray which is quickly vaporized by the superheated steam.

It will be seen that the T-fitting 6 is of such size that the head 8, water and steam pipes 13—15, and entire nozzle head may be removed as a unit, the nozzle head and pipes passing freely through the opening in the T-fitting. If repairs or renewals are required, it will be seen that it will be a relatively simple matter to remove the entire desuperheater head and replace the same with a spare unit with a minimum amount of down time for the line.

In the preferred form, a second desuperheater unit 7', which may be considered as an alternative or as an additional desuperheater, is provided in the line. Since the desuperheater 7' may be and preferably is the same or similar to the desuperheater unit already described, no separate description thereof is here considered necessary.

Water and steam under high pressure are conducted to the desuperheater unit or units through suitable regulating valves. I have devised an improved form of valve suited for high pressures, a typical form of which is shown in detail in Fig. 4. That valve will now be described in detail, after which the general desuperheater arrangement will be taken up.

The valve of Fig. 4 in its preferred form includes a steel body 35 having an inlet connection 36 and an outlet connection 37. The inlet and outlet connections are preferably provided with seats 38 for the reception of pipes to be welded directly to the valve body. The valve body is provided with a valve seat arrangement 39 which may be and preferably is of the general type shown in my Patent No. 2,117,044, dated May 10, 1938, wherein is disclosed a seat adapter ring of hard metal welded in the seat ring passage of the valve and provided with a renewable seat ring. A valve member 40 coacts with the seat ring and the valve and its seat at their co-operating surfaces are preferably "stellited" so as to resist the cutting action of the high pressure water or steam. The valve preferably includes a lower guide stem 41 fitting in a guide 42 in the valve body. A closure cap 43 is screw threaded or welded to the valve body. The valve above the seat preferably carries a hard metal deflector head 44 so as to deflect the stream of fluid passing the valve seat and prevent cutting of the valve body. In the form shown the deflector head 44 is screw threaded to the valve

proper and further secured thereon by means of a key or pin 45.

The valve body is flanged at 46 and a valve bonnet 47 has a cooperating flange, and bolts 48 extending through holes in the flanges secure the bonnet onto the valve body through the medium of the nuts 49—49 threaded on the bolts 48. A suitable gasket 50 may be interposed between a part of the bonnet and valve body as shown. The valve bonnet has a sleeve 51 projecting down into the valve body and a valve stem guide 52 is secured in the sleeve 51 in fluid-tight engagement therewith. In the form illustrated, the upper end 53 of the valve proper and the lower end of the guide 52 at the point 54 are ground so as to form a fluid-tight joint when the valve is in wide open position and thus relieve the valve stem sealing means of the burden of sealing the valve when in wide open position.

In the preferred form, the valve bonnet 47 has an upstanding sleeve 55 provided with heat radiating fins 56 and is provided with a further valve stem guide 57 rigidly secured therein. The upper end of the guide 57 may be counterbored to receive fibrous or other packing 58 to be compressed through the medium of a gland 59, as will be understood. A valve stem 60 is secured to the valve proper, as by means of the pin 45, and extends upwardly through the guides 52—57 and through the packing 58 and gland 60. The guides 52—57 and portions of the valve stem passing therethrough form labyrinth type of packings, in the present instance formed by means of a plurality of grooves 61 turned in the valve stem. The two labyrinth packings, as will be seen from Fig. 4, are separated from each other so as to provide a chamber 62 provided with a fluid drain-off connection 63. Thus, any fluid leaking past the lower labyrinth packing may be drained off through the drain connection 63 and the upper labyrinth and fibrous packing 58 serve as a seal for only such liquids or gases as cannot be adequately disposed of through the drain-off connection 63.

