May 7, 1935. E. F. CARRY 2,000,477

COOLING AND VENTILATING SYSTEM

Filed Nov. 14, 1927 8 Sheets-Sheet 1

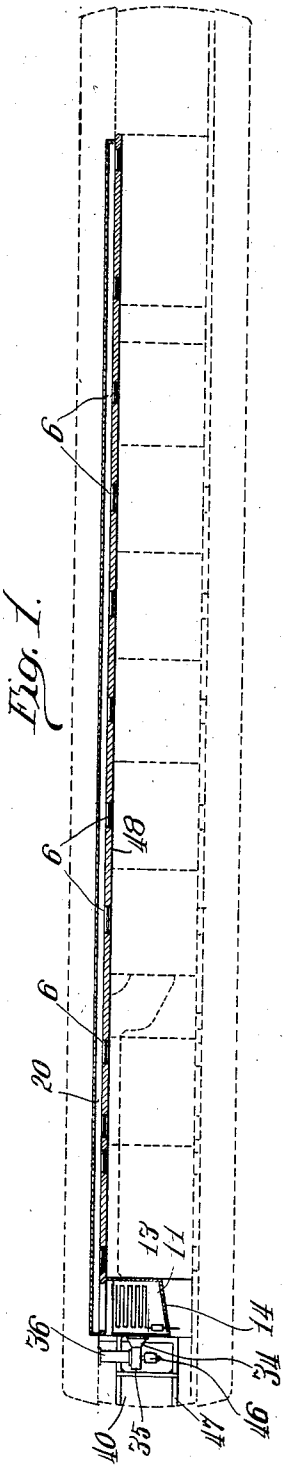


Fig. 1.

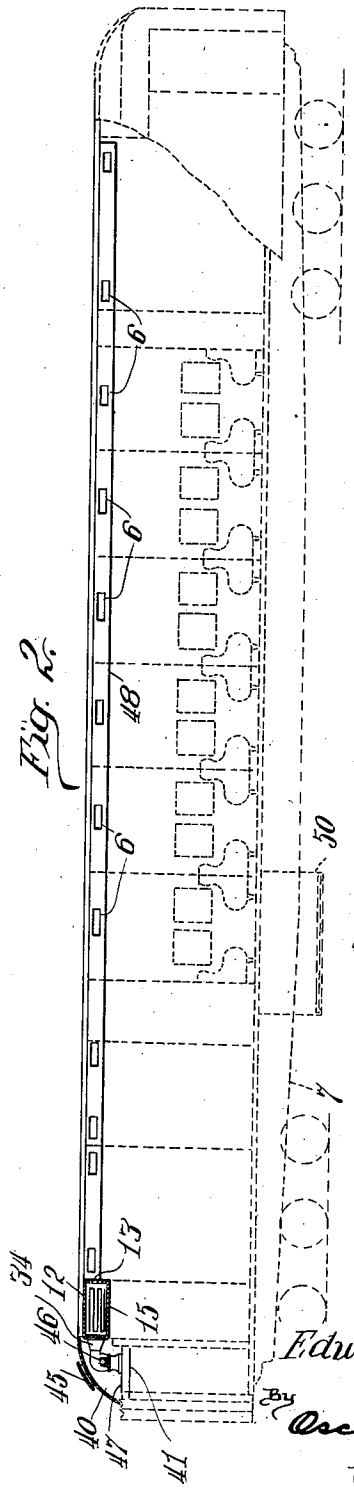


Fig. 2.

