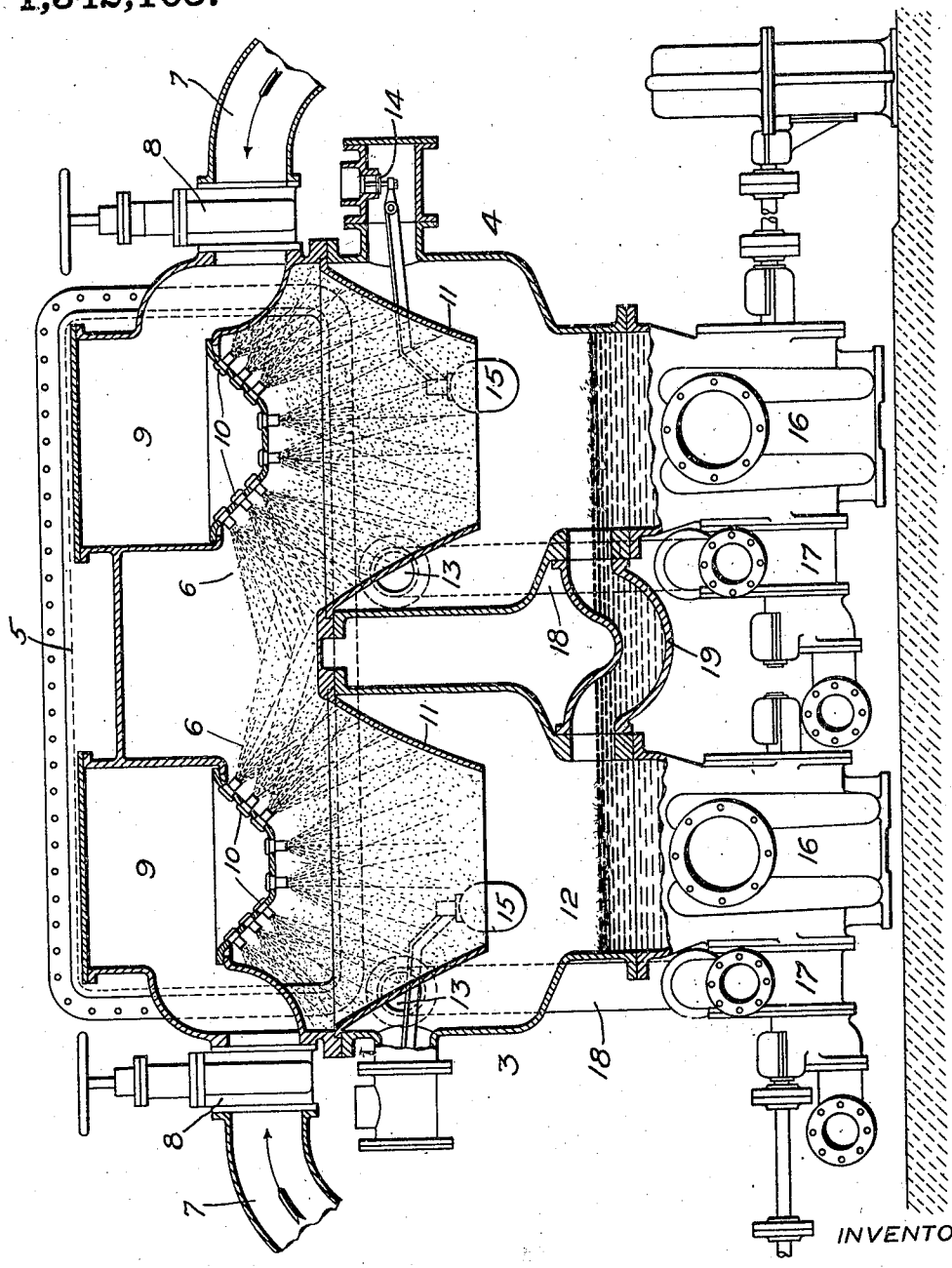
R. N. EHRHART.

CONDENSER INSTALLATION.

APPLICATION FILED APR. 8, 1916.

1,342,103.

Patented June 1, 1920.



INVENTOR.

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BY

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WITNESSES:

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UNITED STATES PATENT OFFICE.

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CONDENSER INSTALLATION.

1,342,103. Specification of Letters Patent. Patented June 1, 1920.

Application filed April 8, 1916. Serial No. 89,820.

To all whom it may concern:

Be it known that I, RAYMOND N. EHRHART, a citizen of the United States, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have made a new and useful Invention in Condenser Installations, of which the following is a specification.

This invention relates to condenser installations in which two or more condensers are adapted to receive fluid, to be condensed, from a single source.

An object of the invention is to provide means such that one of the separate condensers may operate effectively in condensing the fluid from the source, while the other condensers are shut down.

