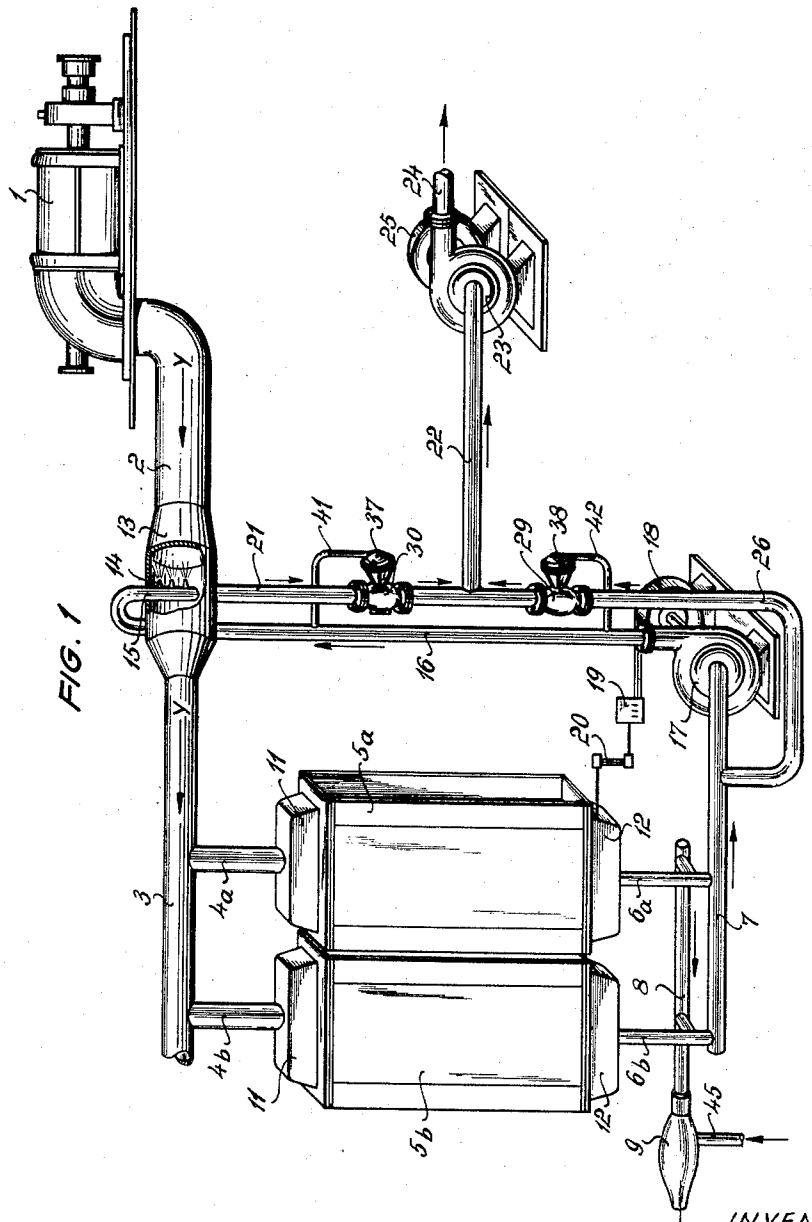
Sept. 6, 1960 F. SCHULENBERG ET AL 2,951,687

METHOD AND APPARATUS FOR CONDENSING EXHAUST STEAM FROM STEAM POWER PLANTS

Filed Aug. 16, 1957 4 Sheets-Sheet 1

FIG. 1



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METHOD AND APPARATUS FOR CONDENSING EXHAUST STEAM FROM STEAM POWER PLANTS