Inventor
Edward F. Carry
By Oscar Hochberg.
his Attorney

May 7, 1935. E. F. CARRY 2,000,477

COOLING AND VENTILATING SYSTEM

Filed Nov. 14, 1927 8 Sheets-Sheet 2

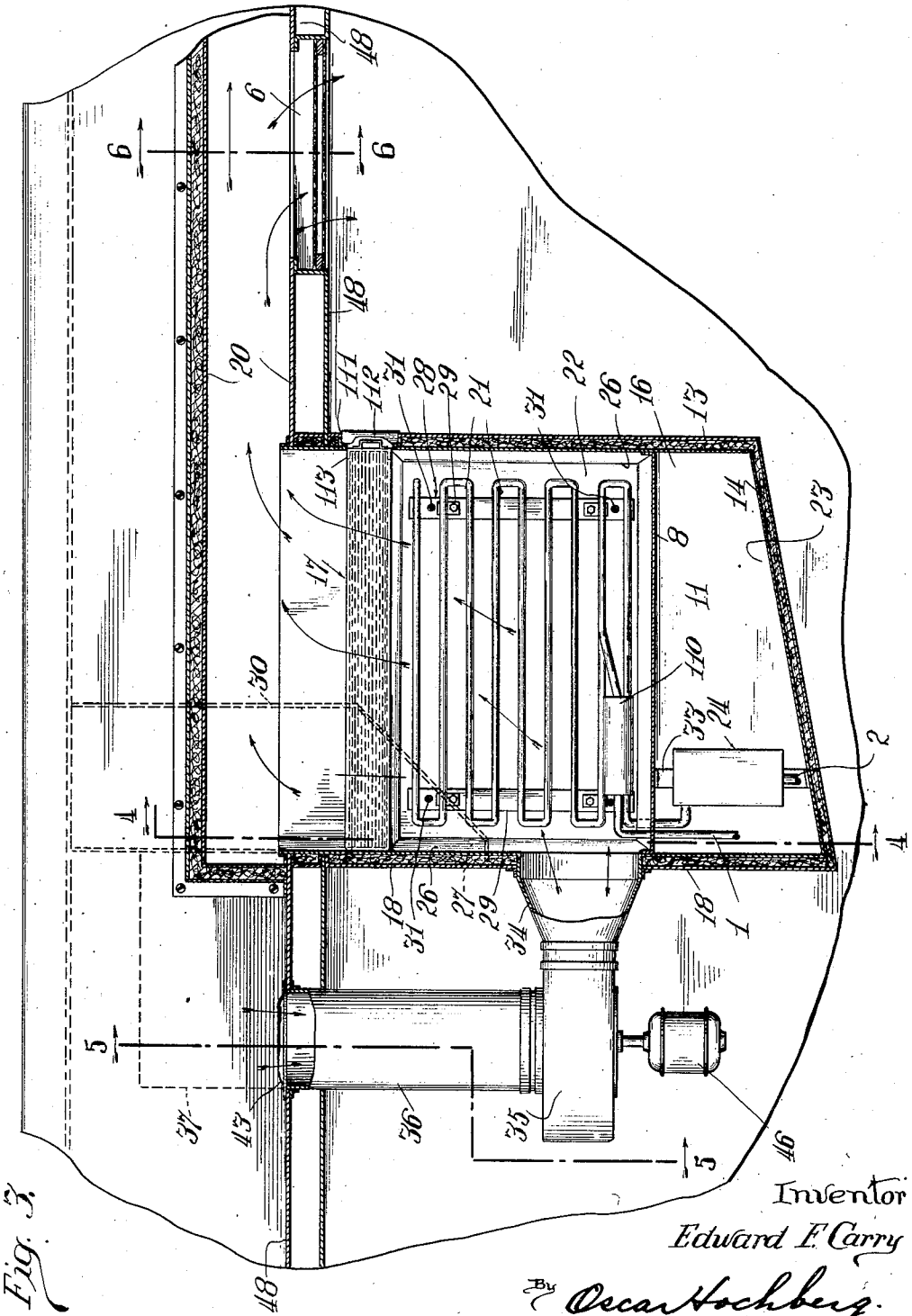


Fig. 3.

Inventor
Edward F. Carry
By Oscar Hochberg.
his Attorney.

May 7, 1935. E. F. CARRY 2,000,477

COOLING AND VENTILATING SYSTEM

Filed Nov. 14, 1927 8 Sheets-Sheet 3

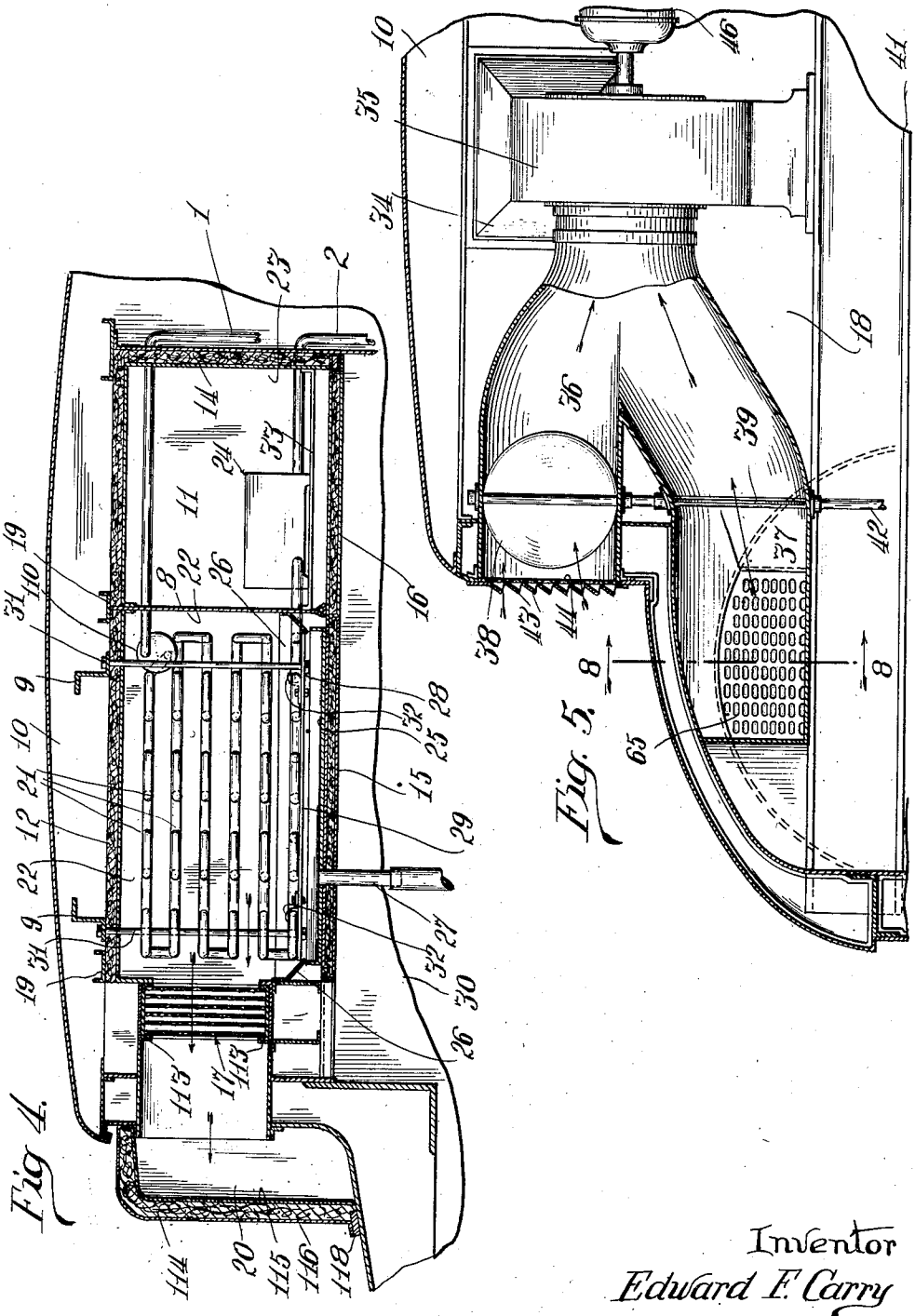


Fig. 4.

Fig. 5.

Inventor
Edward F. Carry
By Oscar Hochberg
his Attorney.

May 7, 1935. E. F. CARRY 2,000,477

COOLING AND VENTILATING SYSTEM

Filed Nov. 14, 1927 8 Sheets-Sheet 4

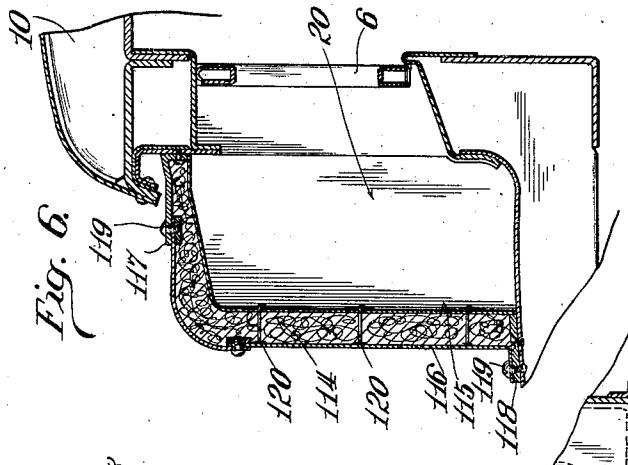


Fig. 6.