It is well known that the temperature of cooling water, delivered to condensers, varies with atmospheric temperatures and that consequently during the winter months the cooling water sometimes falls below 40 degrees Fahrenheit, whereas during the hot months of the year its temperature may be as high or higher than 70 degrees Fahrenheit. It is also well known by those skilled in the art, that it is possible to obtain nearly the same vacuum with a given volume of cooling water at or below 40 degrees Fahrenheit as it is with twice that volume. It is also well known that for the usual commercial design of condenser a given volume of water at a higher temperature, for example at 70 degrees Fahrenheit, will maintain a better vacuum than could be obtained by employing half the volume of water. The difference in vacuum under such conditions is so great as to render it necessary to use the larger quantity of water if it is desirable to maintain a high vacuum in the condenser.

It has become more or less common practice, in large condenser installations, to employ two or more condensers which are adapted to receive fluid or steam to be condensed from a common source. In such an installation it is possible to shut down one or more of the separate condensers during the winter months and to obtain substantially as high a vacuum as would be obtained if all of the condensers of the installation were operating. During the summer months, or while the condensing water is received at a relatively high temperature, it is necessary to employ all of the condensers of the installation to maintain the desired vacuum and the shutting down of one condenser, with a resulting diminution in the amount of condensing water employed, will materially diminish the amount of vacuum obtained.

In installations such as described it is necessary to provide separate means for delivering the cooling water to each condenser, and it is also advisable to employ separate means for withdrawing the water from the condensers and for breaking the vacuum in each condenser in case of flooding. In an installation including two condensers, communicating with the same exhaust system, and in which only one of the condensers is in operation some water is likely to leak into the inoperative condenser, although its water delivery passages are closed. For example, there will be a certain amount of condensation entering the common inlet of the two condensers and some of it will find its way into the inoperative condenser. There will also be the possibility of leaks in the water delivery connections of the inoperative condenser, and if the condenser is idle for a long enough period, it will fill up with water and its vacuum breaker will operate and consequently break the vacuum of the operating condenser, inasmuch as the condensers communicate through their inlet passages. The breaking of the vacuum will, of course, cause a delay, since the inoperative condenser would, under the conditions described, have to be drained before the vacuum could be again established in the operating condenser.

One of the objects of my present invention is to provide a condenser installation, including at least two condensers, receiving fluid from a single source, in which means are provided for preventing the inoperative condenser from filling up with liquid and affecting the operation of the operating condenser.

A further object is to provide means in such a condenser installation whereby liquid collected in the inoperative condenser is delivered to the operating condenser through a water sealed connection.

These and other objects, which will be made apparent throughout the further description of the invention, are attained by

means of a condenser installation embodying the features herein described and illustrated in the single sheet drawing accompanying and forming a part hereof.

In the drawings I have illustrated a condenser installation embodying my invention and which includes two jet condensers.

Throughout the further description of the invention I will employ the term "jet condenser" in its broad sense to include any condenser in which the cooling or condensing water is mingled with the fluid to be condensed. I have also employed the terms "cooling water" and "steam", but with no idea of limiting my invention to condensers which are solely adapted to employ cooling water, in contradistinction to other condensing liquids, or to condensers solely adapted to condense steam, as distinguished from other condensable fluids.

Referring to the drawings: The installation illustrated includes two jet condensers 3 and 4, which are provided with a common inlet port 5. The inlet port communicates with the inlet passage 6 of both condensers. Each condenser is also provided with separate means for delivering cooling water to it. As illustrated, cooling water is delivered to each condenser through a pipe 7, which is provided with a shut-off valve 8, and communicates with a chamber 9, located in the upper portion of the condenser. The chamber 9 is provided with a plurality of delivery or spray nozzles 10, which deliver the water from the chamber 9, in the form of spray, through the condensing zone of the condenser. Each condenser is also provided with a conical apron or flange 11, which is located immediately below the series of spray nozzles and forms, in effect, a collecting cone for collecting the water delivered from the nozzles and for delivering it to the lower part or body 12 of the condenser. Each condenser is also provided with an air offtake port 13, which is so located, with relation to the apron 11, that water passing through the condenser can not be readily drawn into it. Each condenser is also provided with a vacuum breaker for establishing direct communication between the interior of the condenser and the atmosphere in case the water level within the condenser rises above a determined level. As illustrated, the vacuum breaker consists of a valve 14, which is controlled by a float 15, located within the body portion proper of the condenser. Each condenser is also provided with a discharge pump 16, which communicates with the water discharge port and is adapted to discharge the water collecting in the bottom of the condenser. As illustrated, the water pump of each condenser is mounted upon the same shaft with the air pump 17 of the condenser, and the air pump communicates through a pipe 18 with the air offtake port 13.

