

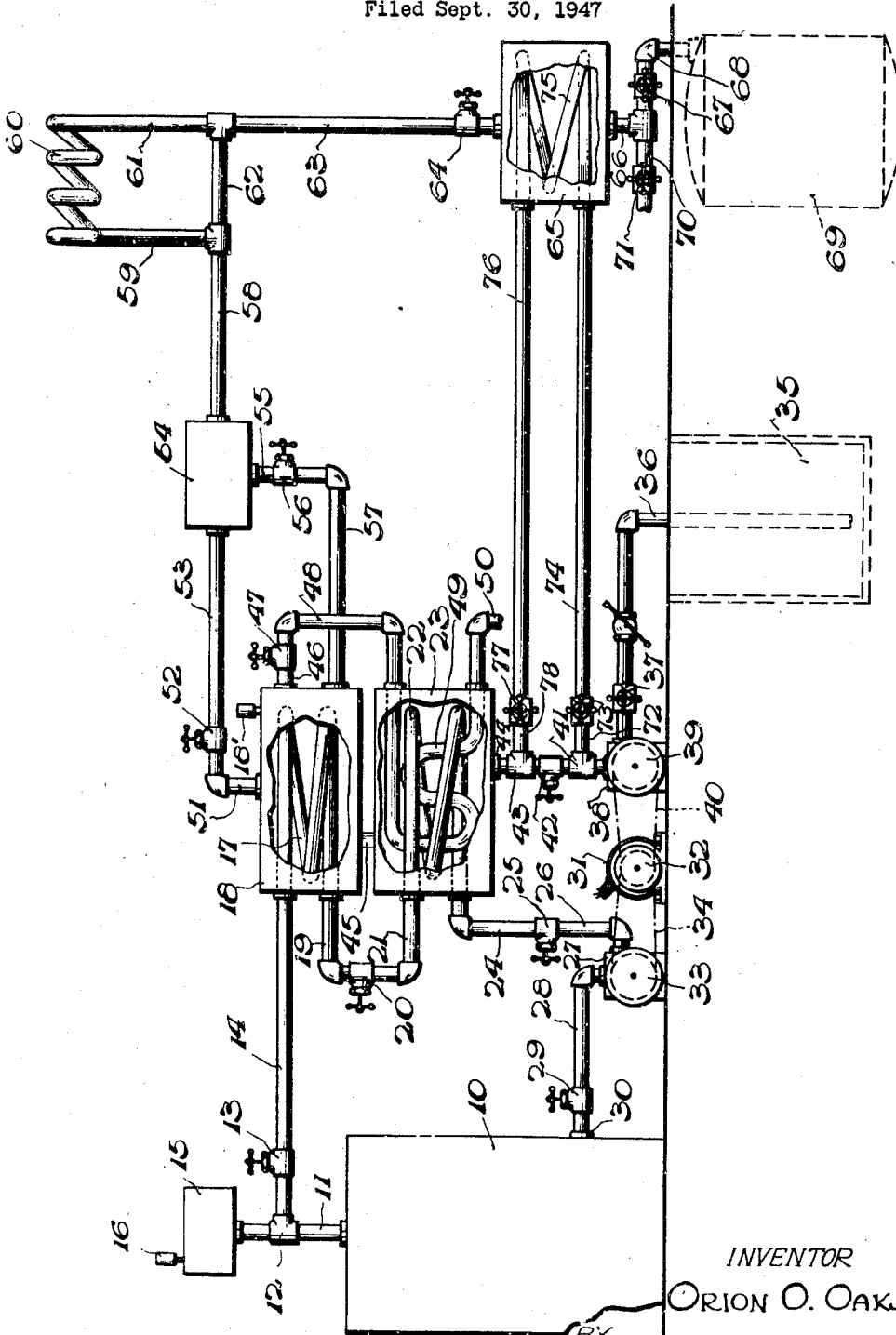
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This invention relates to stills and particularly to stills for the purification of contaminated water or other liquids. More particularly this invention relates to stills employing a particular class of chemical compounds, the tetra-aryl ortho silicates as the heat transfer medium.