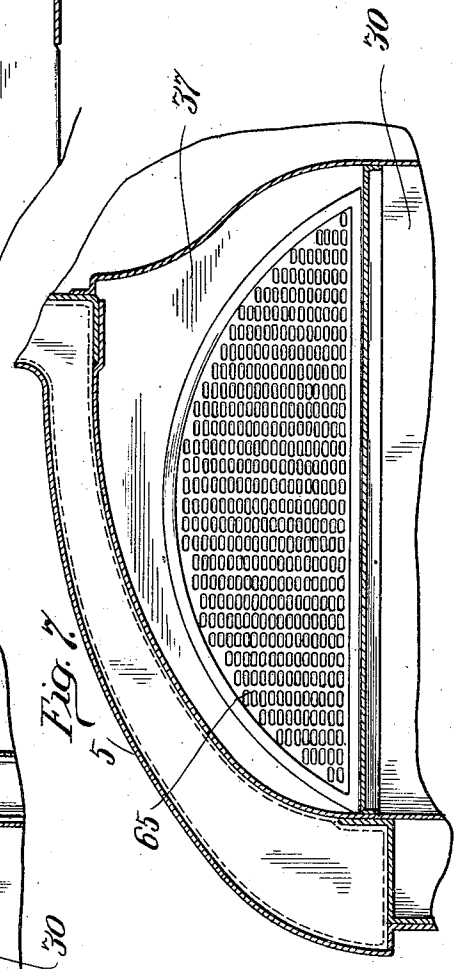


Fig. 7.

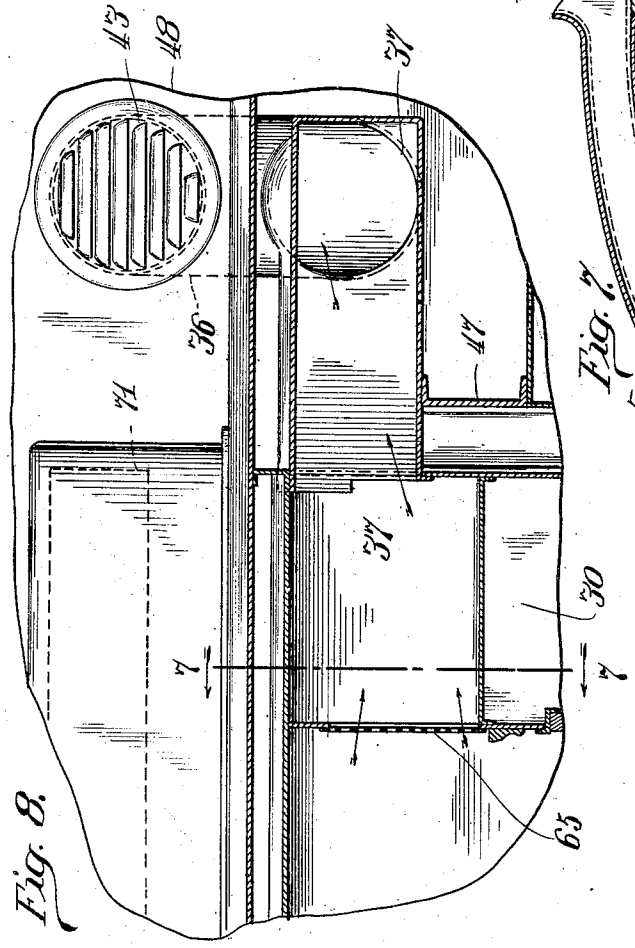


Fig. 8.

Inventor
Edward F. Carry
By Oscar Hochberg
his Attorney.

May 7, 1935. E. F. CARRY 2,000,477

COOLING AND VENTILATING SYSTEM

Filed Nov. 14, 1927 8 Sheets-Sheet 5

Fig. 10.

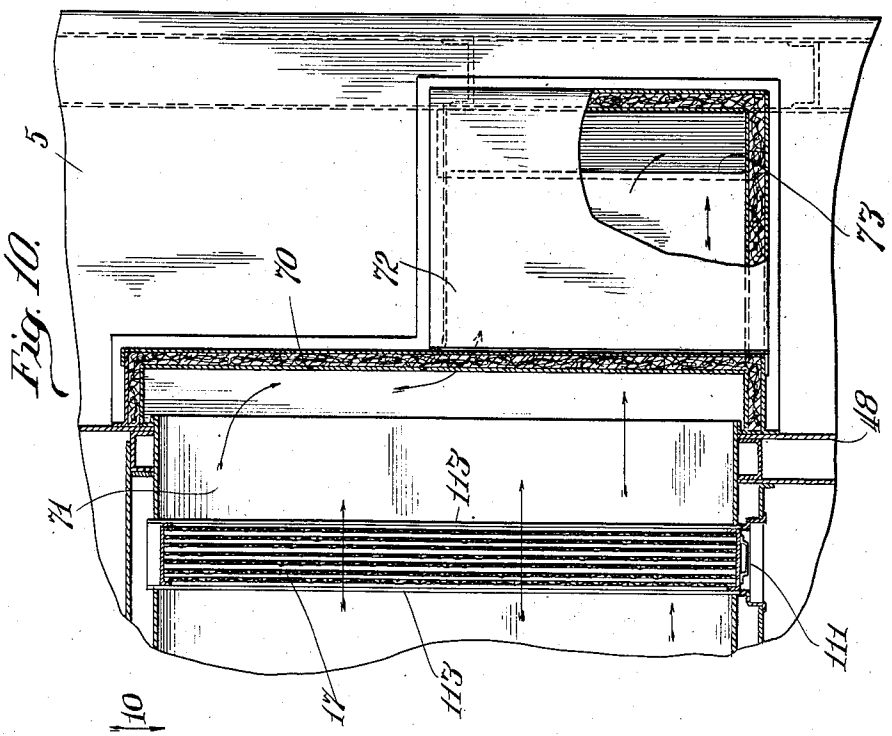
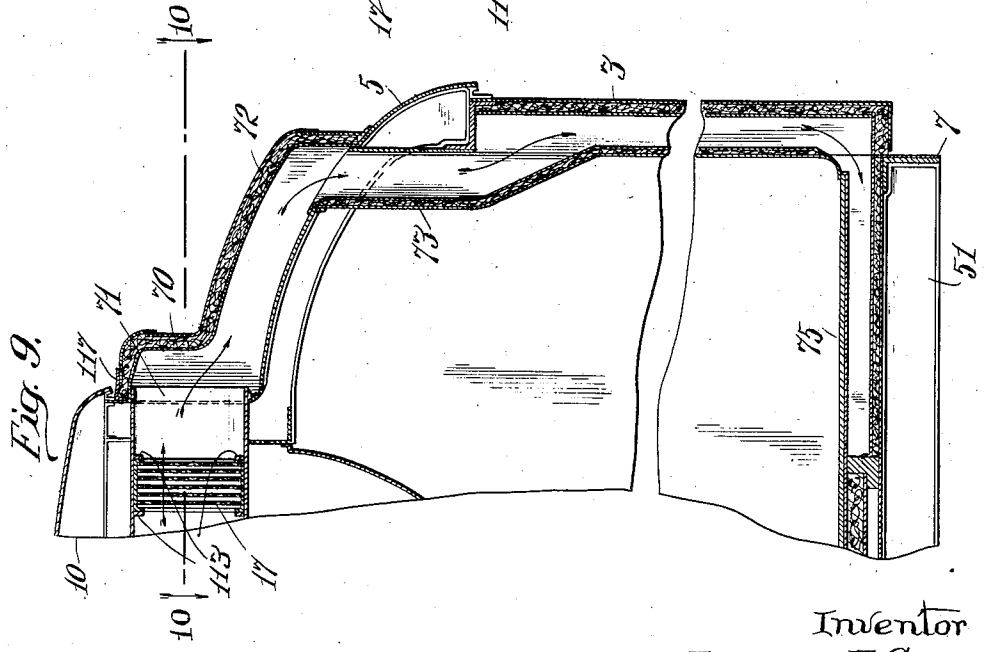


