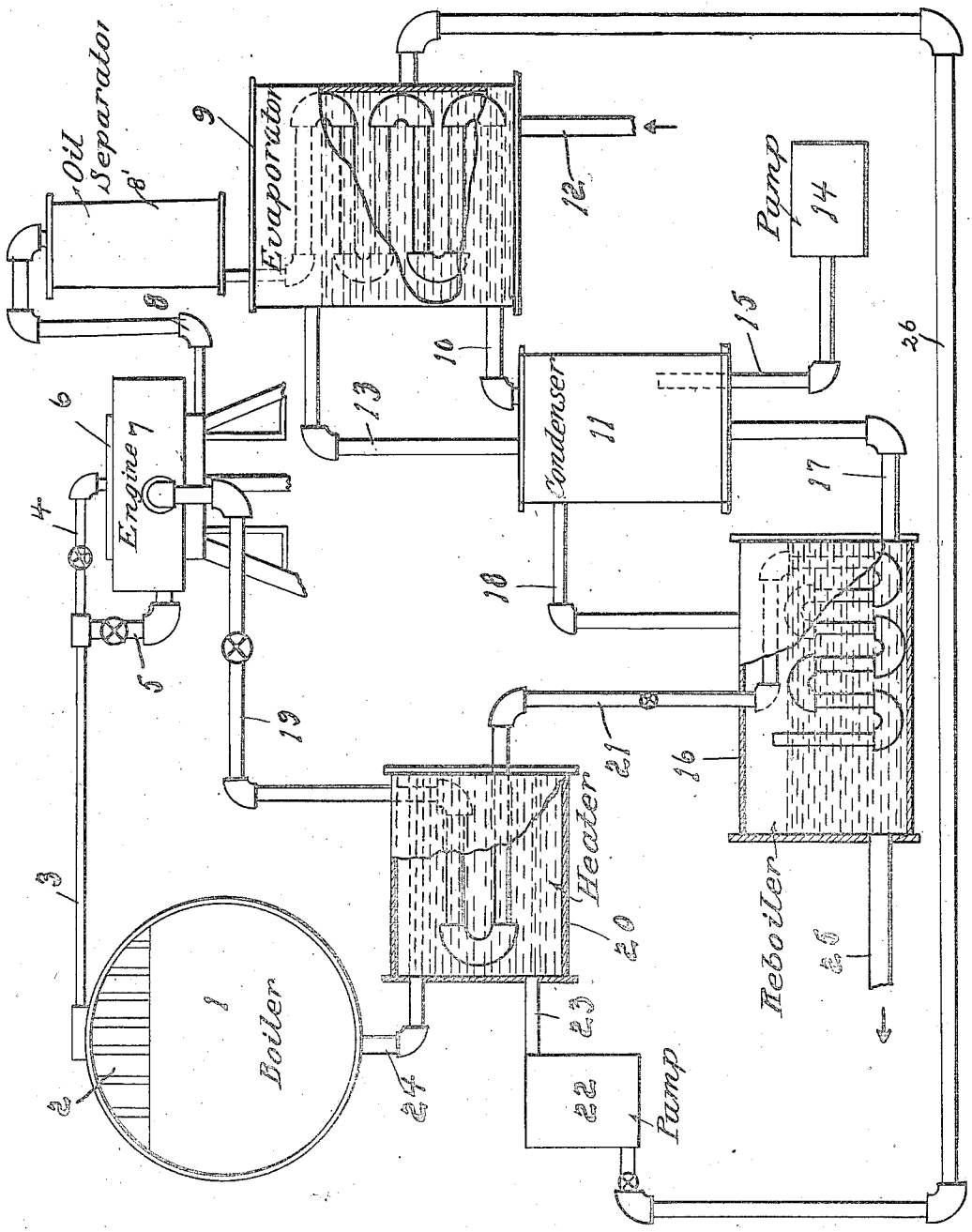
A. FAGET.

WATER DISTILLATION SYSTEM.

APPLICATION FILED JAN. 17, 1910.

971,183. Patented Sept. 27, 1910.



Witnesses.
Rowell P. Rogers.
Sidney Hotchner

Inventor.
Arthur Faget, by,
Carlos P. Griffin Atty.