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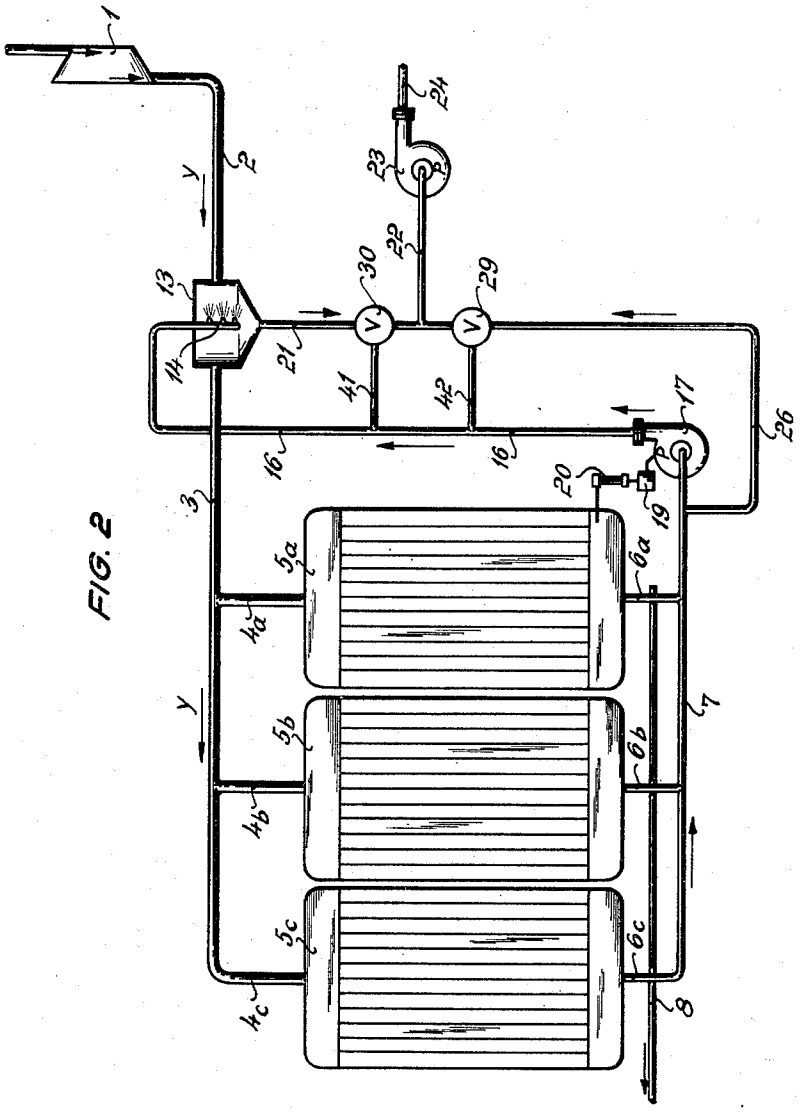


FIG. 2

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METHOD AND APPARATUS FOR CONDENSING EXHAUST STEAM FROM STEAM POWER PLANTS

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FIG. 4

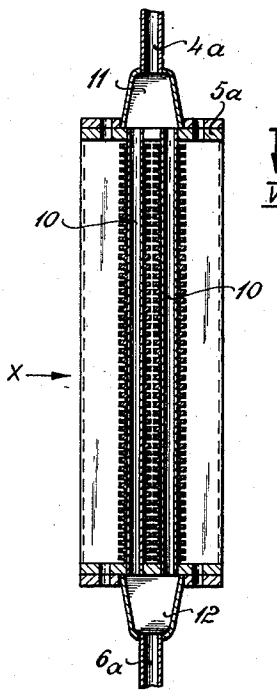


FIG. 3

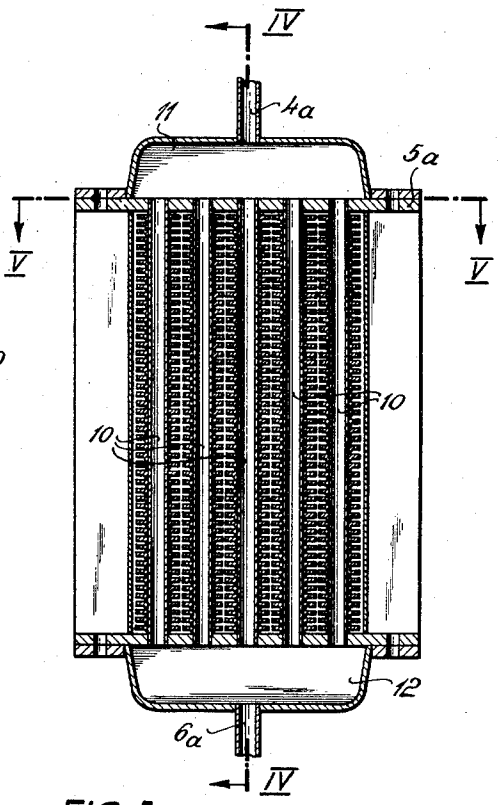
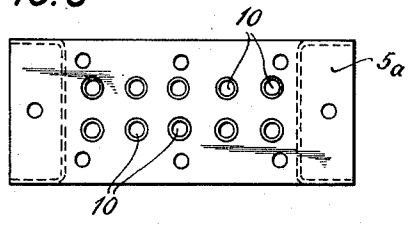


FIG. 5



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METHOD AND APPARATUS FOR CONDENSING EXHAUST STEAM FROM STEAM POWER PLANTS

