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C. C. WORTHINGTON & L. R. ALBERGER.

CONDENSER SYSTEM.

(Application filed Nov. 27, 1899.)

(No Model.)

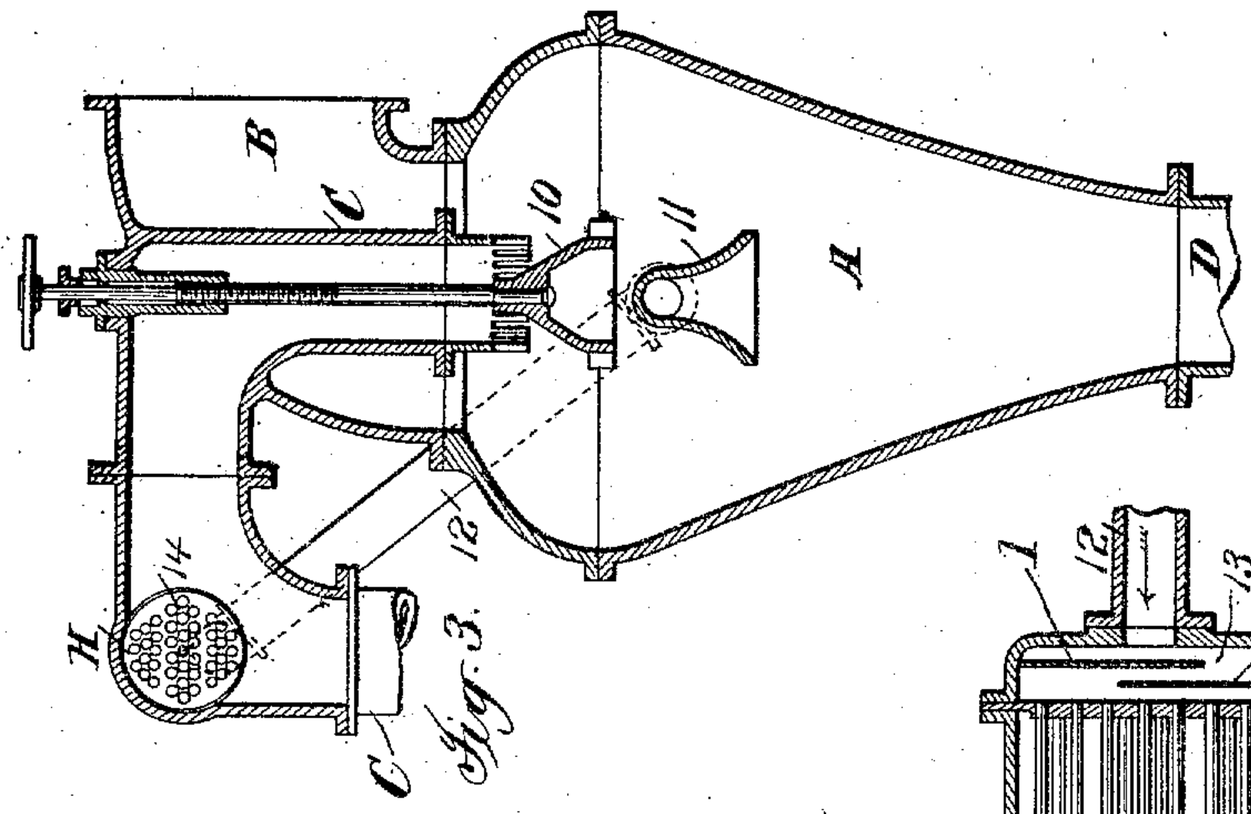

Fig. 3.

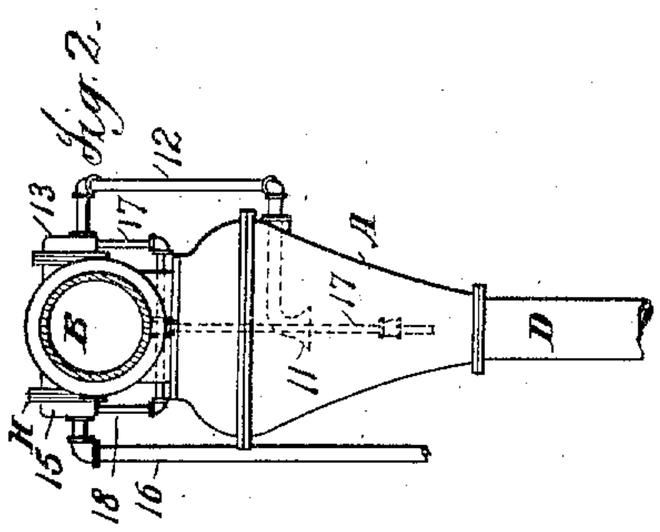

Fig. 2.

