Feb. 2, 1932. J. H. DAVIS 1,843,210

AIR CONDITIONING METHOD AND APPARATUS FOR PASSENGER CARS

Filed Oct. 19, 1929

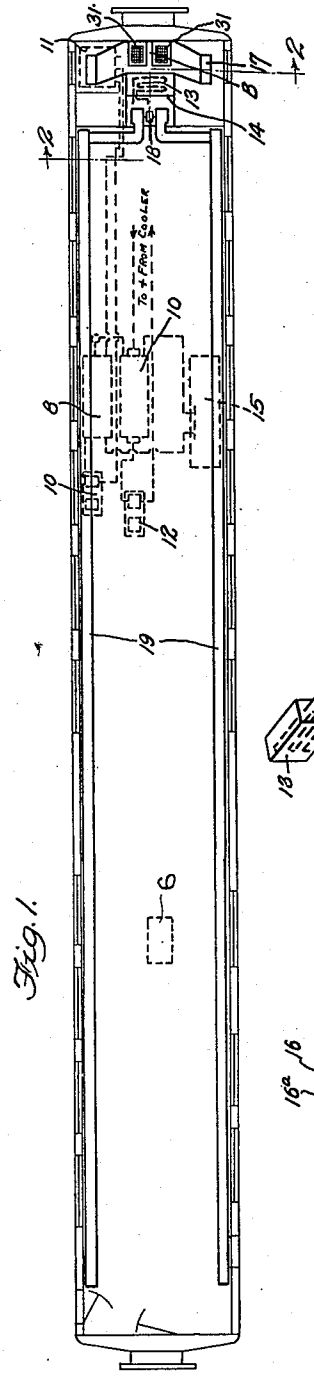

Fig. 1.

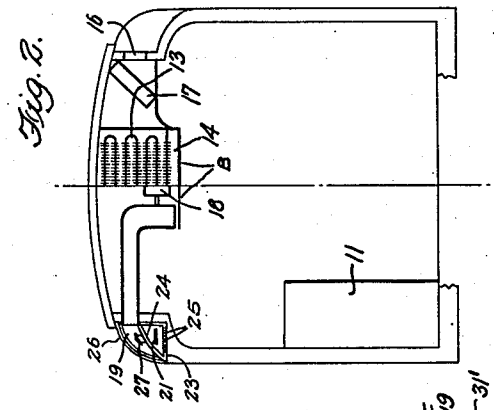

Fig. 2.

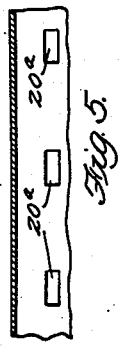

Fig. 5.

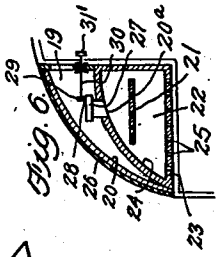

Fig. 6.

Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE

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AIR CONDITIONING METHOD AND APPARATUS FOR PASSENGER CARS

Application filed October 19, 1929. Serial No. 400,929. REISSUED

The object of my invention is the conditioning of air in passenger carrying cars, freeing it from all dust, soot, cinders and other foreign matter, and controlling its temperature and the humidity thereof, and the elimination of all drafts.

In the drawings, which are more or less diagrammatic:

Figure 1 is a top plan view of a car equipped with my invention.

Figure 2 is a vertical sectional view on the line 2—2, Figure 1.

Figure 3 is an outline perspective view of a car equipment designed to carry out my invention.

Figure 4 is a top plan view of one end portion of Figure 1.

Figure 5 is a top plan view of a portion of the half deck roof showing the air distributing ducts.

Figure 6 is an enlarged detail sectional view through the half deck of a car and the air conduit.

In Figure 1 of the drawings I have shown the layout for air conditioning equipment for an individual car system; that is to say, this car is a unit completely equipped with the necessary generating and refrigerating facilities for air conditioning.

To provide the electrical energy required for the air conditioning equipment a nominal 10 kilowatt 110 volt direct current generator 6 is mounted beneath the car floor and is driven by a positive drive from the car axle, in addition the necessary regulator for maintaining a constant voltage above a certain critical speed, necessary automatic switch, etc. In addition, the car may be equipped with a rotary converter 7 whereby alternating current from wayside points, such as depots and yards, may be converted to direct current so that the air conditioning equipment may be operated while the car is standing still.

A motor driven refrigerating unit 15 of proper capacity is mounted beneath the car floor, and compressed ammonia is delivered to the condenser tank 8 beneath the car floor. The hot ammonia is cooled by passing over water coils in the condenser tank 8. The ammonia is then passed through an expansion valve 9 and delivered to the evaporator tank 10 beneath the car floor. Here it circulates through tubes surrounded by water and during the expansion through these tubes chills the water in the evaporator tank. From the evaporator the ammonia passes back to the low pressure side of the compressor.

The water contained in the tubes of the condenser 8 becomes heated due to cooling the compressed ammonia, and it is circulated by means of the pump 10*a* and delivered to the center point of the cooling tower 11 in the corner of the car. Here the water is sprayed, air from within or outside of the car is drawn through the sprayed water, thus cooling the water back to about the temperature of air. The water is then available for reuse in the tubes of the condenser.