Fig. 9.

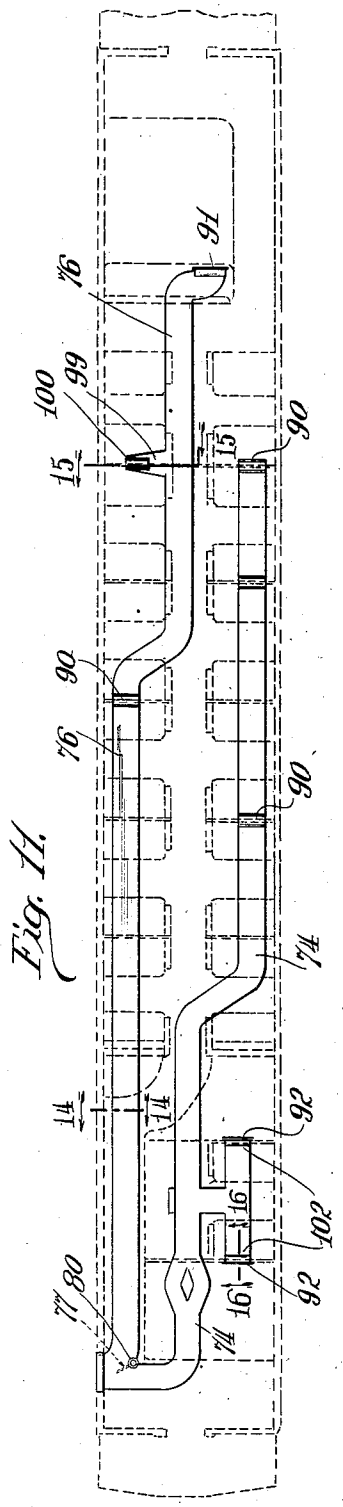


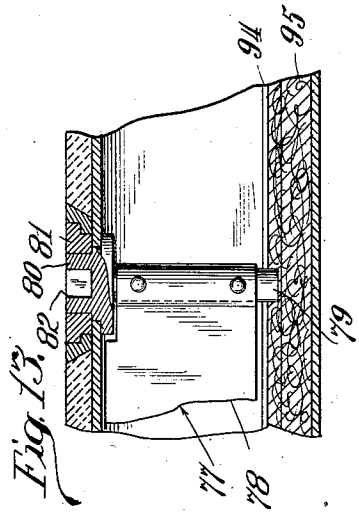
Inventor
Edward F. Carry
By Oscar Hochberg.
his Attorney

