A. FAGET.

DISTILLATION SYSTEM FOR ICE PLANTS.

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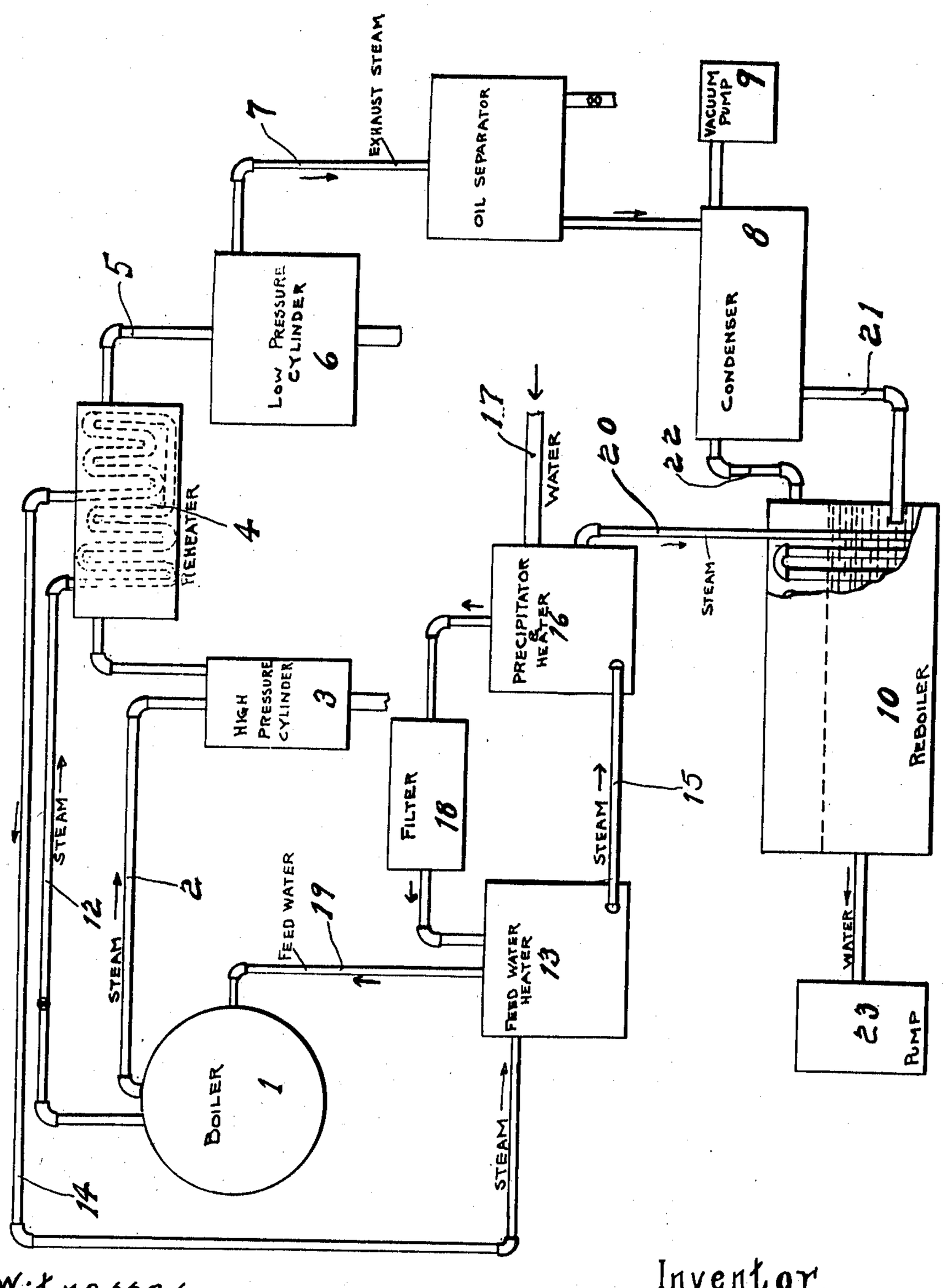

Witnesses.

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UNITED STATES PATENT OFFICE.

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DISTILLATION SYSTEM FOR ICE PLANTS.

978,279. Specification of Letters Patent. Patented Dec. 13, 1910.