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FIG. 7

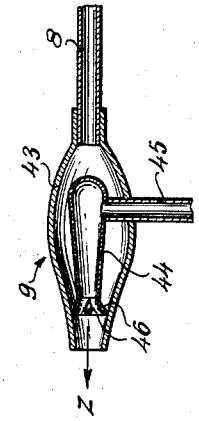


FIG. 9

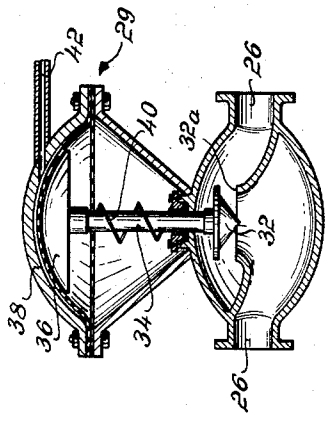


FIG. 6

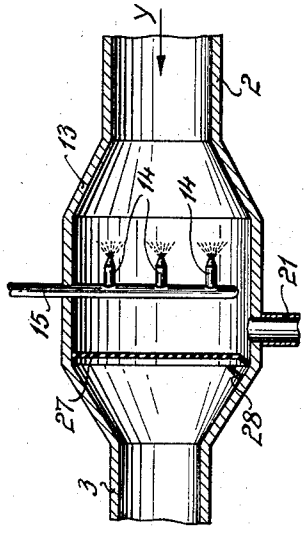
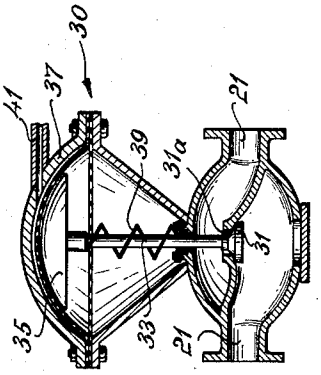


FIG. 8



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United States Patent Office 2,951,687
Patented Sept. 6, 1960

2,951,687

METHOD AND APPARATUS FOR CONDENSING EXHAUST STEAM FROM STEAM POWER PLANTS

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Filed Aug. 16, 1957, Ser. No. 678,718

Claims priority, application Germany Aug. 17, 1956

7 Claims. (Cl. 257—308)

This invention relates to a method of condensing exhaust steam from steam power plants in condenser elements provided with condenser tubes connected in parallel on the steam side and brushed on the outer side by a current of cooling air, and also to apparatus for carrying out said method.

In the case of such air-cooled condensers a relatively large number of condenser elements connected in parallel in relation to the waste steam to be condensed are also connected up with a common steam distribution conduit and a common collecting pipe for the condensation product. Each condenser element consists mostly of a relatively large number of parallel condenser tubes arranged at a distance apart, which tubes are connected in parallel to a common steam distribution chamber and a common collecting chamber for the product of condensation. The condenser tubes are mostly provided with radial ribs on their outer side and are usually of circular or elliptical cross section. These condenser tubes are exposed on their outer side to a current of cooling air drawn from the atmosphere and preferably kept in circulation by propeller blowers. It is, however, also customary to produce the cooling air current in flues of great height without using blowers or the like. The cooling air current in most cases is directed at right angles to the direction of the steam flow within the condenser elements. The condensation product forming in the condenser elements is conducted off through a collecting pipe serving several condenser elements and again used as boiler feed water, whereas the vacuum necessary for condensing the steam is produced by an air exhausting device connected up with condensation product collecting chambers of the condenser elements.

According to the temperature of the air sucked in from the atmosphere for cooling the condenser tubes, there are different temperatures available for condensing the steam. The condenser plants are usually so arranged that at a mean annual temperature the difference between the steam admission temperature in the condenser elements and the cooling air temperature is just sufficient to condense the whole quantity of steam fed to the condenser elements. The result is, however, that in the case of cooling air temperatures below the mean annual temperature, that is particularly in the cold season, the condensate in the condenser elements is cooled down to an unnecessarily and undesirably cold temperature. The cooling of the condensate below the condensation temperature corresponding to actually produced vacuum inevitably leads to undesirable loss of heat which must be additionally supplied to the condensate before it is fed into the boiler. On the other hand, such low air temperatures cause an increase in the vacuum, which is undesirable in most cases, in order not to endanger the steam turbines from which the waste steam conduit is fed. Furthermore, an excessively low cooling of the condensate below the condensation temperature corresponding to the vacuum actually prevailing means unnecessary expenditure of energy which detrimentally affects the economy of the steam condensation.

It is one of the objects of the present invention to overcome said disadvantages and to provide an efficient and novel method of condensing the exhaust steam from steam power plants in condenser elements provided with condenser tubes connected in parallel on the steam side of a steam generator and brushed on the outer side by a current of cooling air kept in constant movement, and an apparatus for carrying out that method; which method comprises producing a mixed condensate by injecting, when the cooling air temperature is considerably below the mean annual temperature, the condensate forming in the condenser elements in finely distributed state into the exhaust steam, fed to the condenser elements, within an injection condenser arranged in front of said condenser elements, and feeding the mixed condensate produced in the injection condenser into a boiler feed conduit as boiler feed water.