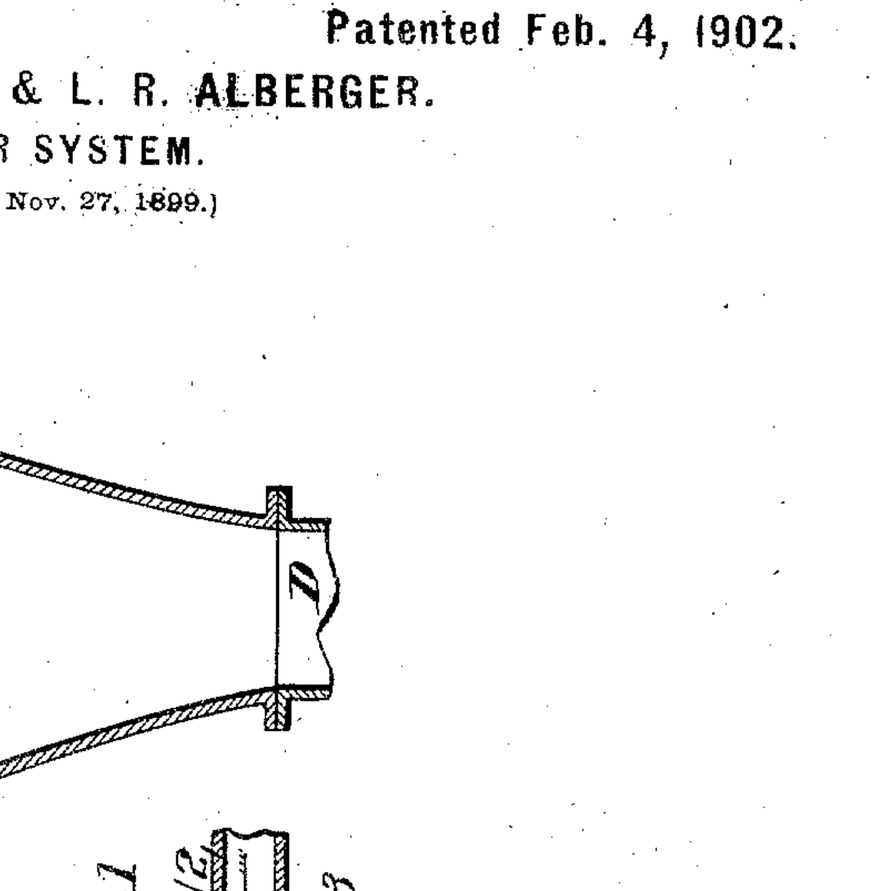

Fig. 4.

Fig. 1.

Attest:
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UNITED STATES PATENT OFFICE.

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CONDENSER SYSTEM.

SPECIFICATION forming part of Letters Patent No. 692,810, dated February 4, 1902.

Application filed November 27, 1899. Serial No. 738,306. (No model.)

To all whom it may concern:

Be it known that we, CHARLES C. WORTHINGTON, a resident of Dunnfield, Warren county, New Jersey, and LOUIS R. ALBERGER, a resident of New York, New York county, New York, citizens of the United States, have invented certain new and useful Improvements in Condenser Systems, fully described in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to condenser systems of the class employing an elevated injector, jet, or similar condenser, the object of the invention being to provide a construction by which the air and other uncondensable vapors brought in with the steam and condensing water may be more efficiently removed from the condensing-chamber and delivered by the air-pump, which is preferably employed with such condensers.

The invention includes, broadly, the use of a surface air-cooler by which the air withdrawn from the condensing-chamber is cooled before entering the air-pump, this surface cooler preferably being placed on the pipe through which the condensing water passes to the condenser, so that the air is cooled by the condensing water. The surface cooler may, however, be otherwise placed and supplied with other cooling liquid within the invention, broadly considered. The invention includes also in addition to this broad invention certain features of construction and combinations of parts, all as fully described hereinafter, and specifically pointed out in the claims.