Application filed November 23, 1909. Serial No. 529,590.

To all whom it may concern:

Be it known that I, ARTHUR FAGET, citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Distillation System for Ice Plants, of which the following is a specification in such full and clear terms as will enable those skilled in the art to construct and use the same.

This invention relates to a distillation system for ice plants, and its object is to effect an economy in the heat used for the distillation of water.

It will be noted by those familiar with the art that it is necessary to distil all water used for can ice-making, since distilled water is required for making clear, hygienic ice. It will also be noted by those skilled in the art that it is necessary to use a certain amount of power in an ice plant to convert the gaseous ammonia into liquid ammonia, and to carry on other operations about such plants, and a series of experiments show that the power required to produce a given amount of ice will produce only one-halt the amount of water used in the ice plant; that is to say, the power required to run an ice-plant producing 100 tons of ice per day will be given by the evaporation of 50 tons of water under normal conditions, thus making it necessary to distil 50 tons of water in addition to the 50 tons used by the power plant.

Certain considerations of engine running show that a compound engine with a high and low pressure cylinder, the latter exhausting into a condenser, form the best combination for such a plant as is contemplated. Such an engine as the one mentioned, however, emulsifies and condenses with the cylinder oil in the low pressure cylinder at least 25% of the steam supplied to it, and this emulsion is practically a total loss, for the reason that it cannot be filtered or used in the ice-making plant. This difficulty is avoided in this system of distillation, and the additional distilled water required is produced with a loss of as small an amount of heat as possible.

The drawing, in which the same numeral of reference is applied to the same portion throughout the several views, is a diagram illustrating such a plant as is herein contemplated, and showing the path of the steam through the boiler to the engines, condenser, heaters, etc.

Numeral 1 represents the boiler from which leads a pipe 2 to the high-pressure cylinder 3. From the high-pressure cylinder 3 the exhaust leads to a re-heater 4, said re-heater being kept under a temperature of approximately 360°, depending, of course, upon the precise steam pressure maintained therein. The exhaust steam from the high-pressure cylinder, after passing from the re-heater, will be substantially the same in temperature as the steam in the boiler at the time it leaves the boiler. The steam then passes through a pipe 5 to the low-pressure cylinder 6, from which it is exhausted through a pipe 7 into an oil separator, and then to a condenser 8, said condenser being maintained at a sufficiently low pressure, by means of a dry vacuum pump 9. Ordinarily, if the steam from the high-pressure cylinder is allowed to cool off, and pass to the low-pressure cylinder, the oil carried therewith and the oil in the low-pressure cylinder will cause a considerable amount of oily and watery emulsion to form; but this emulsion will not form at the temperature of the steam when passing from the boiler in the first instance, and therefore there is very little cylinder condensation in the low-pressure cylinder, all of the condensation taking place in the condenser 7, whereby the emulsification of a considerable quantity of the distilled water is avoided.

The steam reheater is fed from a pipe 12 leading from the boiler 1, and such an amount of steam is permitted to pass through this as will produce the additional water required for the ice-making plant, above that supplied by the engine system. The steam, after passing through the re-heater, is passed to the feed-water heater 13 through a pipe 14. This heater is maintained at a temperature of about 340° at one end, and 280° at the other, the steam then passing through a pipe 15 to a second heater 16, which latter is maintained at a temperature of approximately 280°, other operations of the ice-plant bringing the temperature of the feed-water at the entrance to the heater up to about 200°. The feed-water is passed

into the heater 16 through a pipe 17, and at a temperature of about 200°, and passes therefrom at about 280°, at which temperature the insoluble carbonates begin to become flocculent and are removed from the water by means of a filter 18, which latter is connected with the reheater 13, in which the feed-water is still further heated, leaving the latter at a temperature very nearly that of the boiler 1, the boiler 1 being fed through the pipe 19.