By the condensate injected into the exhaust steam current in the injection condenser in finely distributed state a partial condensation of the exhaust steam is effected before the steam reaches the condenser elements. The mixed condensate produced in the injection condenser has, due to the direct heat exchange with the exhaust steam, a higher temperature than the condensate obtained in the condenser elements exposed on the outside to the cooling air. This ensures that, even in the case of relatively low cooling air temperature and correspondingly low temperature of the condensate produced in the condenser elements, the condensate is again heated by direct exchange of heat with the exhaust steam fed to the condenser elements with simultaneous partial condensation of the exhaust steam, to such an extent that the feed water fed to the steam boiler possesses the most favorable temperature actually desired. This method also presents the advantage that a portion of the exhaust steam is already condensed in the injection condenser so that there is a corresponding reduction of the quantity of steam to be condensed in the air-cooled condenser elements.

Another object of the invention is to provide an apparatus for carrying out the method proposed by the invention, which apparatus comprises a plurality of condenser elements provided with condenser tubes connected in parallel on the steam side of a steam generator and brushed with a current of cooling air on the outer side, an exhaust steam conduit and a steam distribution conduit leading from the steam generator to the air-cooled condenser elements, an injection condenser connected up in said conduits, a plurality of nozzles arranged in said injection condenser and directed towards the exhaust steam current for producing a mixed condensate, a condensate collecting conduit and a condensate feeding conduit coordinated to said condenser elements, a condensate feed pump between said condensate collecting conduit and said feeding conduit for feeding the condensate formed in the condenser elements from said condensate collecting conduit to said nozzles, and a second pump for feeding the mixed condensate formed in said injection condenser into a boiler feed conduit.

To allow automatic regulation, it is advisable to provide an electrically driven pump for supplying the condensate from the condensate collecting conduit to the nozzles of the injection condenser, which pump is equipped with a relay switch which is actuated by a thermostat controlled by the temperature of the condensate. This thermostat can be connected either to the condensate collecting chamber of an air-cooled condenser element or to the condensate collecting conduit.

According to another feature of the invention the condensate collecting conduit can be connected directly to the boiler feed conduit, by-passing the injection condenser and the condensate feed pump preceding it. For this purpose it is advisable to connect the condensate

collecting conduit directly with the second pump, arranged following the injection condenser and feeding the boiler feed conduit, by means of a by-pass conduit equipped with at least one shut-off element, thereby cutting out the injection condenser and the condensate feed pump arranged in front thereof. If in such an arrangement the temperature of the condensate drops below a temperature determined by adjusting the thermostat, the condensate feed pump is automatically switched in and the condensate produced in the condenser elements fed to the injection condenser, whereas this pump is automatically switched out as soon as the condensate in the air-cooled condenser elements is no longer undercooled.

In a preferred form of construction a check valve is provided both in the by-pass conduit and in a mixed condensate discharge conduit connecting from the injection condenser to the second feed pump, the means for actuating the two check valves being so constructed that when one of the valves is opened the other valve is automatically closed. At the same time it is also possible to control the check valves according to the liquid pressure prevailing in the condensate feeding conduit leading to the injection condenser. For this purpose the check valves may be equipped with control cylinders which are connected to the conduit section between the injection condenser and the condensate feed pump connected up in front thereof, in such a manner that in the case of the condensate feed pump being automatically switched in by the thermostat, the check valve connected up in the mixed condensate discharge conduit of the injection condenser is opened by the pressure of the condensate feed to the injection condenser and at the same time the check valve in the by-pass conduit is closed. As soon as the thermostat switches on the condensate feed pump and the pressure in the condensate feeding conduit leading to the injection condenser drops, the valve in the by-pass conduit opens automatically, whereas the valve in the mixed condensate discharge conduit simultaneously closes.

Other objects and advantages of the invention will be apparent from the description set out below when taken in connection with the accompanying drawings. In these drawings, in which like characters of reference designate like parts throughout the several views thereof, and in which is shown a preferred embodiment of a steam condensation plant used in carrying out the method into effect.

Fig. 1 is a perspective view of a steam condensation plant;

Fig. 2 is a lay-out of the condensation plant illustrated in Fig. 1;

Fig. 3 is a longitudinal section of a condenser element shown in Figs. 1 and 2;

Fig. 4 is a section taken on line IV—IV of Fig. 3;

Fig. 5 is a section on line V—V of Fig. 3;

Fig. 6 is a longitudinal section, on a larger scale, of an injection condenser according to Figs. 1 and 2;

Fig. 7 is a longitudinal section, on a larger scale, of an air exhausting device according to Fig. 1;

Fig. 8 is a longitudinal section of a check valve provided between the injection condenser and a mixed condensate feed pump, and

Fig. 9 is a longitudinal section of a check valve provided in a by-pass conduit.

