

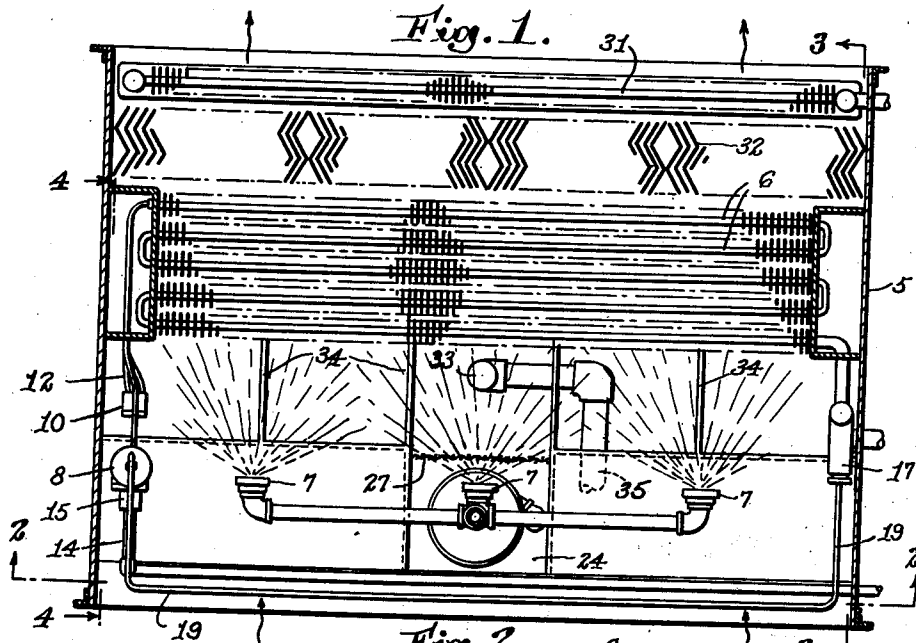
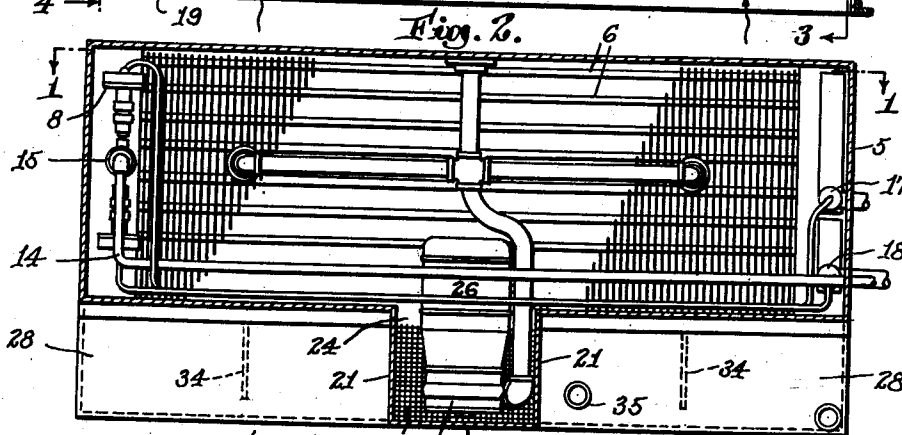
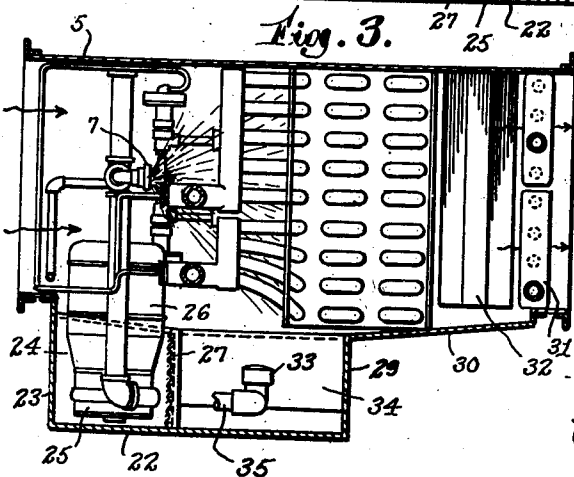
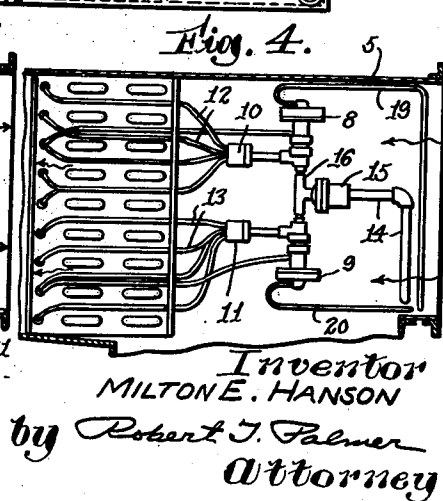
Feb. 6, 1940.