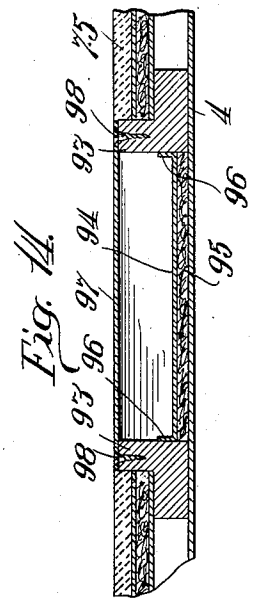
May 7, 1935. E. F. CARRY 2,000,477

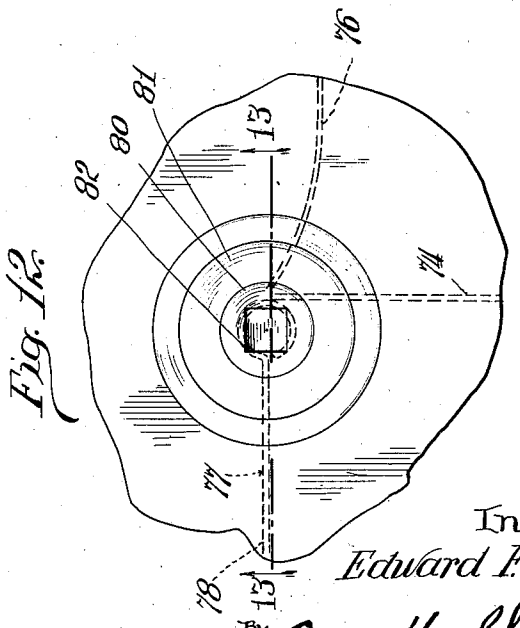
COOLING AND VENTILATING SYSTEM

Filed Nov. 14, 1927 8 Sheets-Sheet 6









Inventor
Edward F. Carry
By Oscar Hochberg.
his Attorney

May 7, 1935. E. F. CARRY 2,000,477

COOLING AND VENTILATING SYSTEM

Filed Nov. 14, 1927 8 Sheets-Sheet 7

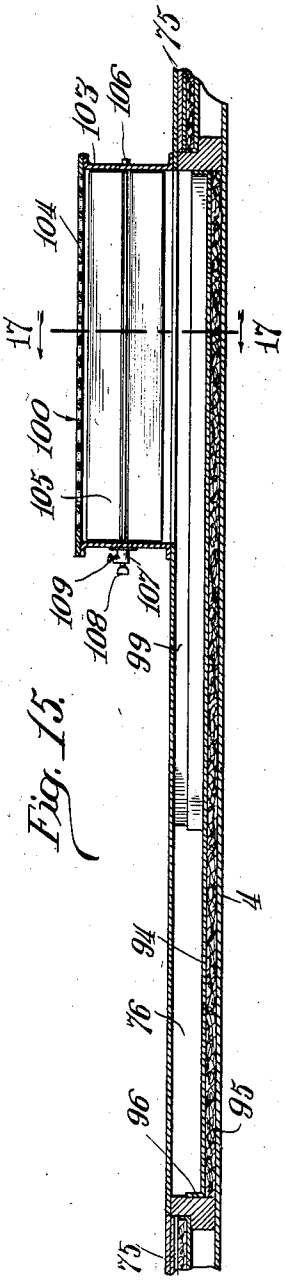


Fig. 15.

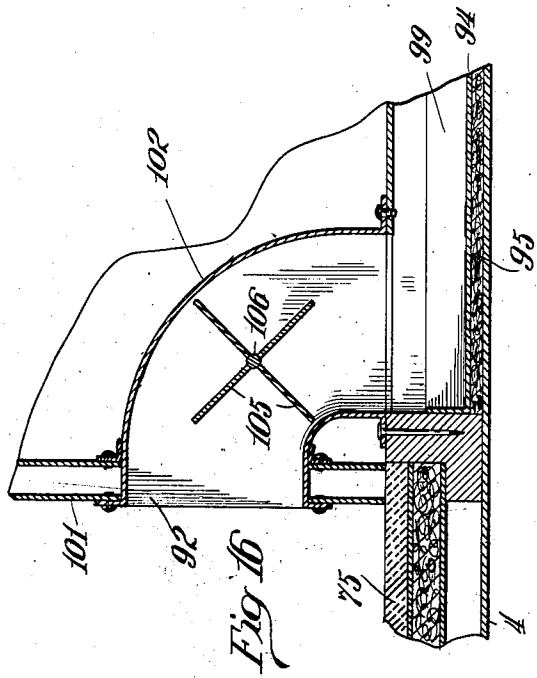


Fig. 16

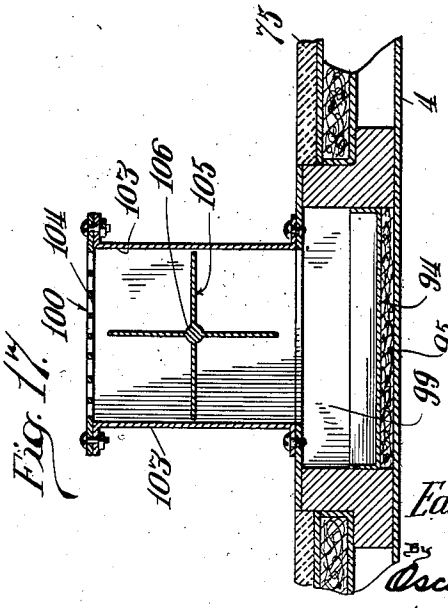


Fig. 17.

Inventor
Edward F. Carry
By Oscar Hochberg.
his Attorney

May 7, 1935. E. F. CARRY 2,000,477

COOLING AND VENTILATING SYSTEM

Filed Nov. 14, 1927 8 Sheets-Sheet 8

Fig. 18.

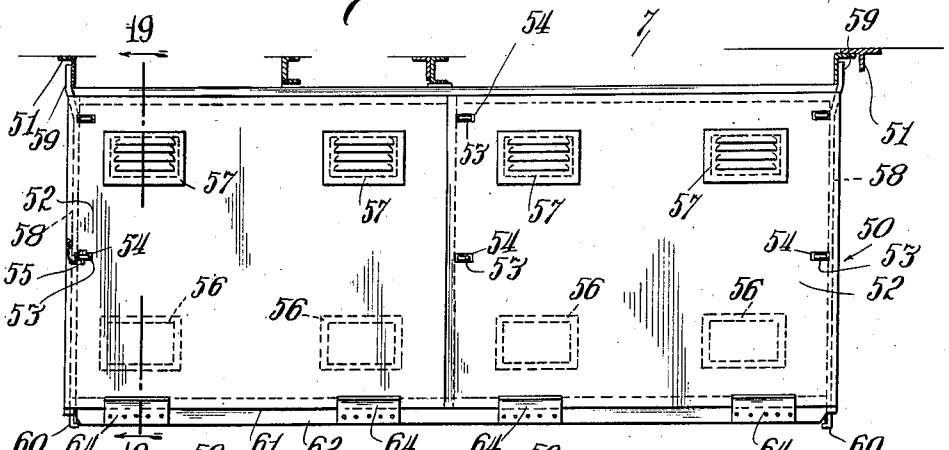


Fig. 19.

