Nov. 6, 1962 V. JUZI 3,062,553

METHOD AND MEANS FOR PRODUCING SEALING VAPOR

Filed April 19, 1960 2 Sheets-Sheet 1

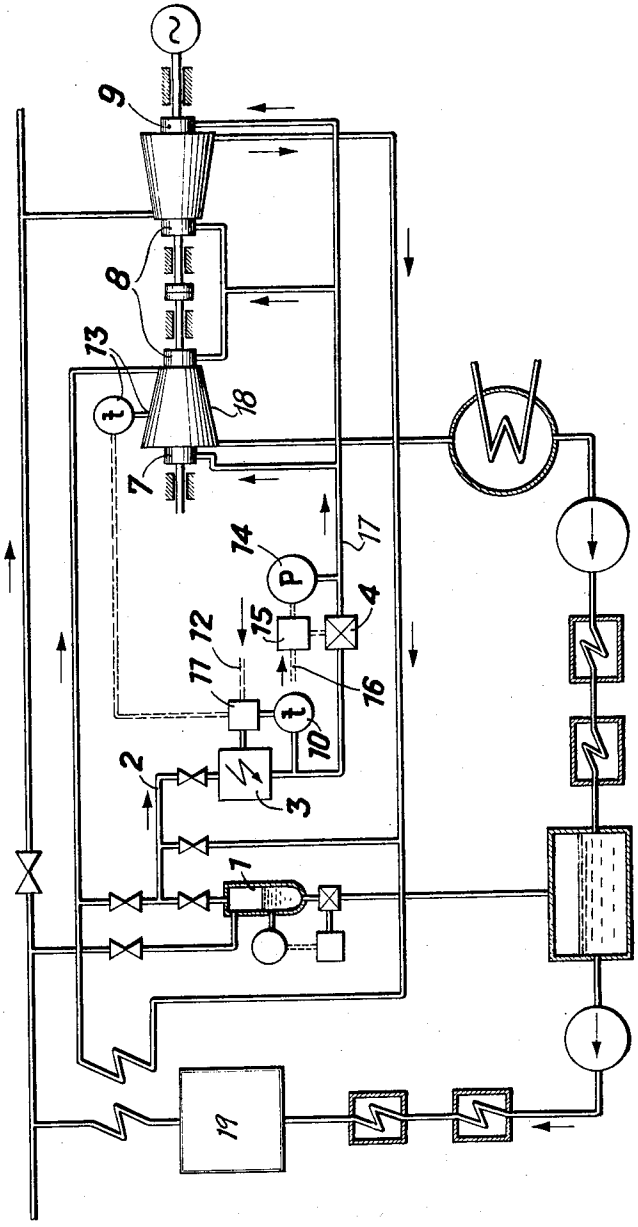


Fig. 1.