M. E. HANSON

2,189,731

SPRAYED EVAPORATOR

Filed Aug. 13, 1938



Inventor
MILTON E. HANSON

by Robert J. Palmer
Attorney

UNITED STATES PATENT OFFICE

2,189,731

SPRAYED EVAPORATOR

Milton E. Hanson, Collingswood, N. J., assignor
to B. F. Sturtevant Company, Hyde Park,
Boston, Mass.

Application August 13, 1938, Serial No. 224,756

9 Claims. (Cl. 62—129)

This invention relates to refrigeration apparatus and relates more particularly to a washed evaporator for the cooling of air.

In passenger vehicles such as railway passenger cars, the so-called dry surface evaporators have been used for air cooling with the air to be cooled, blown or drawn over the evaporator coils. After a period of time, such evaporator coils become coated with a thick green scum, probably made up from vegetable and other organisms and from impurities deposited from the air. Such coils when clean do not remove odors from the air and after the above mentioned coating appears, they add undesirable odors to the air.

The advantages of air washers in cleaning and sterilizing air are well known and air washers have been used in railway passenger cars for air cooling. Such washers, however, not only occupied considerably more space than equivalent coil coolers, but bulky water cooling evaporators were provided on the under side of the cars, and large volumes of water were required. Such equipment could not be used on the modern light weight stream-lined coaches.

This invention provides a combined air cooling evaporator and air washer combining the advantages of and eliminating the disadvantages of both types. Water is sprayed upon the evaporator coils to keep them clean while washing and sterilizing the air. The evaporator coils provide a large air cooling surface so that but a relatively small volume of water is required. The water pump, expansion valves and associated apparatus are enclosed completely within the cooler casing and are adjustable through the air inlet thereof.

An object of the invention is to provide a combined air washer and evaporator air cooler.

Another object of the invention is to enclose an air cooling evaporator, an air washer for same, a water pump and an expansion valve in a unitary air cooler.

Other objects of the invention will be apparent from the following description taken with the drawing.

The invention will now be described with reference to the drawing, of which:

Fig. 1 is a sectional plan view with section taken along the lines 1—1 of Fig. 2;

Fig. 2 is an end view in section along the lines 2—2 of Fig. 1;

Fig. 3 is an elevation view in section along the lines 3—3 of Fig. 1, and

Fig. 4 is a sectional view along the lines 4—4 of Fig. 1.

The casing 5 has mounted therein, the finned evaporator tubes 6. In advance with respect to air flow of the tubes are the spray nozzles 7 which are mounted to spray water across the entire face of

the tubes and to project water spray upon all of the tubes with sufficient pressure to wash them.

The expansion valves 8 and 9 and their distributors 10 and 11 are mounted in the inlet of the casing 5 adjacent one side thereof. The rows of tubes 6 are divided into upper and lower groups and the valve 8 and distributor 10 serve the upper group through the tubes 12 with refrigerant and the valve 9 and distributor serve the lower group with refrigerant through the tubes 13. The valves are supplied with refrigerant through the pipe 14, filter 15 and T connection 16.

The thermostats 17 and 18 at the suction sides of the two groups of tubes control through the tubes 19 and 20 respectively the expansion valves 8 and 9 respectively, and are mounted in the inlet to the casing 5 at the other side of the tubes 6.

The vertical lower walls 21 (Fig. 2) of the casing 5 form with the relatively narrow horizontal lower wall 22 and vertical wall 23 and screen 27, a relatively narrow and relatively deep sump 24 at the front end of the casing. This sump 24 is substantially square in cross section and surrounds the centrifugal pump 25 which with its motor 26 is mounted with shaft vertical in the sump 24. The screen 27 separates the relatively narrow sump 24 from the relatively wide sump 28 which is formed by the outer vertical sides of the casing 5, the vertical wall 29 and the lower wall 22. The two sumps 24 and 28 communicate with each other through the screen 27 to form a substantially T-shaped sump. The lower wall 30 (Fig. 3) extends under the evaporator tubes 6, heater sections 31 and eliminators 32 and extends downwardly at an angle to the sump 28 so as to drain water returned from the tubes 6, eliminators 32 and heaters 31 into the sump 28. The sump 28 also contains the overflow connection 33, which drains excess water from the sumps through the pipe 35 to maintain a desired high water level. The usual drain connection (not shown) is provided for draining the two sumps.

The vertical partitions 34 are provided for preventing water surges during side to side movement of the car.

The screen 27 prevents any sediment from entering the pump suction connection, and by enclosing the pump in a relatively small, relatively deep sump, the pump suction connection is always below the water level so no air can enter the pump.

This design enables the air to be cleaned and the evaporator tubes washed with a minimum of water. In the embodiment illustrated, only 12 gallons of water are required as compared with several times that amount previously required.