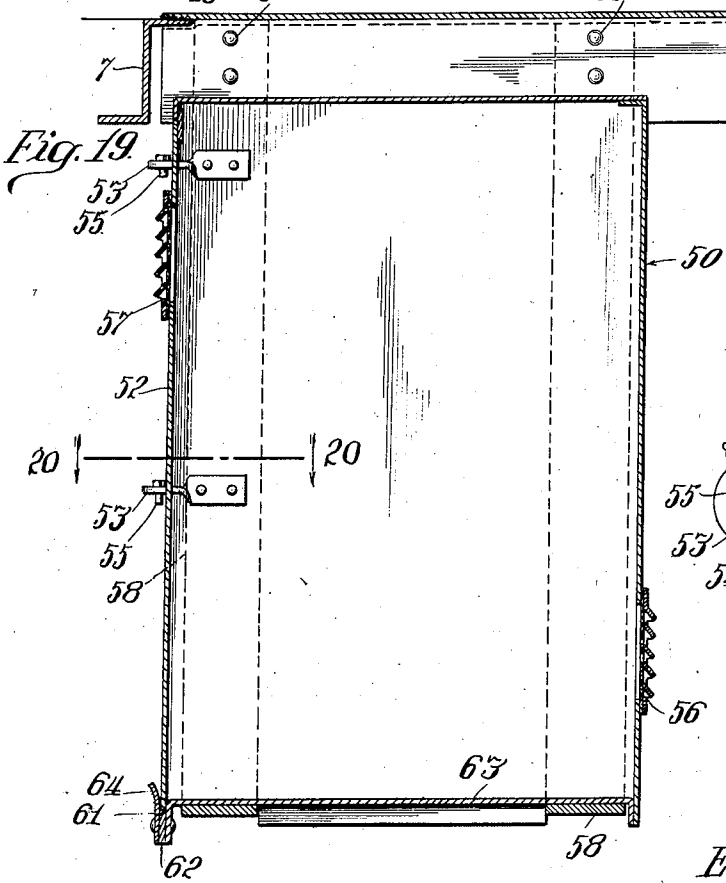
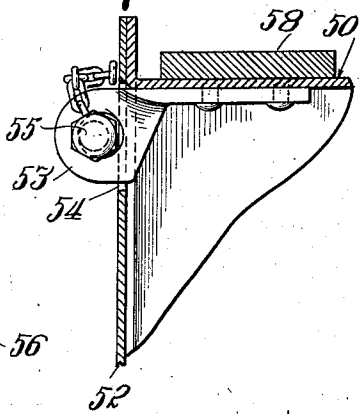


Fig. 20.



Inventor
Edward F. Carry
By Oscar Hochberg.
his Attorney

Patented May 7, 1935 2,000,477

UNITED STATES PATENT OFFICE

2,000,477

COOLING AND VENTILATING SYSTEM

Edward F. Carry, Chicago, Ill.; Mabel D. Carry, executrix of the estate of said Edward F. Carry, deceased, assignor to Pullman-Standard Car Manufacturing Company, a corporation of Delaware

Application November 14, 1927, Serial No. 233,101

11 Claims. (Cl. 62—117)

The invention relates to a cooling and ventilating system for conveyances, and particularly for use in railway passenger-train cars for which the present embodiment of the invention is especially adapted.

The principal object of the invention is to provide means for circulating air precooled and filtered by mechanism associated with the air circulating means.

Another object is to so adapt the car structure to the system that the operation, inspection, and repair of the air cooling and circulating means will be facilitated.

An important object is to utilize in the ventilating system power operated refrigerating mechanism of the type employing a circulating refrigerant automatically or manually controlled to maintain the air within the car at a given temperature.

A further object is to so dispose the air cooling and circulating mechanism as to adapt it to the overhead or floor duct systems of introducing air to the car interior, or to a combination of the two.

The foregoing and other objects are attained by the mechanism illustrated in the accompanying drawings, in which—

Fig. 1 is a diagrammatic plan of a car equipped with the invention and illustrating the installation adapted to the overhead system of introducing air to the car interior;

Fig. 2 is a diagrammatic elevational view of the same;

Fig. 3 is an enlarged plan view of the mechanism illustrated in Fig. 1, showing a portion of the upper air duct and the cooling chamber containing the expansion coil of the refrigerating apparatus and an associated air filter;

Fig. 4 is a vertical sectional transverse view taken on line 4—4 of Fig. 3 taken in the direction indicated by the arrows and showing the upper duct, air filter, expansion coil, and associated accumulator and float valve members of the refrigerating mechanism housed within the cooling chamber;

Fig. 5 is a similar section taken on line 5—5 of Fig. 3 indicating the relation between the outside and interior air intake ducts and an air discharge duct communicating with the air circulating power fan, and showing the air circulation control damper installation;

Fig. 6 is a transverse vertical sectional view through the upper air duct taken on line 6—6 of Fig. 3 looking in the direction indicated by the arrows and showing the application of insulation to the duct and the duct to the deck framing;

Fig. 7 is a similar view through the interior air duct immediately back of the intake grille panel taken on line 7—7 of Fig. 8 looking in the direction indicated by the arrows;

Fig. 8 is a longitudinal vertical sectional view taken on line 8—8 of Fig. 5 looking in the direction indicated by the arrows showing the interior air intake duct extending from the intake grille panel within the car to the fan mounted in the vestibule hood above the platform;

Fig. 9 is a vertical cross sectional view transversely of the car showing another embodiment of the invention in which the precooled and filtered air currents are directed downwardly through ducts formed in the side wall and floor areas of the car.

Fig. 10 is a horizontal sectional view taken on line 10—10 of Fig. 9 looking in the direction indicated by the arrows showing the lateral duct extension for directing air currents to the wall and floor areas, a portion of the lateral duct being torn away to show the wall duct;

Fig. 11 is a diagrammatic plan view of the modified embodiment of the installation showing the air supply ducts disposed in the floor area of the car and leading to outlets distributed throughout the length of the car;

Fig. 12 is a plan of the deflecting damper at the junction of the floor ducts for directing the air to one or the other of said ducts;

Fig. 13 is an elevational and sectional view of the same taken on line 13—13 of Fig. 12 looking in the direction indicated by the arrows;

Fig. 14 is a vertical transverse sectional view through one of the floor duct branches taken on line 14—14 of Fig. 11 looking in the direction indicated by the arrows and showing the duct and floor assembly;

Fig. 15 is a similar view taken on line 15—15 of Fig. 11 looking in the direction indicated by the arrows and showing a lateral duct extension to one of the air outlets;

Fig. 16 is a vertical sectional view through one of the lateral duct outlets in one of the partitions dividing the car interior and is taken on line 16—16 of Fig. 11 looking in the direction indicated by the arrows;

Fig. 17 is a similar view taken on line 17—17 of Fig. 15 looking in the direction indicated by the arrows and showing the relation of the outlet to the lateral duct extension.

Fig. 18 shows the method of suspending the ventilated chamber from the car underframe for

housing the compressor and condenser elements of the system, the front elevational view of the chamber being indicated;

Fig. 19 is a transverse vertical sectional view through said chamber taken on line 19—19 of Fig. 18 looking in the direction indicated by the arrow showing the removable door arrangement and disposition of the vent openings; and

Fig. 20 is a horizontal sectional view taken on line 20—20 of Fig. 19 looking in the direction indicated by the arrows showing one of the door locking hasp and pin assemblies and the disposition of one of the chamber supporting straps.

