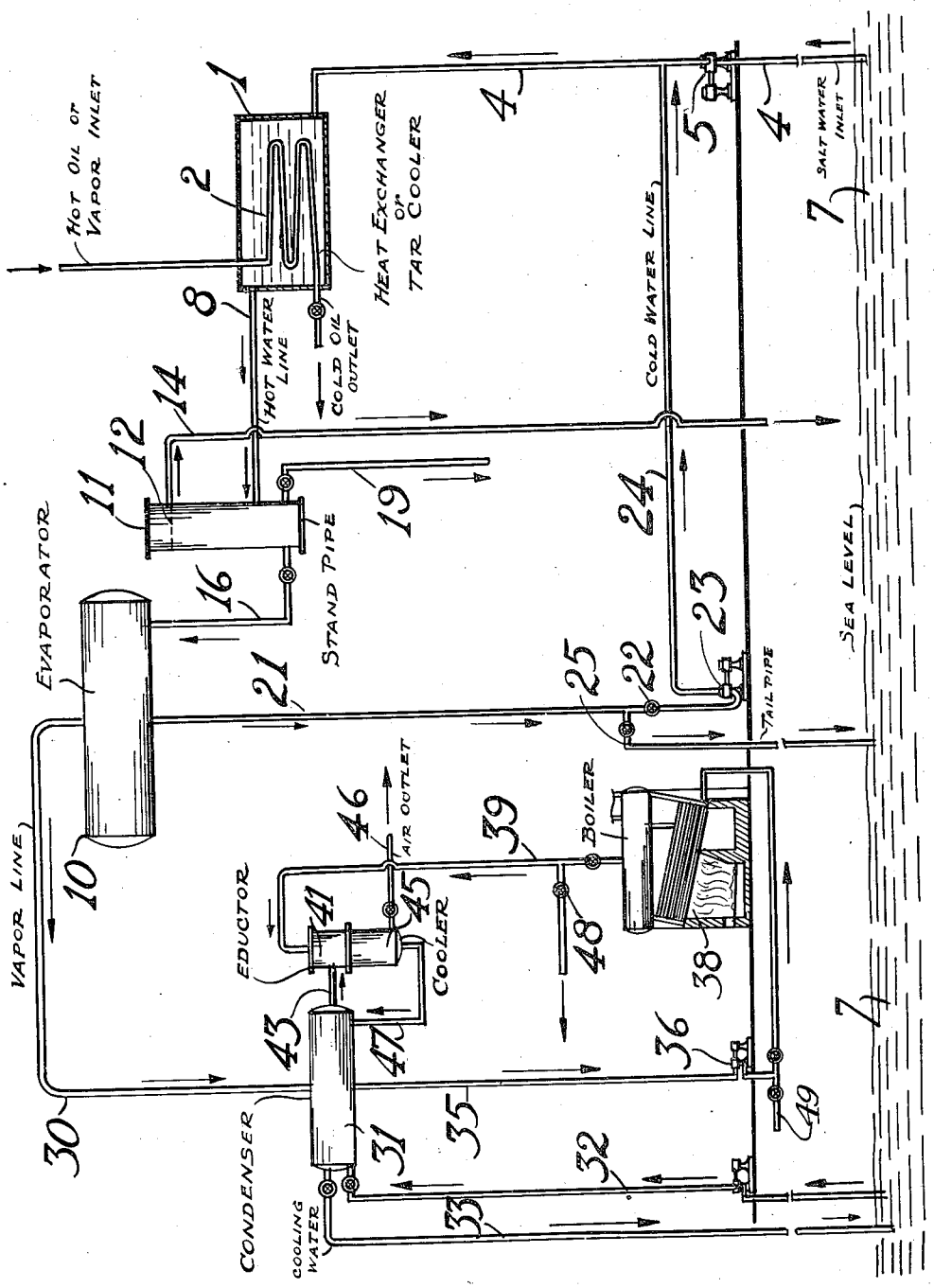
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SYSTEM OF PRODUCING STEAM AND WATER

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## SYSTEM OF PRODUCING STEAM AND WATER

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2 Claims. (Cl. 202—52)

This invention relates to the production of steam and water for refinery purposes.

The invention will be fully understood from the following description taken in connection with the accompanying drawing, in which latter the figure is a diagrammatic representation of a preferred form of apparatus for carrying out the invention.

Referring particularly to the drawing, reference numeral 1 designates a condenser box, tar cooler or the like containing a coil 2 through which hot oil or vapor from a petroleum oil refining operation is passed. The condenser box 1 may be a plurality of heat exchangers used in cooling oil or vapor in the operation of refining petroleum oil. The hot oil or vapor is cooled by means of water such as salt water, which may be passed into the heat exchanger 1 from a line 4 containing a pump 5 and having its inlet end opening into the water of the ocean designated 7. The sale water in passing through the heat exchanger 1 becomes heated to an elevated temperature, such as from, approximately, 160° to 212° F., and is delivered from the heat exchanger 1 through a line 8.