The connecting bolts 48—48 extend upwardly beyond the bonnet and at the tops carry a diaphragm chamber designated generally 64. The diaphragm chamber carries a diaphragm 65 and the chamber has an upper fluid pressure connection 66 to admit fluid pressure for urging the diaphragm 65 downwardly, all as will be understood. The connecting bolts 48—48 serve as guides for a cross-head 67 which by means of a dowel 68 is connected to the diaphragm so that the latter may move the cross-head downwardly, as will be clear. The cross-head is urged upwardly by means of springs 69—69 guided on the bolts 48 and engaging the under-surface of the slidable cross-head. The lower ends of the springs are supported by pressure plates 70 held in various positions of adjustment by nuts 71 on the bolts 48. Thus, by properly positioning the nuts 71, the stress upon the springs 69 may be varied. The valve stem 60 is connected to the cross-head 67, preferably by means of an adapter 72 enclosing the upper end of the valve stem 60 and pinned thereto at 73. The adapter may have a T-head 74 fitting a T-slot in the under-side of the cross-head 67. The valve as described is adapted to be fluid pressure actuated in one direction, that is, the closing direction in the form illustrated in Fig. 4, and is actuated in the opening direction by means of the spring 69 and connections heretofore noted. The valve may be readily adjusted to close at any desired

pressure above the diaphragm 65. Due to the heavy steel construction of the valve body in its preferred form, great fluid pressures may be carried, and due to the valve and seat arrangement likelihood of cutting the valve, the seat, or the valve body, will be reduced to a minimum. The valve when in open position is self-sealing and when the valve is in an intermediate position, the labyrinth and fibrous packings combined with the drain-off connection between two of the packings serve to adequately protect the valve against valve stem leakage. The valves employed in my improved desuperheater in its preferred form are preferably, though not necessarily, of substantially the type shown in Fig. 4.

Referring now to the desuperheater as a whole shown in Fig. 1. Water is conducted through pipe 75 from a suitable source of high pressure water, for example, from the boiler feed pump. The water passes the check valve 76, then flows through water valve 77, which may be of the type shown in Fig. 4, thence past hand valve 78, through pipe 79 to the water connection 18 of the desuperheater 7. When the second desuperheater unit 7' is employed, water is conducted thereto past the hand valve 80 and branch connection 81, water valve 82 (preferably the type shown in Fig. 4) and pipe 83 to the water inlet connection 18 of desuperheater 7'. The valve 77 and 82 are fluid pressure actuated in the closing direction and their action will be later described. While the active desuperheating agent is water, it is preferable to feed steam to the desuperheater or desuperheaters for the purpose of atomizing or further atomizing the water so that it will be presented to the superheated steam in finely divided form. Steam is conducted through pipe 85 from a source of high pressure steam. Steam from pipe 85 passes through steam valve 86 preferably of the type shown in Fig. 4, then through branch connection 87, and past hand valve 88 to the steam connection 19 of desuperheater unit 7. A second hand valve 89 and branch connection 90 may conduct steam past valve 91 (preferably of the type shown in Fig. 4) to the steam connection 19 of desuperheater unit 7'.

The water valves 77 and 82 and the steam valves 86 and 91 are all fluid pressure actuated in the closing direction and to that end I provide a motive fluid pressure line 95 having branch connections, 96, 97, 98 and 99 to the diaphragm chambers of valves 77, 82, 86 and 91, respectively. Motive fluid, which may be any pressure fluid, for example steam or condensate from the desuperheater line 5, is conducted through pipe 100, strainer 101, and a restriction or bleed connection 102 into motive fluid pressure line 95 heretofore described. The bleed connection 102 is such that only a limited or bleed flow of steam or other motive fluid can reach the line 95. Obviously, with line 95 closed to the atmosphere, pressure therein will build up and such pressure exerted on the diaphragms of the water and steam valves heretofore described will cause them to close such valves having been previously urged toward open position by means of the springs 69 described in connection with Fig. 4. The pressure in motive fluid line 95 is regulated in accordance with the temperature of the steam in the desuperheater line 5. As illustrated, the motive fluid line 95 is provided with a valve 103 which may be substantially of the type shown in Fig. 4, except that it is reverse acting, that is, it opens on a downward movement instead of on an upward movement as described in connection

with Fig. 4. The valve 103 discharges to atmosphere or any source of low pressure through pipe 104. The diaphragm chamber of valve 103 is connected by means of pipe or tube connection 105 with a thermostatic device 106 in desuperheated steam line 5. Thus, when the temperature in the line 5 rises, the fluid in the thermostat 6 expands or vaporizes so as to press the diaphragm of pilot valve 103 and open the latter more or less so as to bleed pressure from the motive fluid pressure or control line 95. Such bleeding of pressure from the line 95 and above the diaphragms of the water and steam valves will cause those valves to open further and thus admit more cooling water. As soon as the desuperheated steam again decreases in temperature, the pressure in the thermostat 106 will be decreased, thus permitting the pilot valve 103 to move toward closed position and the motive fluid bled through the restriction or bleed connection 102 will again cause the pressure in the control pipe 95 to build up and move the water and steam valves toward closed position. It is to be understood that during normal operation, the water and steam valves, as well as the pilot valve 103, will be neither fully opened nor fully closed, but will be in some intermediate position so that hunting action is reduced to a minimum and the temperature of the desuperheated steam is maintained constant within the limits of the apparatus.