UNITED STATES PATENT OFFICE.

ARTHUR FAGET, OF SAN FRANCISCO, CALIFORNIA.

WATER-DISTILLATION SYSTEM.

971,183. Specification of Letters Patent. Patented Sept. 27, 1910.

Application filed January 17, 1910. Serial No. 538,511.

To all whom it may concern:

Be it known that I, ARTHUR FAGET, a 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 Water-Distillation System, 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 make the most economical possible use of steam with an ordinary single cylinder engine.

It will be understood by those skilled in the art that the quantity of ice produced in an ice plant requires a considerably larger quantity of distilled water than the distilled water produced by the power plant adjuncts of the ice plant. That is to say, in an ice plant having a daily capacity of one hundred tons of water from the power plant, will produce considerably less than one hundred tons, and to make up the extra amount, additional water must be distilled.

The object of this invention is to make use of the great amount of heat in the steam passing from the distillation apparatus, and from the engine, to reduce to the smallest degree the heat necessary to evaporate the desired quantity of water.

A further object of the invention is to reduce the condensation of steam at the exhaust opening of the engine. This object is accomplished by the use of superheated steam, whereby greater expansion can be secured in the steam cylinder, and by the use of a steam jacket whereby the cylinder is maintained substantially at the temperature of the superheated steam. The use of steam in this manner results in passing slightly more of the heat units into the exhaust steam, but in the system here employed, the heat units are not wasted since a greater expansion can be secured in the engine, and the quantity of water at exhaust opening is reduced, thus reducing the quantity of oil emulsion from the oil separator from 10 to 25%. The feed water is also heated to a considerable extent, first in the evaporator following the oil separator and, second, in the heater between the feed pump and the boiler.

The drawing is a diagram of such a distillation system, the same numeral representing the same portion throughout.

The numeral 1 represents a boiler, which may be of any desired type, said boiler having a superheating attachment 2. Connected with the boiler is a pipe 3 having a branch 4 and a branch 5, each of the latter being provided with valves.

The numeral 6 represents a simple engine having a steam jacket 7. Leading from the engine is the usual exhaust pipe 8, connected with the heating coils of the water evaporator 9, said coils leading through the pipe 10 to the condenser chamber 11. This water evaporator has a supply pipe 12 and has a pipe 13 whereby the steam produced in the evaporator will be drawn into the condenser chamber 11. The condenser is maintained at the desired vacuum by means of the pump 14, which latter is connected to the condenser by means of a pipe 15. The condenser is so situated that any water collecting therein will run into a vacuum reboiler 16 through a pipe 17, and connected with the top of the reboiler and condenser chamber is a pressure equalizing pipe 18. The superheated steam is led through the pipe 5 to the steam jacket 7, and from there through the pipe 19 into the feed water heater 20, and from the latter through a pipe 21 to the coils within the vacuum reboiler 16. The feed water is pumped into the boiler from the pump 22 through pipes 23 and 24. The pipe 21 terminates in the vacuum reboiler 16, and the exhaust pipes 8 and 10 terminate in the condenser chamber, after passing through the evaporator 9. The water is drawn from the vacuum reboiler 16 through a pipe 25 to a suitable storage receptacle, not shown.

The result of the construction shown will be, first: the economical use of the steam operating the engine 6 by reason of the reduction in cylinder condensation therein due to operation at a slightly higher temperature; second: the evaporation of a considerable quantity of water in the water

evaporator 9 by means of the exhaust steam from the engine 6; third: the heating of the feed water by means of the steam from the steam jacket 7 on the engine 6; fourth: the reboiling of the water in the reboiler 16 by means of the heat retained in the steam from the steam jacket 7.

It will be observed that all of the water leaving this plant passes out through the pipe 25, and will be at the temperature of steam under the absolute pressure produced by the vacuum pump 14.