In Figs. 1 and 2 a steam turbine **1** has an exhaust steam conduit **2** which is connected to a steam distribution conduit **3**. A relatively large number of condenser elements **5***a*, **5***b*, **5***c* arranged in parallel as regards the steam to be condensed, is connected up to the steam distribution conduit **3** by connection pieces **4***a*, **4***b*, **4***c*. The number of the condenser elements **5***a*, **5***b*, **5***c* connected to the steam distribution conduit **3** is in most cases considerable greater than in the example illustrated in Figs. 1 and 2. It is also possible to connect several steam distribution conduits **3** arranged at a distance apart, to the exhaust steam conduit **2** by means of branch pipes. In addition it is likewise possible to arrange the condenser elements **5***a*, **5***b*, **5***c* in a double row and to connect their ends facing each other to a steam distribution conduit extending in the longitudinal direction of the double row. The condenser elements **5***a*, **5***b*, **5***c* can be arranged substantially horizontally. The condenser elements of the two rows connected to a common steam distribution conduit are preferably, however, arranged inclined to each other in roof-shape, in such a manner that they form in cross section a substantially equilateral triangle.

On the side opposite the connection pieces **4***a*, **4***b*, **4***c* the condenser elements **5***a*, **5***b*, **5***c* are connected by connection pieces **6***a*, **6***b*, **6***c* to a common condensate collecting conduit **7** and an air exhaust conduit **8** to which a vacuum pump **9** of conventional type is connected.

When the condenser elements **5***a*, **5***b*, **5***c* assembled in a double row are arranged in roof-shape a condensate collecting conduit **7** and an air exhaust conduit **8** are arranged on each side of the double row. Below the condenser elements **5***a*, **5***b*, **5***c* a plurality of propeller blowers of relatively large diameter is arranged, preferably rotating in a horizontal plane; these blowers are not shown in the drawings. When the condenser elements **5***a*, **5***b*, **5***c* are arranged in roof-shape the propeller blowers are located substantially in the base of the substantially equilateral triangle formed in cross section by the condenser elements **5***a*, **5***b*, **5***c*. The propeller blowers may be equipped with independently adjustable individual drives of conventional type, in such a manner that the number of revolutions of the individual propeller blowers can be adjusted independently of each other. Furthermore, it is possible to provide special throttling devices, for example roller blinds, which enable the cooling air current to be regulated within certain limits.

The propeller blowers, provided below the condenser elements **5***a*, **5***b*, **5***c* in a number depending upon the number of condenser elements actually present, suck air out of the atmosphere and force it upwards substantially at right-angles to their plane of rotation through the condenser elements **5***a*, **5***b*, **5***c* arranged above the blowers.

As can be seen from Figs. 3 to 5, each of the condenser elements **5***a*, **5***b*, **5***c* has a relatively large number of parallel ribbed tubes **10** arranged at a distance apart and of circular cross section, which tubes, as can be seen from Figs. 4 and 5, are arranged in two rows one behind the other at a distance apart in the direction of flow *x*. Instead of using tubes of circular cross section it is evident that tubes of elliptical or oval cross section might be employed. All the ribbed tubes **10** of each condenser element are connected at one end to a common steam distribution chamber **11** and at the other end to a common condensate collecting chamber **12**. The steam distribution chambers **11** communicate with the steam distribution conduit **3** through the intermediary of the connection pieces **4***a*, **4***b*, **4***c*, whereas the condensate collecting chambers **12** are connected with the condensate collecting conduit **7** and the air exhaust conduit **8** by means of the connection pieces **6***a*, **6***b*, **6***c*. The steam fed by the steam distribution conduit **3** is condensed in the condenser tubes **10** of the condenser elements **5***a*, **5***b*, **5***c* by cooling air striking against the outer side of the tubes **10** in the direction *x*.

As can be seen from Figs. 1 and 2 an injection condenser **13**, illustrated on a larger scale in Fig. 6, is introduced in the conduits **2** and **3** leading to the condenser elements **5***a*, **5***b*, **5***c*. This injection condenser **13** has a substantially barrel-shaped housing to which the exhaust steam is fed in the direction of flow *y*. Several nozzles **14** arranged side by side and at a distance apart in vertical direction, are distributed over the cross section of said barrel-shaped housing, which nozzles are connected to a condensate feeding conduit **16** by a distribution piece **15**. The condensate feeding conduit **16** is in

turn connected to a condensate feed pump 17 constructed as a centrifugal pump, which is connected to the condensate collecting conduit 7. The feed pump 17 is driven by an electric motor 18. The electric motor 18 is provided with a relay switch 19 of conventional type, only shown diagrammatically in Figs. 1 and 2, which in turn is actuated by a thermostat 20, likewise shown only diagrammatically. In the form of construction illustrated by way of example in Figs. 1 and 2, the thermostat 20 is connected to the condensate collecting chamber 12 of one of the condenser elements 5*a*, 5*b*, 5*c*. It is, however, also possible to connect the thermostat 20 to the condensate collecting conduit 7.