It should here be noted that the springs 69 of water valve 82 and steam valve 91 feeding the auxiliary or second desuperheater unit 7' are adjusted to exert less force against their diaphragms 65 than in the case of valves 77 and 86 supplying the desuperheater 7. Under normal operation, then, normal pressure in the line 95, that is, in the lines 97 and 99, will maintain the valves 82 and 91 closed, while valves 77 and 86 are permitted to open against that pressure so that the water and steam valves serving the desuperheater unit 7' will remain closed during normal operation. However, if for any reason the desuperheater unit 7 should fail to discharge sufficient water for desuperheating the steam in line 5, I have provided means for rendering the desuperheater unit 7' operative so as to discharge an alternate or an additional supply of water into the line 5. In the form shown, the line 5 is provided with a further pilot valve 107 which may be of the same type as the valve 103. The adjusting springs of valve 107, however, are stressed more than the corresponding springs of the valve 103 so that normally the valve 107 remains closed while the valve 103 is open and functioning normally to cause the desuperheater unit 7 to function normally. The valve 107 is moved to open position by means of thermostatic fluid in a second thermostat 108, which may be of the same type as that heretofore described, in the line 5. Thus, should the temperature of steam in the line 5 exceed the limit for which the thermostat 108 and valve 107 are set, the valve 107 will open so as to bleed further fluid from the line 95 and quite rapidly decrease the pressure in the control line 95 and thus permit the water valve and steam valve 91 serving the second desuperheater unit 7' to open so as to discharge an alternative or additional supply of water into the line 5. As soon as the temperature of the steam is reduced in the line 5 below the limit for which the thermostat 108 and pilot valve 107 are set, the latter will close and the desuperheater 7' may ultimately be rendered

again inoperative. However, should the condition causing the desuperheater unit 7 to be insufficient still persist, then the desuperheater unit 7' will continue in operation so as to maintain the temperature of steam in the line 5 at or below the limit as determined by the thermostat 108 and valve 107.

In case the nozzle of the desuperheater should become plugged, say, due to scale, sediment, or the like, I have provided means for blowing the same with steam in a direction reverse to the normal flow of water therein so as to tend to dislodge the obstruction and clear the nozzle, all without dismantling the desuperheater. In the form shown, I provide in the water pipe leading to the desuperheater, for example in the pipe 79, a valve 110 discharging to the atmosphere, blow-off drain or the like. Now, should the desuperheater nozzle become obstructed, the valve 78 adjacent the valve 110 may be closed and the valve 110 opened. Steam will then flow from the main steam line 5 and also from the steam pipe 15 into the water nozzle and the free vent through the valve 110 will permit a rapid flow sufficient to clear any ordinary obstruction in the nozzle. As soon as the obstruction is cleared, the valve 110 may again be closed and the valve 78 opened so as to establish normal operation of the desuperheater. The valve 110 has been shown for the desuperheater 7 only, but of course a similar valve could be arranged in the water pipe leading to the auxiliary desuperheater 7'. The vent 110 could be operated automatically if desired, say when the temperature rises in pipe 5, indicating a lack of sufficient water.