In practice, the sumps are drained at the end of each day or the end of each run and before the next run is started, 12 gallons of fresh water are added by a hose connection under the car

to an extension of the drain pipe. When the proper amount of water has been added, this fact is indicated by water draining through the connection 33 and pipe 35 upon which the attendant discontinues the supply of water.

The water from the nozzles 7 not only cleans and sterilizes the air but washes the coils preventing the collection thereon of organisms and other impurities. The washed evaporator tubes provide clean air contacting surface which together with the water spray is effective for cooling the air.

By placing the pump, the expansion valves, distributors and assembled fittings entirely within the casing, not only is a clean attractive unit provided which is more readily adaptable for shipment and for installation but less trouble is encountered due to the housing of all equipment within the casing where it cannot be damaged through accidental contact with the sides of the shipping carton or with the sides of the car or installation equipment during the installation. As a result, the unit can be installed with the equipment in the condition at which it left the factory.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact apparatus and arrangement of apparatus described, since many departures may suggest themselves to those skilled in the art without departure from the invention.

What is claimed is:

1. An air cooler comprising a casing, means forming an air inlet in said casing, a plurality of groups of evaporator tubes extending crosswise said casing, a plurality of expansion valves for said groups, spray nozzles adjacent the air inlet end of said casing for spraying water upon said tubes, means forming a sump in said casing, and means connected to said nozzles for supplying water from said sump to same.

2. An air cooler comprising a casing, means forming an air inlet in said casing, a plurality of groups of evaporator tubes extending crosswise said casing, a plurality of expansion valves and a plurality of distributors for said groups, spray nozzles adjacent the air inlet end of said casing for spraying water upon said tubes, means forming a sump in said casing, and means connected to said nozzles for supplying water from said sump to same.

3. An air cooler comprising a casing, means forming an air inlet in said casing, a plurality of groups of evaporator tubes extending crosswise said casing, a plurality of expansion valves for said groups, spray nozzles adjacent said air inlet for spraying water upon said tubes, means forming a sump in said casing, and a pump in said sump adjacent said air inlet and connected to said nozzles for supplying water from said sump to same.

4. An air cooler comprising a casing, means forming an air inlet in said casing, a plurality of groups of evaporator tubes extending crosswise said casing, a plurality of expansion valves for said groups, spray nozzles adjacent said air inlet for spraying water upon said tubes, means forming a sump in said casing, and a pump in said sump adjacent said air inlet and connected to said nozzles for supplying water from said

sump to same, said nozzles, said valves and said pump being adjacent said air inlet for adjustment therethrough.

5. An air cooler comprising a casing, means forming an air inlet in said casing, a plurality of evaporator tubes extending crosswise said casing, spray nozzles adjacent said air inlet for spraying water upon said tubes, means forming a relatively deep, relatively narrow and relatively short sump extending from the air inlet end of said casing along a central longitudinal line thereof, means forming a relatively wide sump connecting with said narrow sump, and a pump in said narrow sump connected to said nozzles for supplying water from said narrow sump to same.

6. An air cooler comprising a casing, means forming an inlet in said casing, a plurality of evaporator tubes extending crosswise said casing, spray nozzles adjacent said air inlet for spraying water upon said tubes, means forming a relatively deep, relatively narrow and relatively short sump extending from the air inlet end of said casing along a central longitudinal line thereof, means forming a relatively wide sump connecting with said narrow sump, a pump in said narrow sump connected to said nozzles for supplying water from said narrow sump to same, and an overflow connection in said wide sump.

7. An air cooler comprising a casing, means forming an air inlet in said casing, a plurality of evaporator tubes extending crosswise said casing, an expansion valve in said casing connected to said tubes, spray nozzles adjacent said air inlet for spraying water upon said tubes, means forming a relatively deep, relatively narrow and relatively short sump extending from the air inlet end of said casing along a central longitudinal line thereof, means forming a relatively wide sump connecting with said narrow sump, a pump in said narrow sump connected to said nozzles for supplying water from said narrow sump to same, and an overflow connection in said wide sump.

8. An air cooler comprising a casing, means forming an air inlet in said casing, a plurality of groups of evaporator tubes extending crosswise said casing, a plurality of expansion valves for said groups, spray nozzles adjacent said air inlet for spraying water upon said tubes, means forming a relatively deep, relatively narrow and relatively short sump extending from the air inlet end of said casing along a central longitudinal line thereof, means forming a relatively wide sump connecting with said narrow sump, a pump in said narrow sump connected to said nozzles for supplying water from said narrow sump to same, and an overflow connection in said wide sump, said nozzles, said valves and said pump being adjacent said air inlet for adjustment therethrough.

9. A unit air cooler comprising a casing, a group of evaporator tubes extending across the upper portion of said casing, a second group of evaporator tubes extending across the lower portion of said casing, a refrigerant distributor means in said casing for the tubes of each group, a water sump in said casing under said tubes, and means in said casing for spraying water from said sump upon said tubes.

MILTON E. HANSON.