The thermostat 20 is set to a certain condensate temperature corresponding to the mean annual temperature. The thermostat 20, the relay switch 19 and the electric motor 18 are so electrically connected in a circuit arrangement that, as soon as the condensate temperature drops below the temperature set on the thermostat 20, the electric motor 18 and with it the condensate feed pump 17 are switched on through the intermediary of the relay switch 19. The pump 17 feeds the condensate produced in the condenser elements 5*a*, 5*b*, 5*c* from the condensate collecting conduit 7 through the conduit 16 and the distribution pieces 15 to the injection nozzles 14, by means of which the condensate in finely distributed state is injected into the exhaust steam current in counter direction to the direction *y* in which the exhaust steam flows. The injection of the condensate taking place in finely distributed state within the injection condenser 13 results in the condensation of a considerable portion of the exhaust steam fed in the direction *y* and in a heat exchange between the exhaust steam having a temperature of, for example, +40° C. and the condensate having a temperature of, for example, only +5° C. In the flow direction *y* a shutter-like wall 27 extending across the entire cross section of the flow is provided behind the nozzles of the injection condenser 13, which wall is intended to separate any particles of liquid which may be present in the uncondensed exhaust steam. In addition, a baffle plate 28 is arranged behind the shutter wall for the same purpose.

The mixed condensate produced in the injection condenser 13 passes through a discharge conduit 21 into a collecting conduit 22 from which it is conducted by a feed pump 23 into a boiler feed conduit 24. The feed pump 23 is also constructed as a centrifugal pump and driven by an electric motor 25.

The collecting conduit 22 is also connected directly to the condensate collecting conduit 7, that is by-passing the feed pump 17 and the injection condenser 13. As long as the temperature of the condensate is above the temperature to which the thermostat 20 is set, that is the feed pump 17 is inoperative, the condensate produced in the condenser elements 5*a*, 5*b*, 5*c* flows out of the condensate collecting conduit 7 directly through a by-pass conduit 26 into the collecting conduit 22 whence it is fed into the boiler feed conduit 24 by the feed pump 23. Check valves 29 and 30 are provided in the by-pass conduit 26 and in the mixed condensate discharge conduit connection 21 from the injection condenser 13 to the second feed pump 23, respectively, which valves are controlled automatically according to the liquid pressure prevailing in the condensate feeding conduit 16 in such a manner that when the pump 17 is switched in, the valve 29 is closed and the valve 30 opened, whereas when the pump 17 is inoperative, the valve 30 is closed and the valve 29 open.

The check valves 30 and 29 are illustrated on a larger scale in Figs. 8 and 9, respectively. Said valves comprise respectively valve seats 31*a* and 32*a* and valve bodies 31 and 32 which are connected by rods 33 and 34, respectively, with plate pistons 35 and 36, respectively, that are guided in calotte-shaped control cylinders 37 and 38, respectively. By means of a pressure spring 39 or 40 coaxially surrounding the rods 33 and 34, respectively, the pistons 35 and 36 are held in their extreme upper positions shown in Figs. 8 and 9. In this position the valve seat 31*a*, in the case of the valve 30, is closed by the valve body 31, whereas in the valve 29 the valve body 32 is raised from its seat 32*a*.

The control cylinders 37 and 38 of the valves 30 and 29 are connected to the condensate feeding conduit 16 by control conduits 41 and 42, respectively. If the condensate feed pump 17 is switched in through the intermediary of the thermostat 20 and the relay switch 19, the pistons 35 and 36 are shifted against the force of the springs 39 and 40 by the liquid pressure generated in the conduit 16 via the control conduits 41 and 42 in such a manner that the valve body 31 of the valve 30 is lifted off its seat 31*a* whereas the valve body 32 of the valve 29 is pressed on to its seat 32*a*. If, when the feed pump 17 has been switched off, the pressure in the condensate feeding conduit 16 drops, the valve 29 is opened by the force of the spring 40, whereas the valve 30 is closed. It is evident that the valves 29 and 30 can also be controlled in some other manner than that shown in the form of construction illustrated in Figs. 8 and 9.

The vacuum pump 9 used in the form of construction illustrated in the drawings is shown on a larger scale in Fig. 7. As this figure shows, the air exhaust conduit 8 is connected to a housing 43 of tear-shaped cross section within which a steam-fed ejector 44 is arranged. Steam is fed to the ejector 44 through a connecting conduit 45 and is ejected in the direction *z*. At the same time air from the condensate collecting chambers 12 of the condenser elements 5*a*, 5*b*, 5*c* is sucked out of the housing 43 surrounding the ejector 44 like a jacket and from the air exhaust conduit 8 connected therewith, through a number of slots 46. It is evident that some other known type of air exhausting device may be employed instead of that shown in Fig. 7.

In many cases it will be possible to select an arrangement wherein only a portion of the condensate produced in the condenser elements 5*a*, 5*b*, 5*c* is fed to the injection condenser 13 by the feed pump 17 when the cooling air temperature drops below the mean annual temperature, whereas the remaining portion of the condensate is fed directly to the boiler feed conduit 24 through the by-pass conduit 26. The setting of the thermostat 20 is preferably so chosen that the feed pump 17 is only switched on when the cooling air temperature has dropped to a considerable extent, for example by 5° C. to 6° C., below the mean annual temperature.