For a full understanding of the invention a detailed description of a construction embodying all the features of the same as applied in their preferred form will now be given in connection with the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a diagrammatic elevation of a condensing system embodying the invention. Fig. 2 is a partial view looking to the left in Fig. 1, with the steam-pipe cut off. Fig. 3 is a central vertical section of the condenser and air-cooler on a larger scale. Fig. 4 is a longitudinal section of the air-cooler on a still larger scale.

In the drawings, A is the condenser, having the steam-pipe B entering at the top, the condensing-water pipe C surrounded by the steam-pipe at the top of the condenser, and having the adjustable spray-plate 10 below the condenser end of the pipe C. The condenser tail-pipe D terminates in the hot-well E and preferably rests upon the bottom of the hot-well, as shown in dotted lines, so as to support the condenser and its pipe connections. The condensing water is shown as raised through the condensing-water pipe C by the circulating-pump F, and the air is withdrawn from the condenser and delivered by the air-pump G through the connections hereinafter described, the pumps F G being shown as separate steam-pumps, although it will be understood that any other suitable arrangement may be used for pumping the condensing water and air.

The condenser shown is an injector-condenser of the form shown in United States Letters Patent No. 227,342; but it will be understood that an injector-condenser of any other suitable form may be used or any similar condenser in which the condensing water and steam are brought into contact and where it is desirable to remove the air and other uncondensable vapors from the condensing-chamber. The injector-condenser shown and other forms of injector, ejector, siphon, or induction condensers, to which may be applied the general term "aspirator-condensers," as distinguished from other condensers, will operate to carry off with the water a large part of the air; but especially in plants of considerable size the air-pump is preferably employed with such condensers and important advantages are secured thereby. Thus the amount of water required is reduced only to that necessary for condensation, even under light loads, as the current or flow of water need not be so large and rapid as that required to carry off the air without the air-pump even sufficiently for small and most-carefully-constructed plants. The air-pump is not required to remove all the air from the condensing-chambers of such condensers, but only that not removed with the water by the aspirating-condenser, so that its work is light. The present invention, however, is applicable in

all cases in which an air-pump is thus employed in connection with condensers, whether the air-pump be used to remove all the air and other uncondensable vapors or not.

Referring now to the connections between the air-pump B and the condenser, to which connections the present invention particularly relates, the condensing-chamber of condenser A has in its upper part below the spray-pipe 10 an air-receiver 11, preferably placed centrally of the chamber and having a flaring or bell-shaped mouth opening downwardly, as shown, so as to form a bell, which receiver or bell is connected by pipe 12 with the chamber 13 at one end of the surface air-cooler H, placed within the condensing-water pipe C, so that the condensing water on its way to the condensing-chamber cools the surfaces, by contact with which the air is cooled, which surfaces are shown as formed by the tubes 14, through which the air passes from chamber 13 to chamber 15 at the opposite end of the cooler, the condensing water passing through the spaces between these pipes. It will be seen that the surface air-cooler H forms a supplementary condensing-chamber arranged within the water-delivery pipe C and cooled by the water passing through said pipe. The air-pipe 16, forming the suction-pipe of air-pump G, connects with chamber 15, so that the air is cooled before entering this pipe and the pump G.

The bell-shaped or flaring opening of the air-receiver 11 in the condensing-chamber aids materially in securing the escape of water entrained with the air by reducing the initial velocity of the air and is preferably employed for this purpose, although the pipe 12 may connect directly with the upper part of the condensing-chambber without such receiver. Even with such air-receiver, however, and still more if this be not employed, some water may be carried up the pipe 12 with the air, and thus pass to the air-pump G. The quantity of such water will be slight and may be neglected; but to separate this water thus carried through pipe 12 with the air we preferably use baffle-plates 1 within the chamber 13, which aid in separating out the water, and we provide a drain-pipe 17 from chamber 13, which preferably connects with the lower part of the condensing-chamber or the upper part of the tail-pipe D, as shown, although, of course, this pipe may run to any other suitable part of the system or elsewhere. With the drain-pipe 17 preferably connects also a drain-pipe 18 from chamber 15, so that any water that may possibly be carried over to chamber 15 will be removed thereby. By thus cooling the air on its way from the condenser to the air-pump we are enabled to secure a much more efficient removal of the air and other uncondensable vapors from the condenser, increasing largely the efficiency of the apparatus. As this cooling of the air also increases its density and decreases its volume, a smaller air-pump may be used, with a more efficient action of the pump and less generation of heat by the compression and delivery of the air.