In practicing the invention, the overhead space between the deck slides above the vestibule platform and contiguous portion of the car interior is utilized for the purpose of housing the air cooling, circulating, and filtering apparatus of the system. The mechanism is supported from the upper carlines 10 of the car framing. In the present embodiment, the cooling chamber or compartment 11 is defined by the insulated ceiling panels 12, partition wall panels 13 and 14, and removable floor panels 15 and 16, one side of the chamber being closed by a removable air filter device 17 communicating with air duct 20 disposed longitudinally of the car at the deck side 48, the end wall 18 of the car forming the remaining side of the cooling chamber as best indicated in Figs. 1, 2, and 3, of the drawings. The cooling chamber ceiling panels 12 are secured to the carlines 10 through the medium of intermediate framing pieces 19 to which the panels 12 are suitably secured, similar framing pieces 9 being employed for attachment of the cooling coil 21 housed in chamber 11 by mechanism to be presently described. The cooling chamber 11 is divided by wall 8 to provide separate compartments 22 and 23 respectively enclosing the cooling coil 21 and the float valve mechanism 24 of the refrigerating apparatus; for the purpose of directing the air to be cooled to the space occupied by the cooling coil 21; to insure the desired volume and velocity of cooled air to the car interior; and to confine the deposit of moisture of condensation of the air to the chamber walls immediately enclosing the cooling coil. The water of condensation drips from the walls to a drip pan 25 resting upon the removable floor panel 15, such water being directed from the walls to the pan by a deflected drip table 26 secured along the lower margins of the walls and above the drain pan as best shown in Figs. 3 and 4. From the pan 25 the water is drawn off through drain pipe 27 fitted to the floor panel 15 and leading to a trap (not shown) in locker 30 beneath the cooling chamber as indicated in Fig. 3. To prevent disruption and displacement of the cooling coil during car movement provision is made for supporting the coil independently of the cooling chamber 11. For this purpose suitable hangers 28, suspended from framing pieces 9 and underlying the coil, may be used; those indicated in the drawings comprising flat bars 29 supported at their ends by rods 31 secured at their upper ends to the framing pieces 9 as best shown in Figs. 3 and 4, the coils being further secured to bars 29 by clips 32 to prevent relative movement of hangers and the cooling coil. The float valve mechanism 24 is supported in compartment 23 by means of bracket bars 33 secured at their ends to walls 8 and 14 of the cooling chamber 11 as shown in said figures of the drawings. With the cooling coil and float valve supported independently of the removable floor panels 15 and 16, the respective panels may be removed for inspection, repair or replacement of the mechanism within the cooling chamber.

Air is supplied to compartment 22 of the cooling chamber 11 through an opening in the end wall 18 of the car by motor driven fan 35 installed in the deck housing 40 above the vestibule ceiling 41. The fan 35 and motor 46 are mounted upon the ceiling frame work 47 and upon a pad of wood and felt, or the like, to minimize vibration, access thereto being had through hatch 45 indicated in Fig. 2 of the drawings. The fan illustrated in the drawings is of the centrifugal type discharging air horizontally through funnel 34, and is arranged to supply air drawn from the outside the car or recirculate previously cooled air from the car interior, the outer air being drawn upon from time to time to restore the air within the car, the air from the outside being drawn through intake duct 36 and from the car interior through intake 37 as best shown in Figs. 3 and 5. The intakes 36 and 37 are merged into the fan intake as shown in Fig. 5 and are equipped with dampers or valves 38 and 39 respectively, rotatably mounted at right angles to each other upon a common operating rod 42 extending downwardly through vestibule ceiling 41 and fitted with a suitable operating handle (not shown) so that the closing of one duct will cause the opening of the other, as will be evident. The mouth of outer air intake 36 is covered by a louvered closure 43 secured to the deck side 48 over a fine mesh screen 44 to exclude water and other matter blown against the car side. The air is delivered against static pressure to insure proper circulation through the coil compartment 22 and about the cooling coil 21 and through air filter 17 to the distributing duct 20.

The float valve mechanism 24 which supplies the refrigerant to the cooling coil 21, has fluid connection with the condenser coil and motor driven compressor of the refrigerating system contained within an air ventilated housing 50 secured to the underframe 7 of the car as indicated in Figs. 2, 18, and 19 of the drawings. The housing is hung from the floor beams 51 of the underframe and is provided with a removable cover 52 held to the housing by staples 53 entered in slots 54 of the cover and securing pins 55 for holding the cover to the staples. Screen covered vent openings 56 and 57 are provided in housing 50 and cover 52 respectively, to expedite cooling of the condenser coil and compressor units of the system (not shown) within the housing. The housing is supported by strap brackets 58 secured at their upper ends 59 to floor beams 51 and formed with gibbed portions 60 at their lower ends for engaging the lower portion of the housing 50 as indicated in Figs. 18 and 19. The cover is supported at its lower margin upon a shoulder 61 formed by the contiguous edge of reinforcing strap 62, secured to the housing below the floor 63 thereof, and held by a number of spaced retaining brackets 64 flared outwardly at their respective upper margins to serve as guides for the bottom edge of the cover 52 during the assembling operation, as will be understood. The cover is removed for inspection of the mechanism contained in the housing and for charging the system with fresh refrigerant.

As above stated, the cooled air is forced through the air filter 17 and enters longitudinal

duct 20 by which it is distributed to the car interior through deck sash openings 6 disposed at intervals along the deck side 48, as best shown in Figs. 1, 2, 3, and 6, of the drawings. The air thus introduced is diffused through the car without producing sensible drafts and in sufficient volume to provide the occupants with an adequate supply of wholesome air at a temperature below that prevailing outside of the car. To maintain the desired temperature and to prevent the standard of contamination from falling below a certain amount, the air is recirculated by means of the fan 35 and exhausted from the car through a latticed register 65 covering the mouth of intake 37 above the locker 38 beneath the cooling chamber 11 as best shown in Figs. 3, and 5 to 8, inclusive. The air is exhausted in a plane below the deck openings 6 and at a point removed from said openings to permit the uninterrupted flow of incoming air throughout the car and to avoid the premature diversion of such air to the intake 37 before diffusion thereof has been effected. Upon entering the exhaust or intake 37, the air is drawn into the fan and again projected through funnel 34 into coil compartment 22 of the cooling chamber 11 and against the cooling coil 21 and again through air filter 17, to the distributing duct 20, to the car through deck openings 6, as before.