It will be noted that the supply pump 22 is connected by means of a pipe 26, with the water heater evaporator 9, the object being to take all water into the plant through the pipe 12, and to initially heat the water used in the boiler 1 in two places: first, by means of the exhaust steam which heats it to a certain extent by reason of the connection with the condenser chamber 11 which evaporates a certain percentage thereof; second, this water heated substantially to the temperature of the water in the boiler by means of the steam escaping from the steam jacket 7. The valve on the pipe 5 will be left open, in order to keep the cylinder 6 at substantially the temperature of the boiler, while the valve in the pipe 19 will be regulated to permit the heater 20 to be kept as hot as may be desired, the valve in the pipe 21 determining the actual quantity of steam permitted to escape into the reboiler 16.

It will be understood by those skilled in the art that a suitable oil separator 8' should be interposed in the path of the exhaust from the steam engine, in order that the water from the condenser may be kept free from oil; such additional quantity of water required for the ice-making plant will be allowed to distil by passing off around the steam jacket of the engine.

The quantity of water allowed to distil through the pipe 21 varies with the engine construction, since with a wasteful engine, a great deal of water will be passed through the engine exhaust, while with a very economical engine a smaller quantity of water will be obtained at the exhaust of the engine, therefore, the most satisfactory condition is that one in which the largest proportion of the distilled water required passes off through the pipe 21, instead of through the engine.

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 boiler, a steam engine, connections between the steam engine and boiler whereby the engine is supplied with steam, a water evaporator, means whereby the exhaust steam heats the water in the evaporator, a condenser chamber connected with the evaporator, means for maintaining a vacuum in said condenser chamber, a vacuum reboiler, a steam jacket surrounding the engine cylinder, steam connections with said jacket whereby live steam is supplied thereto, piping whereby the water in the vacuum reboiler may be heated by the steam passing from said steam jacket, as set forth.

2. In a water distillation system, a boiler, a steam engine, connections between the steam engine and boiler whereby the engine is supplied with steam, a water evaporator, means whereby the exhaust steam heats the water in the evaporator, a condenser chamber connected with the evaporator, means for maintaining a vacuum in said condenser chamber, a vacuum reboiler, a steam jacket surrounding the engine cylinder, steam connections with said jacket whereby live steam is supplied thereto, a feed water heater, and a pipe whereby the feed water and the water in the vacuum reboiler may be heated by the steam passing through the engine steam jacket, as set forth.

3. In a water distillation system, a boiler, a superheater connected therewith, a steam engine, connections between the steam engine and superheater whereby the engine is supplied with steam, a water evaporator, means whereby the exhaust steam heats the water in the evaporator, a condenser chamber connected with the evaporator, means for maintaining a vacuum in said condenser chamber, a vacuum reboiler, a steam jacket surrounding the engine cylinder, steam connections with said jacket whereby live steam is supplied thereto, and piping whereby the water in the vacuum reboiler may be heated by the steam passing from said steam jacket, as set forth.

4. In a water distillation system, a boiler, a superheater connected therewith, a steam engine, connections between the steam engine and superheater whereby the engine is supplied with steam, a water evaporator, means whereby the exhaust steam heats the water in the evaporator, a condenser chamber connected with the evaporator, means for maintaining a vacuum in said condenser chamber, a vacuum reboiler, a steam jacket surrounding the engine cylinder, steam connections with said jacket whereby live steam is supplied thereto, a feed water heater, and a pipe whereby the feed water and the water in the vacuum reboiler may be heated by the steam passing through the engine steam jacket, as set forth.

5. In a water distillation system, a boiler, a steam engine, connections between the steam engine and boiler whereby the engine is supplied with steam, a water evaporator, means whereby the exhaust steam heats the water in the evaporator, a condenser cham-

ber connected with the evaporator, means for maintaining a vacuum in said condenser chamber, a vacuum reboiler, piping whereby the reboiler is connected with the condenser chamber, a steam jacket surrounding the engine cylinder, steam connections with said jacket whereby live steam is supplied thereto; piping whereby the water in the vacuum reboiler may be heated by the steam passing from said steam jacket, as set forth.

6. In a water distillation system, a boiler, a superheater connected therewith, a steam engine, connections between the steam engine and superheater whereby the engine is supplied with steam, a water evaporator, means whereby the exhaust steam heats the water in the evaporator, a condenser chamber connected with said evaporator and into which said exhaust steam passes, means for maintaining a vacuum in said condenser chamber, a vacuum reboiler, piping connecting the reboiler with the condenser chamber, a steam jacket surrounding the engine cylinder, steam connections whereby the steam jacket is supplied with live steam, a feed water heater, and piping whereby the water in the feed water heater and in the vacuum reboiler may be heated by the steam passing from said steam jacket, as set forth.