As has been heretofore indicated, I preferably have a secondary source of water supply so that in case of failure of the primary source, the desuperheater may continue in operation with water from the auxiliary source and I have provided means for rendering the transition from one source to the other automatic. In the form shown, there is provided a water reservoir 111 having a water outlet pipe 112 connected to the main water inlet pipe 75 beyond the check valve 76. An upwardly opening check valve 113 is positioned in the outlet pipe 112 so that during normal operation the water pressure in pipe 75 will maintain the valve 113 closed and during operation by means of the auxiliary water supply pressure in pipe 112 will maintain check valve 76 closed. A hand valve 114 is placed in line 112. Above the tank 112 there is a float chamber 115 into which leads a water pipe 116 connected to any suitable source of water supply, such as a water main. Check valves 117-118 are provided in the line 116 at opposite sides of the water inlet from the pipe 116 to the float chamber 115. The float chamber has a float 119 pivotally mounted therein and linked to a rocker arm 120 for actuating the valves 121-122 which may be arranged as shown in the drawing. A vent 123 is provided in the upper deck of the float chamber. The valve 122 controls the atmospheric passage 124 while the valve 121 controls a passage from the pipe 125 connecting the tank 111 and the float chamber above the valve 121. A steam pipe 126 leads from the high pressure steam line 85 into the top of the tank 111. In the steam line 126 is a valve 127 which may be similar to that shown in Fig. 4. The diaphragm chamber of the valve 127 is connected through pipe 128 with the water line 75 leading, say, from the boiler feed pump. Therefore, so long as the pressure in line 75 is adequate, the

valve 127 will remain closed and no high pressure steam can enter the chamber 111, but should the pressure in pipe 75 fail, that is to say, become inadequate, the valve 127 will open and allow high pressure steam to enter the tank 111 and force water therefrom through pipe 112 into the main water line of the desuperheater.

The operation of the auxiliary water supply or pumping arrangement is as follows:

With no water in the float chamber, the float 119 will be in its bottom position shown. Water from the main 116 will then flow into the float chamber 115, the air therein passing through the vent 123 and valve 122 to the atmospheric vent 124. When the float chamber is about filled, the float will have arisen with the water and will rock the rocker arm 120 and the snap action means or counterweight 129 will snap the rocker over so as to close the valve 122 and open the valve 121. Water from the float chamber 115 will then flow by gravity past valve 118 into tank 111, because the pressure in tank 111 and that in the float chamber are the same when the latter is full, since the valve 121 is then open and permits air or steam to pass through pipe 125, valve 121, vent 123, and thence into the float chamber 115. However, as soon as the tank is filled to about the level of the bottom of pipe 125, the air cannot be displaced from the tank 111 through the pipe 125 and no further water will enter the tank 111. This pumping action will continue and the level of water in the tank 111 will be maintained whether or not the steam valve 127 is open or closed. Therefore, should the normal source of water supply through pipe 75 fail, the steam valve 127 will be opened and high pressure steam will enter the tank 111 so as to force the water therefrom through pipe 112 and into the main water line to the desuperheater. This auxiliary source of water supply will be maintained in operation until such time as the normal pressure in the normal water line 75 is raised so as to again close the steam valve 127. Thereafter, the normal water supply will be from pipe 75 as heretofore described.

The operation of the entire desuperheater as a whole may now be briefly summed up as follows:

When the desuperheater device is first started up, thermostatic members 106—108 will be cold, the valves 103—107 will be closed and there will be no pressure above the water and steam diaphragms of the valves of the desuperheater and thus valves will be open and water will be sprayed into the steam pipe against the direction of flow as indicated in Fig. 1. As soon as the normal pressure builds up in the line 5, the motive fluid for the control line will build up in pipe 95 and since valves 103—107 are closed, the pressure will build up above the diaphragms of the water and steam valves so as to partially close the same. Such closing has the effect of cutting down the supply of water and the desired steam temperature will result and be maintained in accordance with the settings of the thermostat 106—108 and valves 103—107 as heretofore described. Should the desuperheater 7 fail to function properly and the temperature of the desuperheater steam build up, the auxiliary or second desuperheater 7' will be put into operation to maintain the temperature of the steam below the limit determined by the thermostat 108 and valve 107. In case the temperature for some reason should exceed the predetermined limit as set by thermostat 108, the main regulating or reducing valve (not shown) may

be caused to close off completely as heretofore noted. In case the primary or normal source of water supply fails, an auxiliary source of water supply is automatically put into the line so that there need be no interruption of an adequate supply of water to the desuperheater.