While the method herein described, and the apparatus used for carrying out this method into effect constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

We claim:

1. A steam condensation plant, comprising in combination, a steam exhaust conduit; varying main condenser means having a varying cooling action and having an inlet and an outlet, said inlet being connected to said steam exhaust conduit; equalizing injection condenser means in said steam exhaust conduit upstream of said varying main condenser means; condensate feeding means for feeding condensate from said outlet of said varying main condenser means into said equalizing injection condenser means; condensate discharge means connected only to said equalizing injection condenser means for discharging the condensate therefrom; a feed conduit connected to said condensate discharge means; by-pass means communicating with said outlet of said varying main condenser means and said feed conduit; and control means for controlling the flow of condensate through said condensate feeding means and said by-

pass means in such a manner that when the temperature of the condensate in the region of said outlet of said varying main condenser means surpasses a given temperature said condensate will flow through said by-pass directly into said feed conduit and so that when the temperature of said condensate drops below said given temperature said condensate will flow through said condensate feeding means into said equalizing injection condenser means to be heated therein by the steam of the exhaust conduit, whereby the temperature of the condensate leaving through said feed conduit can be kept substantially constant regardless of variations in the cooling action of said main condenser means.

2. A steam condensation plant, comprising in combination, a steam exhaust conduit; air cooled surface condenser means having a varying cooling action and having an inlet and an outlet spaced from each other, said inlet being connected to said steam exhaust conduit; equalizing injection condenser means in said steam exhaust conduit upstream of said air cooled surface condenser means; condensate feeding means for feeding condensate from said outlet of said air cooled surface condenser means into said equalizing injection means; condensate discharge means connected only to said equalizing injection condenser means for discharging the condensate therefrom; a feed conduit connected to said condensate discharge means; by-pass means communicating with said outlet end of said air cooled surface condenser means and said feed conduit; and control means for controlling the flow of condensate through said condensate feeding means and said by-pass means in such a manner that when the temperature of the condensate in the region of said outlet of said air cooled surface condenser means surpasses a given temperature said condensate will flow through said by-pass directly into said feed conduit and so that when the temperature of said condensate drops below said given temperature said condensate will flow through said condensate feeding means into said equalizing injection condenser means to be heated therein by the steam of the exhaust conduit, whereby the temperature of the condensate leaving through said feed conduit can be kept substantially constant regardless of variations in the temperature of the air acting on said surface condenser means.

3. A steam condensation plant, comprising in combination, a steam exhaust conduit; air cooled surface condenser means having a varying cooling action and having an inlet and an outlet spaced from each other, said inlet being connected to said steam exhaust conduit; equalizing injection condenser means in said steam exhaust conduit upstream of said air cooled surface condenser means; condensate feeding means for feeding condensate from said outlet of said air cooled surface condenser means into said equalizing injection condenser means; condensate discharge means connected only to said equalizing injection condenser means for discharging the condensate therefrom; a feed conduit connected to said condensate discharge means; by-pass means communicating with said outlet of said air cooled surface condenser means and said feed conduit; and control means for controlling the flow of condensate through said condensate feeding means and said by-pass means in such a manner that when the temperature of the condensate in the region of said outlet of said air cooled surface condenser means surpasses a given temperature said condensate will flow through said by-pass directly into said feed conduit and so that when the temperature of said condensate drops below said given temperature said condensate will flow through said condensate feeding means into said equalizing injection condenser means to be heated therein by the steam of the exhaust conduit, said control means including pump means in said condensate feeding means for feeding the condensate from said outlet of said surface condenser means into said injection condenser means, and means for starting said pump means when the temperature of the condensate in the region of said outlet of said surface condenser means falls below a given temperature and for stopping said pump means when said temperature rises above said given temperature, whereby the temperature of the condensate leaving through said feed conduit can be kept substantially constant regardless of variations in the temperature of the air acting on said surface condenser means.

4. A steam condensation plant, comprising in combination, a steam exhaust conduit; air cooled surface condenser means having a varying cooling action and having an inlet and an outlet spaced from each other, said inlet being connected to said steam exhaust conduit; equalizing injection condenser means in said steam exhaust conduit upstream of said air cooled surface condenser means; condensate feeding means for feeding condensate from said outlet of said air cooled surface condenser means into said equalizing injection condenser means; condensate discharge means connected only to said equalizing injection condenser means for discharging the condensate therefrom; a feed conduit connected to said condensate discharge means; by-pass means communicating with said outlet end of said air cooled surface condenser means and said feed conduit; and control means for controlling the flow of condensate through said condensate feeding means and said by-pass means in such a manner that when the temperature of the condensate in the region of said outlet of said air cooled surface condenser means surpasses a given temperature said condensate will flow through said by-pass directly into said feed conduit and so that when the temperature of said condensate drops below said given temperature said condensate will flow through said condensate feeding means into said equalizing injection condenser means to be heated therein by the steam of the exhaust conduit, said control means including pump means in said condensate feeding means for feeding the condensate from said outlet of said surface condenser means into said injection condenser means, means for starting said pump means when the temperature of the condensate in the region of said outlet of said surface condenser means falls below a given temperature and for stopping said pump means when said temperature rises above said given temperature, and valve means coordinated with said pump means for permitting flow of condensate through said by-pass means and stopping flow of condensate through said discharge means while said pump means is stopped and permitting flow of said condensate through said discharge means and stopping flow through said by-pass means while said pump means is running.