Heretofore many devices have been known and used for the purification of water including many varieties and types of stills. So far as I am aware these stills have been commercially acceptable but inefficient as compared to that of the present invention. Further, many of these stills have required special equipment because of steam pressures generated by the heat transfer medium or by the vapor pressure of the heat transfer medium. Because of the unusual heat characteristics of the tetra-aryl ortho silicates stills coming within the purview of my invention can be made of the lightest possible materials and require no special apparatus. The tetra-aryl ortho silicates are described in the Johnston Patent No. 2,335,012 dated November 23, 1943. As there described these compounds boil in the neighborhood of 600° F. and may still be circulated at -60° F. At the lower end of this temperature range the compounds become viscous but do not change volume and over this temperature range no vapor pressures are created and equipment using the tetra-aryl ortho silicates need only be strong enough for circulating purposes.

It is accordingly an object of the present invention to provide a novel still using a particular class of chemical compounds, the tetra-aryl ortho silicates, as the heat transfer medium.

Another object is to provide such a still which is efficient in operation utilizing a maximum amount of the heat available for distillation purposes.

Another object is to provide such a still which requires no special apparatus and which may be constructed of the lightest possible materials.

Another object is to provide such a still in which the water to be purified is preheated by acting as the coolant of a water cooled condenser.

Another object is to provide such a still in which the water to be purified is partially heated by water from a vaporizer containing impurities drained from a vaporizer.

Other and further objects of the present invention will appear from the following description.

My invention is capable of many mechanical embodiments one of which is shown in the accompanying drawing and is described hereinafter to illustrate my invention. This should in no way be construed as defining or limiting the invention and reference should be had to the appended claims for this purpose.

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In the drawing a suitable heater 10 is provided for tetra-aryl ortho silicate and may be heated by any suitable means such as gas, oil, coal, electricity and the like. Heated tetra-aryl ortho silicate is circulated from heater 10 through pipe 11, connection 12, manually adjustable flow control valve 13 and pipe 14. Since the system is preferably, though not necessarily, a closed system an expansion tank 15 for the tetra-aryl ortho silicate is provided connected to connection 12 and a suitable normally closed pressure and vacuum responsive relief valve 16 is provided in communication with tank 15. Pipe 14 connects with coil 17 in vaporizer 18. Vaporizer 18 may be provided with a safety steam valve 18' of conventional design. Pipe 19 connects coil 17 with manually adjustable flow control valve 20 which is connected by pipe 21 to coil 22 in water heater 23. Pipe 24 connects coil 22 to manually adjustable flow control valve 25. Valve 25 is connected by pipe 26 to a suitable circulating pump 27 for the tetra-aryl ortho silicate and pump 27 is connected by pipe 28 and manually adjustable flow control valve 29 to the return side 30 of heater 10. Pump 27 is driven by a suitable motor 31 driving through pulleys 32 and 33 and belt 34.

Water to be purified is taken from collection tank 35 through pipe 36 and manually adjustable flow control valve 37 by pump 38. Pump 38 is driven by motor 31 through pulleys 32 and 39 and belt 40. The discharge side of pump 38 is connected to coupling 41, manually adjustable flow control valve 42, coupling 43 and intake 44 of heater 23. Heater 23 is connected to vaporizer 18 by pipe 45. Pipe 46 opens into vaporizer 18 and is connected to manually adjustable flow control valve 47. Valve 47 is connected by pipe 48 to coil 49 mounted in heater 23 and coil 49 is discharged to waste through pipe 50.

Steam is taken from vaporizer 18 by pipe 51 and passes through manually adjustable volume control valve 52 and pipe 53 to a conventional separator 54 which removes water from the steam. Water removed by separator 54 passes through pipe 55 and manually adjustable control valve 56 to pipe 57 and is returned to vaporizer 18.

Steam passes from separator 54 to pipe 58 and into pipe 59 and air-cooled condenser 60 where it is partially condensed and passes into pipe 61. Steam also passes into pipe 62 and is mixed with the partially condensed steam from pipe 61 in pipe 63. Pipe 63 connects to manually adjustable control valve 64. Valve 64 is in communication with water-cooled condenser 65. Purified water is removed from condenser 65 by pipe 66 and passes through manually adjustable valve 67 to pipe 68 and storage tank 69. Purified water may be taken from tank 69 through pipe 70 and manually adjustable valve 71.

Water to cool condenser 65 is preferably drawn from coupling 41 through pipe 72, manually adjustable flow control valve 73 and pipe 74 to coil 75 mounted in condenser 65. Coil 75 is connected by pipe 76, manually adjustable flow control valve 77 and pipe 78 to coupling 43. By using the water to be purified to cool condenser 75 this water is preheated before passing to heater 23 with obvious economies in heat consumption and increased efficiency in overall operation of the still.