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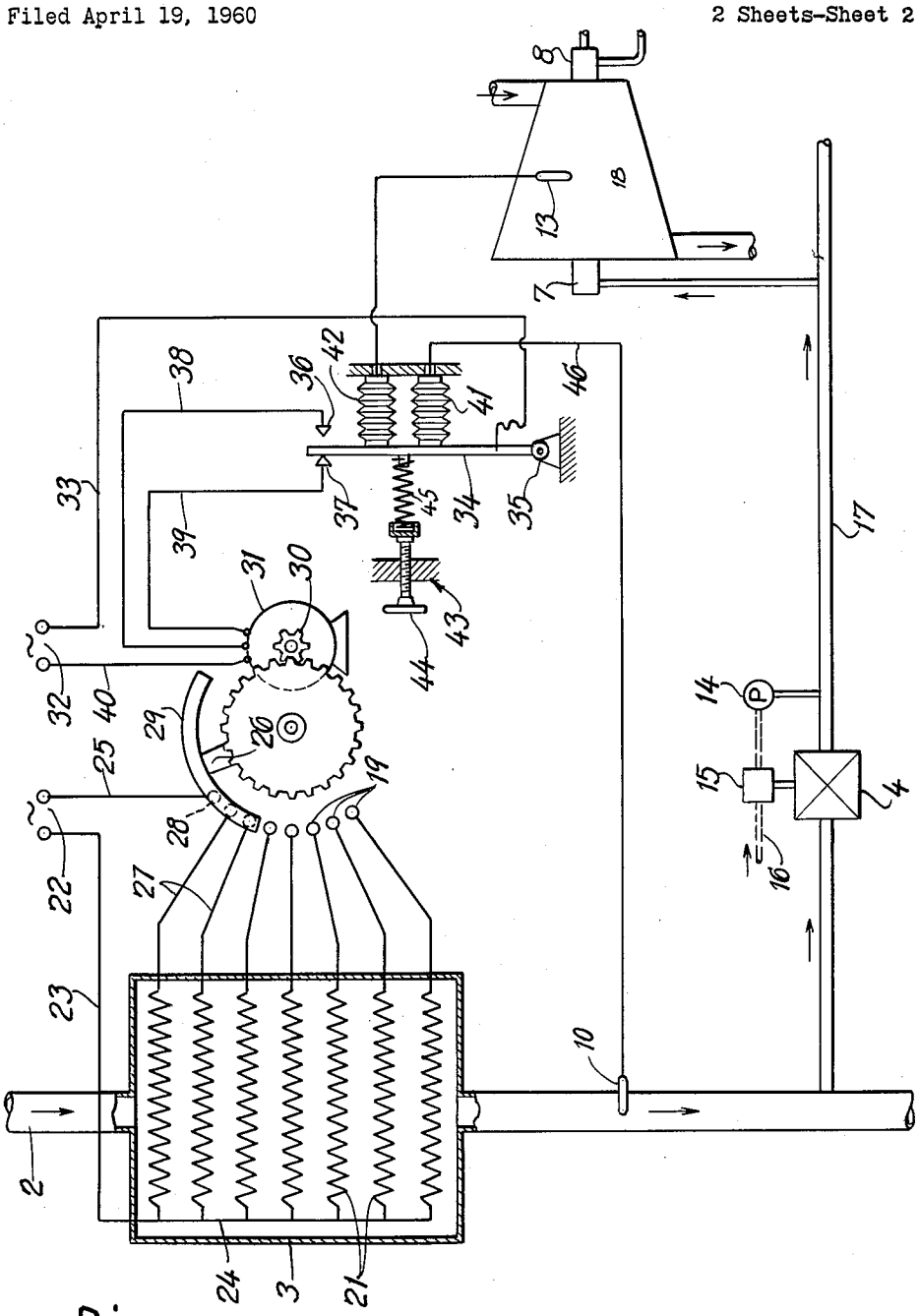


Fig. 2.

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METHOD AND MEANS FOR PRODUCING SEALING VAPOR

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8 Claims. (Cl. 277—1)

The present invention relates to a method for producing sealing vapor for packings of devices forming part of a vapor plant and to an arrangement for performing the method.

It is known to use steam taken from a suitable part of a steam plant, for example, from the live steam pipe or from a conduit conducting medium pressure steam, as sealing steam for packings of devices forming part of the plant. Such arrangements are particularly used in steam power plants including a turbine having stuffing boxes and a condenser receiving exhaust steam from the turbine whereby sealing steam introduced into the stuffing boxes prevents passage of air through the stuffing boxes into the condenser. When the plant is at a standstill there is no sealing steam available.

It is an object of the present invention to provide a method and means for producing sealing vapor, particularly for the stuffing boxes of a turbine in a steam power plant for preventing entry of gas into the turbine also during standstills of the plant. In the method and apparatus according to the invention, saturated steam is taken from a steam accumulator, is superheated and thereupon conducted to the packings which are sealed by the steam. The pressure in the steam accumulator is so high that it does not drop below a predetermined value even if steam is taken from the accumulator during relatively long periods of time.

It is preferred to control the temperature of the superheated sealing steam so that a predetermined superheat temperature is maintained. The set point of this superheat control may be adjusted according to an operating condition in the steam plant, for example, according to the temperature of the turbine casing.

It is also of advantage to control the pressure of the sealing steam to maintain a predetermined pressure. As is the case with the superheat temperature of the sealing steam, the pressure of the sealing steam may be adjusted according to an operating condition of the plant, for example, in response to the position of a starting device which supervises the starting operation of the plant.