The chilled water in the evaporator 10 is taken by the pump 12 and is delivered to the surface cooler 13 located overhead in the end of the car. This cooler 13 consists of suitable form of piping of proper material to which is attached fins 14 for increasing the radiating surface, the coils being so arranged that as the air passes over the same the heat in the air will be given up to the cool surfaces of the cooler.

Normally the air in the car will be recirculated, but provision is made by means of a duct 16 for the admission of the desired amount of outside fresh air. This is controlled by a suitable damper 16*a*. The outside fresh air is passed through an air filter 17, which may be of a mechanical design, or of the water spray type. The drawings show the mechanical type of air filter because it occupies less space, weighs less, and its

cost is less than the spray type of air filter.

After the air is cooled by passing over the surface cooler 13 it is then drawn into the motor driven centrifugal fans 18, and delivered to the air ducts 19 on each side of the car at the half deck. As shown in Figures 2 and 6, these ducts are covered with insulation 20 so as to prevent the chilled air within the duct from becoming heated due to the outside light and the sun as well as the hot outside air during the summer time.

It being preferable to maintain the present pleasing lines of the interior of the car, I avail myself of the space 22 now in present construction in the half deck between the plate 23 and the half deck roof 24, the only change in the plate 23 is that I provide it with perforations 25 or suitable grill work. Over the half deck roof 24, I secure a plate 26 extending substantially the length of the car, thereby forming an air duct 19. The sheet or plate 26 is provided on the inside with suitable insulation 20. In the half deck roof 24, I provide with suitable intervals openings 20^a which establish communication between the duct 19 and the space 22, through which the treated air may pass from the duct into the space 22, and in order to prevent objectionable drafts from entering the car, I provide a perforated baffle 21, suitably secured in the space 22 under, but spaced from the openings 20^a. The air passes from the space 22 into the car through the perforations 25 of the half deck plate 23. In order that the admission of the conditioned air into the car may be under control, I provide dampers 27 for the openings 20^a which may be operated in any suitable manner from within the car, and merely for purposes of illustrating some means for operating these dampers, I have shown the damper provided with a rack 28 which is engaged by a pinion 29 mounted on the operating rod 30 having a hand wheel 31′ in the car, but of course it will be understood that I do not limit myself to this construction of damper operating means, as there are other means that may be employed for this purpose. If it is found that the conditioned air has a tendency to discharge into that end of the car near the cooler in too great a volume, this can be corrected by closing some of the dampers at that end, thus directing the air discharge further back into the car.

The air from the interior of the car is conducted through the ventilators 31 to the surface cooler 13.

While I have shown a preferable location for the air ducts 19, it is obvious that other dispositions and locations for these ducts may be adopted without departing from the spirit of my invention.

While I have named "ammonia" as the refrigerant, it is, of course, understood that any suitable refrigerant may be used.

What I claim is:

1. The method of conditioning the air in a passenger car, which consists in chilling water, circulating said water to a cooling surface, passing the air over said cooled surface to cool it and delivering said cooled air through ducts into the car.

2. In a railway car, in combination, in an air conditioning device for the car, an air filter, an air cooling device, a centrifugal fan, and air ducts opening into the interior of the car, all of said elements being in the half deck of the car.

3. In a railway car, in combination, in an air conditioning device for the car, an air filter, an air cooling device, a centrifugal fan, and air ducts opening into the interior of the car, all of said elements being in the half deck of the car, a cooling tower in said car and means connecting said cooling tower with said air cooling device.

4. In an air conditioning device for passenger cars, the combination with a generator on the axle of the car, a condenser, and an evaporator, circulating pumps connected with said generator, condenser and evaporator, an air cooling device connected with said evaporator, a water cooling tower connected with said condenser, an expansion valve between said condenser and evaporator.

5. In an air conditioning device for passenger cars, the combination with a generator on the axle of the car, a condenser, and an evaporator, circulating pumps connected with said generator, condenser and evaporator, an air cooling device connected with said evaporator, a water cooling tower connected with said condenser, an expansion valve between said condenser and evaporator, a centrifugal fan associated with said air cooling device, and ducts to convey the air into the car.

6. The method of conditioning and distributing air for passenger cars which consists in filtering the air, cooling the filtered air, and introducing the air into the car in the zone of the half deck of said car.

7. In combination, in a temperature regulating device for passenger cars, an air duct on the roof of the half deck of the car, ports extending from said duct through said roof, a half deck plate spaced from said roof to form a chamber in communication with said ports, and ports leading from said chamber into the car.

8. In combination, in a temperature regulating device for passenger cars, an air duct on the half deck roof of the car, a perforated half deck plate spaced from the roof, a wall extending from said plate to the said roof forming a chamber, ports leading from the air ducts into said chamber, and a baffle plate in said chamber below said ports.

9. In combination, in a temperature regulating device for passenger cars, an air duct

on the half deck roof of the car, a perforated half deck plate spaced from the roof, a wall extending from said plate to the said roof forming a chamber, ports leading from the air ducts into said chamber, and a baffle plate in said chamber below said ports and dampers controlling said ports.

10. The method of conditioning air and continuously distributing it at different points in the space occupied by passengers in railway cars, which consists in filtering the air, passing it over coolers and driving it through a system of ducts and distributing it throughout the car.

In testimony whereof I affix my signature.

JESSE H. DAVIS.