In order to prevent flooding of one condenser, in case it is shut down while the other is in operation, I have provided a passage 19, which establishes communication between the body portions 12 of the two condensers at a point below the condensing zones, or below the collecting cones 11. As illustrated, the passage 19 is so located that its point of communication with each condenser is below the normal water level of the condenser. With such an arrangement, the water level within the inoperative condenser can not rise above that of the level maintained in the operative condenser and consequently the operating pump 16 will discharge the water collected in both the operating and inoperative condensers. I have also shown the passage 19 so formed that it forms a water seal between the condensers. This is accomplished in the apparatus illustrated by employing a curved passage or pipe, the intermediate portion of which is located below the horizontal plane of its ends. This forms, in effect, a trap which will deliver water from one condenser body to the other, but will prevent the passage of uncondensed steam from one condenser to the other. The trap or water seal is provided to prevent the passage 19 from delivering uncondensed steam from the inoperative condenser to the operating condenser, since, if steam were delivered through this passage it might not be condensed in the operating condenser and consequently might be drawn out through the air off-take port 13 with the air.

With the passage 19 located as described, it will fill up with water as soon as the water in the operating condenser has reached its normal level and consequently will prevent the passage of steam from one condenser to the other, but will not interfere with the passage of water. With this arrangement of apparatus either condenser may be operated while the other is shut down and there will be no danger of having the inoperative condenser fill up with water and break the vacuum of the operating condenser. In addition to this the water can be removed from the operating condenser by means of its pump 16, or by means of the pump 16 of the other condenser. The apparatus has the additional advantage that the water level in the condensers will be maintained the same while both condensers are in operation, and one water pump may be employed for both of the condensers.

While I have described and illustrated but one embodiment of my invention, it will be apparent to those skilled in the art that various changes, modification, substitutions, additions and omissions may be made in the

apparatus illustrated without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim is:

1. The combination with a plurality of condensers having communicating condensing chambers receiving steam from the same inlet and provided with separate air outlets and separately controlled condensing jets, of a connection between the water legs of the condensers adapted to permit condensate in an inoperative condenser to flow to an operative condenser and prevent uncondensed vapor entering the inoperative condenser from the said inlet, from passing to the air off-take of the operative condenser through the said connection.

2. The combination with a plurality of condensers having communicating condensing chambers receiving steam from the same inlet and provided with separate air outlets and separately controlled jets, of a condensate sealed connection between the water legs of the condensers adapted to permit condensate to flow from one condenser to the other and prevent uncondensed vapor entering an inoperative condenser from the said inlet, from passing to the air off-take of an operative condenser through the said connection.

3. The combination with a plurality of condensers having communicating combining cones each served by a separately controlled condensing jet, and each condenser being served by a separate air off-take communicating with the discharge end of the combining cone, of a connection between the water legs of the condensers adapted to permit condensate in an inoperative condenser to flow to an operative condenser and prevent uncondensed vapor entering an inoperative condenser from the said inlet, from passing to the air off-take of an operative condenser through the said connection.

4. The combination with a plurality of condensers having communicating condensing chambers receiving steam from the same inlet and each provided with a separate vacuum breaker responsive to variations of the fluid within that condenser, of means for preventing condensate entering the condensing chamber of an inoperative condenser from the said inlet, from rising above the level of the condensate in an operative condenser.

5. The combination with a plurality of condensers having communicating condensing chambers receiving steam from the same inlet and provided with a condensate controlled vacuum breaker communicating with the said inlet whereby the vacuum breaker is subjected to the action of the combined condensate within the condensers.

6. The combination with a plurality of condensers having communicating condensing chambers receiving steam from the same inlet and provided with a vacuum breaker communicating with the said inlet and responsive to variations of the quantity of condensate in the condenser, and provided with separate air off-takes for withdrawing non-condensable fluids from the condenser, of a connection adapted to permit the flow of condensate from one condenser to another, and prevent the passage of steam entering an inoperative condenser from the inlet, to the air off-take of an operative condenser through the said connection.

7. A condenser installation comprising at least two jet condensers adapted to operate in parallel, independent means for delivering condensing water to each condenser, and independent means for withdrawing air or non-condensable vapors from each condenser, whereby each condenser may operate while the other is closed down, and a water sealed passage for establishing communication between the condensers at a point below the condensing zone adapted to permit condensate to flow from one condenser to another and prevent uncondensed vapors from passing through the passage from an inoperative condenser to the air withdrawing means of an operative condenser.

8. A condenser installation comprising two jet condensers, adapted to operate in parallel on fluid from the same source, separate means for delivering condensing water to each condenser, separate means for withdrawing condensing water and the water of condensation from each condenser, separate means for removing non-condensable fluids from each condenser, a float actuated vacuum breaker communicating with the said fluid source, and a water sealed passage between the condensers at a point below the condensing zones whereby the level of the condensate is maintained uniform in all the condensers.

In testimony whereof, I have hereunto subscribed my name this 5th day of April, 1916.

RAYMOND N. EHRHART.