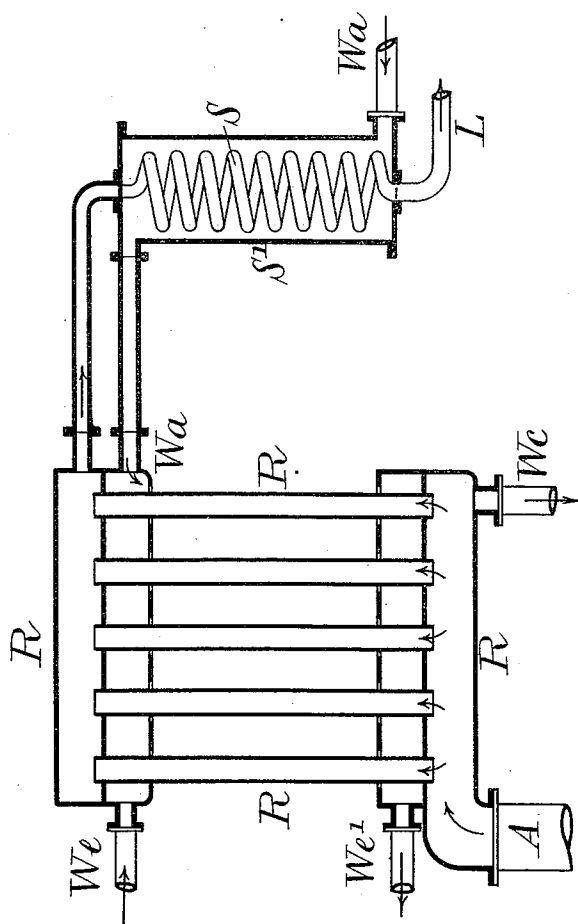


(No Model.)

E. THEISEN.
SURFACE CONDENSER.

No. 546,946.

Patented Sept. 24, 1895.



Witnesses:

Geo. W. Rea.

Albert Corzette.

Inventor.

Eduard Theisen.

By

James L. Norris.

Atty.

UNITED STATES PATENT OFFICE.

EDUARD THEISEN, OF BADEN-BADEN, GERMANY.

SURFACE CONDENSER.

SPECIFICATION forming part of Letters Patent No. 546,946, dated September 24, 1895.

Application filed August 28, 1894. Serial No. 521,555. (No model.) Patented in Belgium August 4, 1894, No. 111,263; in France August 4, 1894, No. 240,538; in England August 11, 1894, No. 5,351; in Austria September 21, 1894, No. 44/4,978, and in Hungary January 5, 1895, No. 1,862.

To all whom it may concern:

Be it known that I, EDUARD THEISEN, engineer, a citizen of the United States, residing at Kronprinzenstrasse 4, Baden-Baden, Germany, have invented a certain new and useful Surface Condenser, (for which I have obtained Letters Patent in Belgium, dated August 4, 1894, No. 111,263; in France, dated August 4, 1894, No. 240,538; in Austria, dated September 21, 1894, No. 44/4,978; in Hungary, dated January 5, 1895, No. 1,862, and in Great Britain, dated August 11, 1894, No. 5,351,) of which the following is a specification.

15 In surface condensers working with cooling by evaporation, where the actual cooling medium is the atmospheric air, the cooling-water only serving by its evaporation to transfer to the air the heat of the steam which is set free on condensation, there is, in consequence of the comparatively high condensing temperature of about 60° centigrade, when compared with the vacuum obtained, a considerable volume of uncondensed gases contained in the condenser. In addition such air as leaks in, owing to want of tightness of the cylinder, stuffing-boxes, pipe connections, &c., is the more detrimental the higher the temperature of the condenser is. This condition is especially to be observed when for the purpose of economy in first outlay and in subsequent working means of cooling the water are omitted and the cooling-water is used over and over again, with an addition of fresh cooling-water to make good that lost by evaporation, this quantity being nearly equal to that of the water of condensation from the steam. Now the volume of uncondensed gases which have to be withdrawn from the condenser determines the size and working of the air-pump, and on this ground it is desirable that the uncondensed gases should have as low a temperature as possible when entering the air-pump, as the lower the temperature is the smaller will be the volume, and a better vacuum will be easily gained. On the other hand, the rapidity of evaporation of the evaporative condensing-water, and consequently the intensity of the condensation, will depend mainly upon the difference

between the temperature of such water and that of the atmospheric air passing in contact therewith. The greater this difference is the more rapid will be the evaporation, or, in other words, the smaller can be the amount of surface of the condenser for performing a certain duty. As now the temperature of the atmospheric air is practically a determined factor, the said difference of temperature will be increased when the temperature of the cooling-water is kept as high as possible, and nearly equal to that of the steam entering the condenser. Now, according to my present invention, I prevent such detrimental cooling effect, and at the same time reduce the volume of the uncondensed gases before they enter the air-pump by employing the afore-said supplemental supply of cold condensing-water to cool the uncondensed gases withdrawn from the evaporative surface condenser, and consequently reduce their volume before they enter the air-pump, the supplemental condensing-water being thereby correspondingly raised in temperature before it is added to the main body of evaporative condensing-water of the condenser. By this means it will be seen that the double beneficial effect is obtained of, on the one hand, considerably reducing the size and work of the air-pump for performing a certain amount of duty, and, on the other hand, of utilizing, first, the low temperature of the supplemental cooling-water, and, secondly, the quantity of this water for cooling by evaporation.

On the accompanying drawing is shown by way of example a diagrammatic section of an apparatus by which the above-described method of operating can be carried out.

The exhaust-steam from the steam-engine or other apparatus is condensed on the inner surface of the evaporative surface condenser R, in which the steam enters at A. The water of condensation runs down the tubes into the bottom compartment and is drawn off at Wc. The outer surfaces of the condenser R receive a supply of evaporative condensing-water from the supply We, and after flowing down the outer surfaces of the tubes this water is drawn off at We', as indicated by the arrows. Atmospheric air is made to

impinge upon the film of water flowing down the tubes R, a portion of which is consequently continuously evaporated and carried off thereby. This loss is continuously replaced by an additional supply of condensing water which enters at Wa, after having been made to pass through a casing S' in contact with the refrigerating-worm S, through which the uncondensed gases are drawn off from the condenser R by the air-pump (not shown) connected to S at L, such gases being thus cooled down to a corresponding extent before entering the air-pump, while the additional condensing-water entering at Wa is warmed to a corresponding extent before mixing with the main supply of condensing-water.

It will be evident that the apparatus for carrying out my above-described method of operating can be variously constructed without departing from the nature of my invention. The accompanying diagram is only intended as an example of the mode of carrying the invention into practice.

Having thus described the nature of my

invention and the best means I know for carrying the same into practical effect, I claim—

The combination with an evaporative surface condenser, of a supplemental surface condenser through which the uncondensed gases from the evaporative surface condenser are to be drawn off on their way to an air pump, the outer casing of the supplemental surface condenser being made to communicate at one end with a supply of cold water and at the other end with the compartment of the evaporative surface condenser into which the worm evaporative condensing water is sent, substantially as shown and described and for the purposes specified.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 7th day of August, A. D. 1894.

EDUARD THEISEN.

Witnesses:

ERNEST THERION,
T. KLAUSMANN.