The steam, leaving the heater 16, passes through a pipe 20 into the vacuum reboiler, and is discharged therein, the pump 9 maintaining the vacuum in the neighborhood of 25 inches of mercury in the vacuum reboiler and condenser, and the heat of the steam passing from the heater 16 is sufficient to reheat the water contained in the reboiler 10 enough to drive off all undesirable vapors. The reboiler 10 is sufficiently lower than the condenser for the water to run from the condenser into the reboiler, through a pipe 21, a pipe 22 connecting the upper portion of the reboiler with the upper portion of the condenser, in order to maintain each at the same absolute pressure. As fast as the water accumulates in the reboiler it is removed therefrom by means of a pump 23.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is as follows:

1. In a water distillation system, a steam boiler, a steam power plant, steam connections from the boiler whereby the steam used in the power plant may be reheated during its passage therethrough, a feed-water heater and steam connections from the reheater to the feed water heater, whereby the live steam passing through the reheater will heat the feed water nearly to that of the boiler, as set forth.

2. In a water distillation system, a steam boiler, a steam power plant, steam connections from the boiler whereby the steam may be reheated in its passage through the power plant, a condenser into which the power plant discharges, a feed-water heater, a feed-water filter, a secondary feed-water heater wherein the feed-water is raised nearly to the temperature of the boiler, means to pass feed water through each heater, and pipes whereby the steam used for reheating the power steam is passed through each feed water heater, as set forth.

3. In a water distillation system, a steam boiler, a steam power plant, steam connections from the boiler whereby the steam may be reheated in its transmission through the power plant, a condenser into which the power plant discharges, a feed-water heater, a filter, a secondary reheater in which the feed-water is heated to substantially the temperature of the boiler, piping whereby the steam used for reheating the power steam will be passed through the feed water heaters and a vacuum boiler into which the steam from the reheater and feed-water heaters is discharged, as set forth.

4. In a water distillation system, a steam boiler, a steam power plant connected with the boiler, steam connections for reheating the steam during its passage through the power plant, a water heater to which the reheater steam connections lead, and a vacuum reboiler into which the steam is discharged from the several heaters, substantially as described.

5. In a water distillation system, a boiler, a power plant, steam connections whereby the steam used in the power plant is reheated during its passage therethrough, a feed-water heater, a connection from the re-heater to the feed-water heater, a filter through which the feed-water is passed after it has been partially heated, and a vacuum reboiler into which the steam from the reheater and feed-water heaters is discharged, substantially as set forth.

6. In a water distillation system, a steam boiler, a steam power plant, steam connections from the boiler whereby the steam is reheated in its passage through the power plant, a feed water heater, a steam connection from the reheater to the feed-water heater, a feed water filter through which the feed water passes after being partially heated, and a vacuum reboiler into which the steam from the heaters discharges, as set forth.

7. In a water distillation system, a steam boiler, a steam power plant connected with said boiler, a steam reheater for increasing the temperature of the steam in its passage through the power plant, steam connections from the boiler to said reheater, a condenser into which the power plant discharges, a feed water heater, steam connections from the reheater to the feed-water heater, steam connections extending from the feed-water heater, a vacuum reboiler into which said connections lead, and water connections from the condenser to the reboiler, as set forth.

8. In a water distillation system, a steam boiler, a compound steam power plant connected with said boiler, a steam reheater for increasing the temperature of the steam after its passage through the high pressure cylinder of the engine, steam connections from the boiler to said reheater, a condenser into which the power plant discharges, a feed water heater, steam connections from the re-heater to the feed water heater, feed water connections from the boiler to the feed water heater, a vacuum reboiler, and steam connections extending from the feed water heater to and terminating in the vacuum reboiler, and water connections from

the condenser to the re-boiler whereby the condensed water will drain into the re-boiler, as set forth.

9. In a water distillation system, a steam boiler, a compound steam power plant connected with said boiler, a steam reheater for increasing the temperature of the steam after its passage through the high pressure cylinder of the power plant, steam connections from the boiler to said re-heater, a condenser into which the power plant discharges, a feed water heater, steam connections from the re-heater to the feed water heater, feed water connections from the feed water heater to the boiler, means to remove impurities from the feed water during its passage through the feed water heater, a vacuum re-boiler, steam connections extending from the feed water heater to and terminating in the re-boiler, and water connections from the condenser to the re-boiler as set forth.

In testimony whereof I have hereunto set my hand this 11″ day of Nov. A. D. 1909, in the presence of the two subscribed witnesses.

ARTHUR FAGET.

Witnesses:
C. P. GRIFFIN,
HUGH T. SIME.