It is to be understood that the several manually adjustable control valves in the system may be set to provide desired rates of flow in the several parts of the still; to provide the most efficient rate of circulation for the heated tetra-aryl ortho silicate; and to provide the maximum amount of preheating of the water to be purified consistent with proper operation of the water-cooled condenser.

To use the embodiment of my invention as described heater 10 is fired and motor 31 and pump 27 are energized. Heated tetra-aryl ortho silicate is then circulated through coils 17 and 22 heating them and the water surrounding them. The temperature of the tetra-aryl ortho silicate delivered to coils 17 and 22 may be controlled by controlled firing of heater 10 and the most efficient operating temperature may be readily determined for each type of still coming within the scope of my invention.

Motor 31 also drives pump 36 and water is drawn from tank 35 and if valves 73 and 77 are closed may be taken directly to heater 23 where it is initially heated by the tetra-aryl ortho silicate in coils 23. The heated water then passes through pipe 45 to vaporizer 18 where steam is generated and passes through pipe 53 to separator 54. Water is removed from the steam in separator 54 and is returned to vaporizer 18 through pipes 55, 56 and 57. The dried steam then passes through pipe 58, 59, 62 and 63 to condensers 60 and 65 where it is completely condensed and passed as purified water to storage tank 69. As soon as steam begins to condense in condenser 60 valves 73 and 77 should be opened to pass water to coils 75 to completely condense the steam and preheat the water.

Water filled with impurities and heated to high temperatures but not vaporized in vaporizer 18 is taken by pipes 46 and 48 to coil 49 to assist in heating the water in heater 23 and is thereafter drained to waste through pipe 50.

It will now be apparent that by the present invention I have provided a novel still using a particular class of chemical compounds, the tetra-aryl ortho silicates, as the heat transfer medium; which is efficient in operation using a maximum amount of the heat available for distillation purposes; which requires no special apparatus and may be made of the lightest possible materials; in which the water to be purified is preheated by acting as the coolant of a water-cooled condenser; and in which the water to be purified is partially heated by water containing impurities draining to waste from a vaporizer.

Changes to or modifications of the above described illustrative embodiment of my invention may now be suggested to those skilled in the art without departing from my inventive concept and reference should be had to the appended claims to determine the scope of this invention.

What is claimed is:

1. In a still employing an organic silicate as the heat transfer medium and including means for heating the heat transfer medium, a source of fluid to be distilled and storage means for the distilled fluid, a fluid heater, a fluid vaporizer connected to said heater, means for circulating fluid from the source of fluid to said heater and to said vaporizer, means for passing the heat transfer medium from said heating means in heat exchange relationship through said vaporizer, then in heat exchange relationship through said fluid heater and then to return the heat transfer medium to said heating means, means for leading heated fluid containing impurities from said vaporizer in heat exchange relationship through said fluid heater and then to drain, fluid vapor condensing means, means for conducting fluid vapor from said vaporizer to said condensing means, a vapor and fluid separator in said conducting means, means for returning fluid from said separator to said vaporizer, means for connecting said condensing means to the storage means, and means for circulating the fluid to be distilled as the coolant, through said condensing means and then to said fluid heater.

2. In a still employing an organic silicate as the heat transfer medium and including a heater for the heat transfer medium, a source of fluid to be distilled and storage means for the distilled fluid, a fluid heater, a fluid vaporizer connected to said heater, coils in said fluid heater and in said vaporizer for the heated heat transfer medium, means for connecting said coils in said vaporizer to the heater for the heat transfer medium, means for connecting said coils in said vaporizer and said coils in said fluid heater, means for connecting said coils in said fluid heater to the return side of the heater for heat transfer medium, a second set of coils in said fluid heater connected to said fluid vaporizer and emptying to drain, means for supplying fluid from the source of fluid to said fluid heater and from said fluid heater to said vaporizer, fluid vapor condensing means, means for conducting fluid vapor from said vaporizer to said condensing means, a vapor and liquid separator in said conducting means, means for connecting said separator to said vaporizer for leading fluid from said separator back to said vaporizer, a coil in said condensing means, means for circulating the fluid to be distilled as the coolant through said last named coil and then to said fluid heater, and means for connecting said condensing means to the storage means.

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The following references are of record in the file of this patent:

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