The apparatus for performing the method according to the invention includes an accumulator of saturated steam which is connected by means of a conduit to the individual packings requiring sealing steam. A superheater is interposed in the steam conduit and heated by energy supplied from the outside of the plant. There is also a throttling device interposed in the steam conduit for reducing the pressure of the sealing steam to a value producing most favorable sealing conditions. The superheater is preferably electrically heated. The throttling device may be placed upstream or downstream of the superheater.

It is of particular advantage to use as steam accumulator a vessel having sufficient capacity and operating at a suitable pressure level and serving also other purposes in the steam plant, for example a water separator, a boiler drum or a feedwater accumulator containing a supply of feedwater for starting the plant.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments

thereof when read in connection with the accompanying drawing, in which:

FIG. 1 is a diagrammatic illustration of a steam power plant including means for producing sealing steam according to the invention.

FIG. 2 is a more elaborate diagrammatic illustration of a portion of the plant shown in FIG. 1.

FIG. 1 shows a steam power plant including a steam generator 19, a turbine 18 having stuffing boxes 7, 8, 9 for the turbine shaft, which stuffing boxes are sealed by sealing steam also when there is no steam available from the steam generator.

In the embodiment of the invention illustrated in FIG. 1, saturated sealing steam is taken from a by-pass water separator 1 forming part of the steam generating apparatus of the plant and being capable of accumulating sufficient steam to satisfy the sealing requirements during standstill of the plant. The sealing steam is conducted from the steam space of the separator 1 through a conduit 2 into a preferably electrically heated auxiliary superheater 3. The superheated sealing steam flows through a conduit 17 including a throttling device 4 to the turbine stuffing boxes 7, 8 and 9. The temperature of the steam leaving the superheater 3 is measured by a temperature sensitive device 10 and compared in a regulator 11 with a set point value represented by a signal conducted to the regulator 11 through a conduit 12. The regulator 11 controls the heat supply to the superheater 3 according to the result of the aforedescribed comparison. The conduit 12 may be connected to a central switchboard of the plant and the signal conducted through the conduit 12 may be produced by manipulating a hand wheel. In lieu of or in addition to the control of the regulator 11 by signals arriving through the conduit 12, the regulator may be controlled by means of signals produced by a device 13 which is responsive to the temperature of the casing of a turbine 18. By increasing the heat supply to the auxiliary superheater 3 upon decreasing temperature of the turbine casing, condensation of sealing steam in the stuffing boxes of the turbine is reduced or prevented.

The pressure of the sealing vapor is maintained constant in the conventional manner by means of the throttling device 4 which is actuated by a regulator 15 which operates according to the pressure sensed by a device 14 in the conduit 17 downstream of the throttling device 4. The set point of the regulator 15 may be adjusted by suitable means, not shown, located, for example, at a central switchboard or by means which are responsive to operating conditions at certain parts of the plant and produce signals which are transmitted to the regulator 15 through a conduit 16. Whereas the temperature sensitive device 10 is shown upstream of the throttling device 4, it may be advisable in certain cases to arrange the temperature sensitive device 10 downstream of the throttling device 4 so that an undesired temperature drop effected by the throttling device 4 can be prevented. While in the illustrated plant sealing steam is used for sealing stuffing boxes of turbines, sealing steam may also be used for stuffing boxes of valves and other devices forming part of the steam plant.

In the arrangement shown in FIG. 2, the superheater 3 is heated by a plurality of electric heating elements 21 arranged in parallel relation with respect to the current flow therethrough. The heating elements 21 are supplied by electric energy from a source 22 to which the heating elements are connected by means of a conductor 23 and a bus bar 24. The free ends 27 of the heating elements are connected to the source 22 by means of a conductor 25 and a switch 26. The switch 26 includes a metallic bar 29 which is in sliding contact with a terminal 28 at the end of the conductor 25 and with terminals 19 connected to the ends 27. The bar 29 can be

moved through gears 30 by an electric motor 31 which may selectively rotate in opposite directions. The motor 31 receives power from a source 32 which is connected by a conductor 33 to a switch lever 34. The latter swings on a fulcrum 35. The lever 34 connects the conductor 33 either through a contact 36 and a conductor 38 to the motor 31, or through a contact 37 and a conductor 39 to the motor 31 whereby the motor rotates in one or the opposite direction. The terminal of the motor not connectable to the conductor 33 is connected to the source 32 by a conductor 40.