The hot salt water passing through the line 8 is delivered to an evaporator 10 in uniform quantities to be subjected to flash evaporation through the following arrangement of parts. The line 8 opens into a stand pipe 11 where the hot salt water is permitted to accumulate to a predetermined level at indicator 12. A waste line 14 leading from the stand pipe 11 at level 12 conducts excess salt water to a suitable place of disposal such as the ocean 7. A line 16 leads from the stand pipe 11 below the level 12 and opens into the evaporator 10. The salt water and vapors from the line 16 are drawn into evaporator 10 at substantially constant volume being regulated by the constant head 12 in the stand pipe 11, thus resulting in a substantially constant transformation of the liquid into vapor during the evaporating operation. A drain line 19 leads from the stand pipe 11 to a suitable place of disposal.

Evaporator 10 is subjected to lower than atmospheric pressures sufficient to flash a portion of the salt water into vapor. During this flashing operation the major portion of the salt water remains in liquid form and becomes chilled. This major fraction or unevaporated portion of the salt water is delivered from the evaporator 10 through a tail pipe or barometric column 21. The barometric column 21 communicates through a valve 22 with a pump 23 which delivers the cold major fraction of the salt water through a line 24 into the line 4 to be mingled with fresh salt water passing into the heat exchanger 1. Excess portions of the major fraction can be withdrawn from the barometric column 21 through a valved tail pipe 25 to a suitable place of disposal, such as the ocean 7.

The evaporator 10 is subjected to lower than atmospheric pressures by the following arrangement of parts. The cooled minor fraction is conducted through an overhead line 30 to a condenser 31 where the vapor is condensed. The condenser 31 is cooled by a suitable cooling fluid, such as sea water, pumped into the condenser 31 through a line 32 and discharged from the condenser 31 through a line 33. The condensate is withdrawn from the condenser 31 through a line 35 containing a pump 36 and is delivered to a steam boiler 38 where the condensate is converted into steam. Fresh feed water may be supplied to the boiler as desired by means of the valved line 49. The steam is conducted from the boiler 38 into a steam header 39 common to other boilers. A portion of the steam in header 39 is passed into a steam jet air eductor or vacuum pump 41. This air eductor or vacuum pump 41 communicates with the condenser 31 through a line 43. The air and other non-condensibles are removed from the condenser 31 through the line 43, thereby generating less than atmospheric pressure within the condenser 31. The steam from the steam jet air eductor 41 and non-condensibles from condenser 31 are passed from the eductor 41 through a cooler 45 in which the steam is condensed and returned to the condenser 31 through line 47, the air and non-condensibles being discharged to the atmosphere. The excess steam from the steam header 39 is delivered for refinery use through valve 48. To start the equipment the vacuum pump 41 is actuated to evacuate the condenser 31, conduit 30 and evaporator 10. The non-condensibles are eliminated from the condenser 31 during the operating period. When sufficient vacuum has been obtained in the evaporator 10, the salt water flows from line 16 into the evaporator 10. The minor fraction becomes flashed and passes through the conduit 30 to the condenser 31 at the expense of the sensible heat of the major fraction which leaves the evaporator 10 by the barometric tube 21 at a lower temperature than the entering feed water passing through line 16.

By the procedure described, fresh water and cooled circulating water are obtained for petroleum oil refinery purposes from warm waste feed water without the addition of heat by flashing

the waste feed water at sub-atmospheric pressures, and steam also for oil refinery purposes, is produced as a product.

Various changes and alternative arrangements may be made within the scope of the appended claims, in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. The method of producing steam for petroleum oil refinery purposes, which comprises passing salt water in heat exchange with petroleum oil in an oil refinery operation whereby the water is heated, flashing the heated water at less than atmospheric pressures to obtain a cooled minor fraction of vapors and a cooled major fraction of unvaporized water, separating the cooled minor fraction as an overhead product, condensing the overhead, withdrawing the condensed overhead heating the same together with fresh feed water to generate steam, and returning a portion of the steam to suitable eductors or vacuum pumps to remove noncondensibles from the zone of sub-atmospheric pressures thereby establishing and maintaining the sub-atmospheric pressures.

2. The method of producing steam and water for refinery purposes, which comprises passing salt water in heat exchange with petroleum oil in an oil refinery operation, whereby the water is heated, flashing the heated water at less than atmospheric pressures to obtain a cooled minor fraction of vapors and a cooled major fraction of unvaporized water, separating the cooled minor fraction as an overhead product, condensing the overhead, withdrawing the condensed overhead heating the same together with fresh feed water to generate steam, returning a portion of the steam to suitable eductors or vacuum pumps to remove non-condensibles from the zone of sub-atmospheric pressures thereby establishing and maintaining the sub-atmospheric pressures, and separating the cooled major fraction from the flashing zone and returning it to the heat ex- exchanger.

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