It is an important general feature of my invention to provide means for proportioning the supply of steam and water to the desuperheater. Generally speaking, the steam pressure to the desuperheater is maintained at, say, about one-fourth the pressure of the water both over and above the pressure in the desuperheater line 5. The water and steam lines are proportioned and the water and steam valves are likewise proportioned and orifices of the valves are arranged so that substantially the above pressure differentials between water and steam will be maintained. In other words, it is not necessary to have spraying steam at the same pressure as the sprayed water but steam at a much lesser pressure will suffice. The proportioning of the pipe and valves and the setting of the latter is such as to normally maintain the pressure differentials somewhere near those noted. However, when the water pressure is very low at the desuperheater, that is, when only a small amount of water is required for desuperheating the steam, the steam pressure may be relatively a little higher than during normal operation, that is, if the water pressure goes down to, say, five pounds at the desuperheater the steam pressure may then be, say, half the water pressure and there will be adequate spraying action.

I have herein described a preferred form of the invention arranged in complete form and in a preferred manner. However, it is to be understood that I do not wish the invention in its broader aspects limited to the complete combination arrangement shown nor to the particular valves and devices herein disclosed since there are many other types of valves, thermostats, thermostatic valves and other parts which could be used, all within the scope of the invention as defined in the appended claims.

I claim:

1. In a device of the character indicated, a desuperheater for introducing water into a steam line, a plurality of sources of water for supplying said desuperheater, and means controlled by the water pressure from one source for automatically supplying water from the other source upon a drop of water pressure from said one source below a predetermined limit.

2. In a device of the character indicated, a desuperheater for supplying water to a steam line, a normal source of water supply for supplying water to said desuperheater, an auxiliary water supply, and means controlled by the pressure of water from said normal source for automatically causing water to be supplied to said desuperheater device from said auxiliary supply upon a drop of the water pressure from said normal source.

3. In a device of the character indicated, a first desuperheater for supplying water to a steam line, a second desuperheater for supplying water to said steam line, valves for controlling the supply of water to each of said desuperheaters, fluid pressure actuated means for controlling said valves, and adjustable means to cause one of said valves to be actuated by said fluid pressure actuated means before the other.

4. In a device of the character indicated, a first desuperheater for introducing water into a

steam line, a second desuperheater for introducing water into said steam line, a first source of water supply, a second source of water supply, means controlled by the temperature of steam in said steam line for controlling the operation of both said desuperheaters, and means controlled by the water pressure from one source for automatically supplying water from the other of said sources of water supply, upon a drop of the water pressure from said one of said sources below a predetermined limit.

5. In a device of the character indicated, a desuperheater to discharge water and steam into a steam line, water and steam conduits for conducting water and steam to said desuperheater, valves for controlling the passage of water and steam through said lines, fluid pressure actuated means for actuating said valves, control pipe means for conducting control fluid under pressure to said fluid pressure actuated means for actuating the same, and thermostatically actuated means for varying the pressure in said control pipe, for the purpose described.

6. In a device of the character indicated, a main steam line, a desuperheater therein, a water line and an atomizing steam line connected to said desuperheater, a valve in each of said lines, fluid pressure actuated means for operating said valves, a control line for conducting fluid under pressure to said fluid pressure actuated means for controlling said valves, a pair of bleed means in said control line and thermostatically actuated means controlled by the temperature in said main steam line for controlling

one of said bleed means to vary the pressure in said control line, for the purpose described.

7. In a device of the character indicated, a main steam pipe, a desuperheater therein, a water conduit for conducting water to said desuperheater, a valve in said conduit for stopping the flow of water to said desuperheater and means for opening said conduit to the atmosphere at a point between said valve and said desuperheater whereby steam from said main steam pipe will blow through said desuperheater and conduit and dislodge obstructions therein.

8. In a device of the character indicated, a desuperheater for spraying water and steam, a valve for controlling the pressure of water and a valve for controlling the pressure of steam and means for simultaneously controlling said valves for maintaining the water pressure substantially higher than the steam pressure.

9. In a device of the character indicated, a desuperheater for spraying water and steam, water and steam conduits for said desuperheater, valves in said conduits, means for actuating said valves, and thermostatic means for controlling said valve actuating means.

10. In a device of the character indicated, a desuperheater for spraying water and steam, water and steam conduits for said desuperheater, valves in said conduits, fluid pressure actuated means for controlling said valves, and thermostatic means for controlling said fluid pressure actuated means.

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