7. In a water distillation system, a boiler, a superheater connected therewith, a steam engine, connections between the steam engine and superheater whereby the engine is supplied with steam, a water evaporator, means whereby the exhaust steam heats the water in the evaporator, a condenser chamber connected with said evaporator and into which said exhaust steam passes, means for maintaining a vacuum in said condenser chamber, a vacuum reboiler, piping connecting the vacuum reboiler with the lower part of the condenser chamber, piping connecting the upper part of the vacuum reboiler with the upper part of the condenser chamber, a steam jacket surrounding the engine cylinder, steam connections whereby the steam jacket is supplied with live steam, a feed water heater, and piping whereby the water in the feed water heater and in the vacuum reboiler may be heated by the steam passing from said steam jacket, as set forth.

8. In a water distillation system, a boiler, a steam engine, connections between the steam engine and boiler whereby the engine is supplied with steam, a condenser, means to exhaust the steam from said engine into said condenser, a steam jacket surrounding the cylinder of said engine, connections with the boiler and said steam jacket, a feed water heater, means whereby the steam passing from said steam jacket will heat the water in said feed water heater, a vacuum reboiler connected with the condenser, and means whereby the steam passing from the feed water heater will heat the water in the vacuum reboiler, as set forth.

9. In a water distillation system, a boiler, a superheater connected therewith, a steam engine, connections between the steam engine and boiler whereby the engine is supplied with steam, a condenser, means to exhaust the steam from said engine into said condenser, a steam jacket surrounding the cylinder of said engine, connections with the boiler and said steam jacket, a feed water heater, means whereby the steam passing from said steam jacket will heat the water in said feed water heater, a vacuum reboiler connected with the condenser, and means whereby the steam passing from the feed water heater will heat the water in the vacuum reboiler, as set forth.

10. In a water distillation system, a boiler, a steam engine having a steam jacket around the cylinder thereof, a water heater and evaporator, means whereby the exhaust from the engine will heat the water in the water heater and evaporator, a condenser chamber, connections between the upper portion of the water heater and evaporator, and condenser chamber, means whereby the exhaust steam passing through the water heater and evaporator will pass into the condenser chamber, a vacuum reboiler adapted to receive the water from said condenser chamber, steam connections with the steam jacket of the engine, a feed water heater, means whereby the steam passing into the steam jacket will heat the water in the feed water heater, and means whereby the feed water heater is supplied with water from the water heater and evaporator, as set forth.

11. In a water distillation system, a boiler, a steam engine having a steam jacket around the cylinder thereof, a water heater and evaporator, means whereby the exhaust from the engine will heat the water in the water heater and evaporator, a condenser chamber, connections between the upper portion of the water heater and evaporator and condenser chamber, means whereby the exhaust steam passing through the water heater and evaporator will pass into the condenser chamber, a vacuum reboiler adapted to receive the water from said condenser chamber, steam connections with the steam jacket of the engine, a feed water heater, means whereby the steam passing into the steam jacket will heat the water in the feed water heater, means whereby the steam passing through the feed water heater will heat the water in the vacuum reboiler, and means whereby the feed water heater is supplied with water from the water heater and evaporator, as set forth.

12. In a water distillation system, a boiler, a steam engine having a steam jacket around the cylinder thereof, connections between the

steam engine and boiler whereby the engine is supplied with steam, a water heater and evaporator, means whereby the water in said water heater and evaporator, is heated by the exhaust steam, a condenser chamber into which said exhaust steam discharges, steam connections whereby the steam jacket on the engine cylinder is supplied with steam, a feed water heater, and means whereby the feed water in said heater is heated by the steam passing from said steam jacket, as set forth.

In testimony whereof I have hereunto set my hand this 8th day of January A. D. 1910, in the presence of the two subscribed witnesses.

ARTHUR FAGET.

Witnesses:
C. P. GRIFFIN,
M. MACINNIS.