It will be understood that our invention is not to be limited to the apparatus shown, but that other forms of apparatus are well adapted for the use of our invention and that the form and arrangement of the air-cooler connections between the condenser and air-pump may also be varied widely without departing from the invention.

What we claim is—

1. In a condensing system in which the air or part of the air is removed from the condensing-chamber by an air-pump, the combination with the condenser and connections to the air-pump, of a surface cooler and cooling-liquid connections therefor for cooling the air on its way to the air-pump by liquid-cooled surfaces, substantially as described.

2. In a condensing system in which the air or part of the air is removed from the condensing-chamber by an air-pump, the combination with the condenser and connections to the air-pump, of a surface cooler cooled by the incoming condensing water for cooling the air on its way to the air-pump, substantially as described.

3. The combination with an elevated injector or other aspirating condenser, an air-pump, and connections between the condenser and air-pump for removing air from the condensing-chamber, of a surface cooler and cooling-liquid connections therefor between the condenser and air-pump for cooling the air on its way to the air-pump by liquid-cooled surfaces, substantially as described.

4. The combination with condensing-chamber A, of air-receiver 11 placed centrally of the chamber and flaring downwardly, an air-pump, pipe connections between receiver 11 and the air-pump, and a surface air-cooler on said connections, substantially as described.

5. The combination with condensing-chamber A and condensing-water pipe C, of air-cooler H on said pipe C and having end chambers 13, 15 and pipes 14 through which the air passes, and pipes connecting said chambers 13, 15 respectively with the condensing-chamber and air-pump, substantially as described.

6. The combination with condensing-chamber A and condensing-water pipe C, of air-cooler H on said pipe C and having end chambers 13, 15 and pipes 14 through which the air passes, pipes connecting said chambers 13, 15 respectively with the condensing-chamber and air-pump, baffles 1 in chamber 13 for separating the water, and drain-pipe 17 from chamber 13, substantially as described.

7. The combination with condensing-chamber A and condensing-water pipe C, of air-cooler H on said pipe C and having end chambers 13, 15 and pipes 14 through which the air passes, pipes connecting said chambers 13, 15 respectively with the condensing-chamber and air-pump, baffles 1 in chamber 13 for separating the water, and drain-pipes 17, 18 from chambers 13, 15, substantially as described.

8. The combination with condensing-chamber A and condensing-water pipe C, of air-cooler H on said pipe C and having end chambers 13, 15 and pipes 14 through which the air passes, pipes connecting said chambers 13, 15 respectively with the condensing-chamber and air-pump, and drain-pipes 17, 18 from chambers 13, 15, substantially as described.

9. The combination with condensing-chamber A and condensing-water pipe C, of air-cooler H on said pipe C and having end chambers 13, 15 and pipes 14 through which the air passes, air-receiver 11 placed centrally of the condensing-chamber and flaring downwardly, pipes connecting the air-cooler with receiver 11 and the air-pump, baffles 1 in chamber 13 for separating the water, and drain-pipe 17 from chamber 13, substantially as described.

10. The combination with condensing-chamber A, condensing-water pipe C and a surface air-cooler on said pipe, of pipes connecting said surface air-cooler with the condensing-chamber and the air-pump, and a water-drain pipe from said air-cooler connecting with the condensing-chamber or its delivery connections for carrying off water drawn from the condensing-chamber with the air or condensed in the air-cooler, substantially as described.

11. In a condenser, the combination with the condensing-chamber and the exhaust and water-delivery pipes leading thereto, a bell located in the condensing-chamber and a pipe opening beneath said bell and adapted to convey air therefrom, of a supplementary condensing-chamber arranged within the water-delivery pipe and cooled by the water passing therethrough, and a pipe leading from said supplementary condenser to an air-suction pipe, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

CHAS. C. WORTHINGTON.
LOUIS R. ALBERGER.

Witnesses:
B. W. PIERSON,
CHARLES W. NICHOLS.