The lever 34 is actuated by bellows 41 and 42 counteracting a set point adjustment device 43. The set point is adjusted by manipulating a hand wheel 44 for adjusting the tension of a spring 45 which presses the lever 34 in a direction opposite to the pressure exerted by the bellows 41 and 42. The pressure in the latter is produced in the conventional manner by the pressure of the vapor of a suitable substance. The bellows 41 is connected through a conduit 46 to the temperature sensitive device 10, which is in the form of a thermometer bulb, which is exposed to the superheated steam leaving the superheater 3. The interior of the bellows 42 is connected by a conduit 47 to a bulb forming part of the device 13 which is exposed to the temperature of the casing of the turbine 18. The conductors 38 and 39 are so connected to the motor 31 that the latter rotates the switch 26 in counterclockwise direction for increasing the heat supply to the superheater upon a decrease of the temperature of the superheated steam leaving the superheater and upon a decrease of the temperature of the turbine casing. The same effect is obtained by compressing the spring 45 by rotating the set point adjusting wheel 44. For increasing the temperature of the sealing steam, current is supplied to the motor 31 from the source 32 through the conductor 33, the lever 34, the contact 36 and the conductor 38. For reducing the temperature of the sealing steam, the lever 34 is removed from the contact 36 and the contact 37 is closed. When the sealing steam has the desired temperature, the lever 34 is between the contacts 36 and 37 and no current is supplied to the motor 31.

I claim:

1. Method of supplying sealing steam to the steam-sealed packings of apparatus forming part of a steam plant including a steam generator, the method including the steps of accumulating saturated steam produced in said generator during normal operation of the plant, of conducting the accumulated steam as sealing steam to the packings during standstill of the plant when no steam is generated, and of superheating the sealing steam during conduction to the packings during standstill of the plant by a source of heat different from the source of heat by which said steam generator is heated.

2. Method as defined in claim 1 wherein the steam is accumulated at a pressure higher than the pressure required for sealing the packings, and the pressure of the superheated steam is reduced prior to entry of the superheated steam into the packings to the pressure required for sealing the packings.

3. Method according to claim 2 wherein the pressure of the superheated steam is reduced in response to the pressure of the superheated steam entering the packings for maintaining a predetermined pressure of the superheated steam entering the packings.

4. Method as defined in claim 1 including controlling said superheating step in response to the temperature of the superheated sealing steam for maintaining a predetermined temperature of the steam entering the packings.

5. In a steam plant, a steam generator, a steam accumulator operatively connected to said generator for accumulating saturated steam while the steam generator is in operation, an apparatus including steam-sealed packings, a conduit interconnecting said steam accumulator and said packings for conducting sealing steam from the former to the latter during periods of time when said steam generator is shut down and no steam is produced therein, an auxiliary superheater interposed in said conduit, means for heating said auxiliary superheater separately from said steam generator for superheating the sealing steam passing through said conduit from said accumulator to said packings during periods of time when the plant is standing still, and throttling means interposed in said conduit for reducing the pressure of the sealing steam drawn from the accumulator to a pressure suitable for sealing said packings.

6. In a steam plant as defined in claim 5, and wherein said auxiliary superheater is provided with electric heating means affording superheating of the steam passing from said accumulator to said packings during periods of time when said steam generator is shut down.

7. In a steam plant as defined in claim 5, and wherein said means for heating said auxiliary superheater includes control means operatively connected to a part of said apparatus and responsive to the temperature of said part for controlling the temperature of the superheated sealing steam supplied to said packings in response to the temperature of said part during standstill of the plant.

8. Method according to claim 4 including the step of controlling the set point of the superheating control in dependence on the operating temperature of a part of the steam plant.

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