5. A steam condensation plant, comprising in combination, a steam exhaust conduit; air cooled surface condenser means having a varying cooling action and having an inlet and an outlet spaced from each other, said inlet being connected to said steam exhaust conduit; equalizing injection condenser means in said steam exhaust conduit upstream of said air cooled surface condenser means; condensate feeding means for feeding condensate from said outlet of said air cooled surface condenser means into said equalizing injection condenser means; condensate discharge means connected only to said equalizing injection condenser means for discharging the condensate therefrom; a feed conduit connected to said condensate discharge means; by-pass means communicating with said outlet of said air cooled surface condenser means and said feed conduit; and control means for controlling the flow of condensate through said condensate feeding means and said by-pass means in such a manner that when the temperature of the condensate in the region of said outlet of said air cooled surface condenser means surpasses a given temperature said condensate will flow through said by-pass directly into said feed conduit so that when the temperature of said condensate drops below said given temperature said condensate will

flow through said condensate feeding means into said equalizing injection condenser means to be heated therein by the steam of the exhaust conduit, said control means including pump means in said condensate feeding means for feeding the condensate from said outlet of said surface condenser means into said injection condenser means, means for starting said pump means when the temperature of the condensate in the region of said outlet of said surface condenser means falls below a given temperature and for stopping said pump means when said temperature rises above said given temperature, a first valve movable between open and closed positions and located in said by-pass means, a second valve movable between open and closed positions and located in said discharge means, and means operatively connected to said valves, respectively, for moving said first valve from said open to said closed position thereof and said second valve from said closed to said open position thereof when said pump means is running and moving said first valve from said closed to said open position thereof and said second valve from said open to said closed position thereof when that pump means is stopped, whereby the temperature of the condensate leaving through said feed conduit can be kept substantially constant regardless of variations in the temperature of the air acting on said surface condenser means.

6. A steam condensation plant, comprising in combination, a steam exhaust conduit; air cooled surface condenser means having a varying cooling action and having an inlet and an outlet spaced from each other, said inlet being connected to said steam exhaust conduit; equalizing injection condenser means in said steam exhaust conduit upstream of said air cooled surface condenser means; condensate feeding means for feeding condensate from said outlet of said air cooled surface condenser means into said equalizing injection condenser means; condensate discharge means connected only to said equalizing injection condenser means for discharging the condensate therefrom; a feed conduit communicating with said condensate discharge means; by-pass means communicating with said outlet of said air cooled surface condenser means and said feed conduit; and control means for controlling the flow of condensate through said condensate feeding means and said by-pass means in such a manner that when the temperature of the condensate in the region of said outlet of said air cooled surface condenser means surpasses a given temperature said condensate will flow through said by-pass directly into said feed conduit and so that when the temperature of said condensate drops below said given temperature said condensate will flow through said condensate feeding means into said equalizing injection condenser means to be heated therein by the steam of the exhaust conduit, said control means including pump means in said condensate feeding means for feeding the condensate from said outlet of said surface condenser means into said injection condenser means, means for starting said pump means when the temperature of the condensate in the region of said outlet of said surface condenser means fall below a given temperature and for stopping said pump means when said temperature rises above said given temperature, a first valve movable between open and closed positions and located in said by-pass means, a second valve movable between open and closed positions and located in said discharge means, and membrane means subjected to pressure in said feeding conduit between said pump means and said injection condenser means operatively connected to said valves, respectively, for moving said first valve from said open to said closed position thereof and said second valve from said closed to said open position thereof when said pump means is running and moving said first valve from said closed to said open position thereof and said second valve from said open to said closed position thereof when that pump means is stopped, whereby the temperature of the condensate leaving through said feed conduit can be kept substantially constant regardless of variations in the temperature of the air acting on said surface condenser means.

7. A method for condensing the exhaust steam of a steam power station and for handling the condensate after condensation of the steam, comprising the steps of condensing the exhaust steam by air cooling, feeding the thus obtained condensate directly into the steam boiler when the temperature of the air for condensing the exhaust steam is above a given temperature; and mixing the condensate obtained by air cooling the exhaust steam, in finely divided condition with uncondensed exhaust steam and feeding the mixed condensate thus obtained then into the steam boiler when the temperature of the air used for condensing the steam by air cooling is below a given temperature.

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