The arrangement above outlined lends itself readily to the floor system of air distribution as depicted in Figs. 9 to 17 inclusive, of the drawings. The air for this purpose, like the air for the overhead supply system, is forced through air filter 17 into an air duct 70 covering the passage 71 leading to the filter, the duct 70 having a lateral extension 72 traversing the lower deck 5 of the car as shown in Figs. 9 and 10 of the drawings, and communicating with a downwardly extending duct portion 73 framed partially beneath the lower deck and within side wall 3 of the car to the floor 75 where it merges with the floor ducts 74 and 76 having communication with outlets disposed at predetermined positions in the floor area and hereinafter described. The floor ducts 74 and 76 are arranged at their junction to accommodate a deflecting damper 77 comprising a blade portion 78 fixed to a rotatable pin 79 formed with a head 80 having a bearing in bushing 81, and provided with a socket portion 82 to facilitate manipulation of blade 78 to control the air entering ducts 74 and 76. The floor ducts are preferably disposed as shown in Fig. 11 to uniformly distribute the air to the several outlets 90, 91, and 92 indicated in this figure and assembled with the floor 75 as best shown in Figs. 14 to 17, inclusive, and insulated to prevent the conduction of heat to the duct to permit the cooled air to reach the several outlets without appreciable change in temperature. In the indicated embodiment the air ducts are arranged above the usual floor plate 4 of the car underframe and between the customary wooden floor supporting stringers 93 resting upon the floor plate 4. The bottom lining 94 of the ducts is shielded from the floor plate 4 by a thickness of any suitable insulating material 95 and is preferably formed with marginal securing flanges 96 lapping contiguous faces of adjacent stringers 93 to which they are secured to prevent displacement of the lining and confined insulation 95. Suitable cover plates 97 are fitted over the ducts and secured to the respective floor stringers 93 by wood screws 98, or the like, and constitute portions of the floor area of the car.

It may be necessary to divert some of the incoming air from the main line ducts 74 and 76 to furnish air to compartments separated from the remainder of the car interior and to points not traversed by the main line ducts. For this purpose branch line ducts 99 are provided to conduct the air to outlets 92 and 100 proportioned to admit air in sufficient volume and at a rate of flow commensurate with the size and number of the compartments to be ventilated. The compartments are supplied through outlets 91 and 92, preferably of the type shown in Fig. 16 projecting air laterally through openings in partitions or panels 101 by means of elbowed ducts 102 connecting outlet openings 91 and 92, and floor ducts 74, 76, and 99, as best shown in Figs. 11 and 15 to 17, inclusive. For supplying air to the car interior outside of the enclosed sections, outlets 103 of the type indicated in Figs. 15 and 17 and opening upwardly are employed; such outlets are preferably protected by a perforated plate or grille 104 designed to prevent the dropping of foreign substances into the ducts. The air supply from the several ducts, is regulated by means of dampers 105 mounted for rotation within the outlets upon operating rods 106 journaled in bearings 107 in the outlet walls, and manipulated by a handle 108 fitted to an end of the respective rods. After setting the dampers 105, they are fixed against rotation by means of set screws 109 working in rod bearings 107 and against the respective rods 106. The rate of flow and pressure of the air at the several outlets throughout the system may be regulated by manipulation and adjustment of the several dampers to obtain the desired distribution of air through the car.

In operation, when it is desired to quickly reduce the temperature of the air within the car below that prevailing outside, and before the car leaves the terminal and passengers are admitted, the ventilators, windows, and doors are first closed. The attendant then closes the switch or switches controlling the fan and compressor motors to recirculate the air within the car until the desired drop in temperature is reached, after which the refrigerating apparatus operates to maintain the air within the car at the required temperature until the car has been thoroughly cooled and ventilated, whereupon the apparatus may be adjusted to provide air at a temperature comfortable to passengers of the car when ready for occupancy. The cooling is effected by circulating a refrigerant through pipe 2 leading to float-valve 24 from which it is fed to the cooling coil 21; as the liquid expands and changes to a gas in this coil it absorbs heat from the air forced against the coil by fan 35, thereby cooling the air in the coil compartment 22. The refrigerant circulates through the cooling coil 21 from which it enters one end of an accumulator 110 communicating with the compressor of the mechanism through pipe 1 connected to the opposite end of said accumulator. The heated gas is drawn off and compressed by the compressor and pumped into the condenser of the mechanism located in the air cooled housing 50 beneath the car, and again liquified and circulated through the cooling coil, and the cycle of operation described repeated. The continued passage of air from the cooling chamber 11 through the air filter 17 will cause the dust and other matter in the air to accumulate on the

filter screens, necessitating the removal of the filter for periodic cleaning. The filter is entered in the cooling chamber through an opening 111 in the wall 13 closed by an insulated door 112 to facilitate renewal and inspection, and is held from lateral displacement within the chamber 22 by spaced guide rails 113 traversing the chamber as best shown in Figs. 3, 4, 9 and 10, of the drawings.

To protect the duct walls from the action of deposited moisture precipitated from the circulating cooled air, the metal exposed to such air currents may be galvanized to prevent corrosion. The longitudinal upper duct 20 is formed with an outer wall made up of a body of laminated insulation 114 covered inside and out with galvanized sheathing plates 115 and 116, respectively. The duct is framed to the deck side 48 by means of longitudinal plates 117 and 118 respectively secured to the deck side at the eaves plate and to the lower deck roof 5, as best shown in Figs. 4 and 6. The sheathing plates 115 and 116 are preferably held by screws 119 tapped into the longitudinals 117 and 118, but may be welded thereto, or otherwise secured. The sheathing and insulating elements of the duct wall are nailed or otherwise secured together as indicated at 120 and preferably assembled as a unit before mounting upon the car.

The ventilating and cooling system above outlined may be adapted for use with any suitable automatic refrigerating apparatus now available and readily installed in existing railway passenger-train equipment. The system is of especial value in torrid weather in trains which have been standing in train sheds and exposed to the heat of the outer air, insuring the positive cooling of the air within the cars to a temperature substantially below that prevailing outside, and is not affected by countercurrents of air caused by the intermittent and sporadic opening of doors, ventilators, or windows.

The air circulating mechanism may be arranged for operation independently of or simultaneously with the cooling apparatus, and whether the cars are in motion or at rest, as required. The cooling coils, fans, and intakes are all overhead in space heretofore unused for the purpose, while the floor ducts are all disposed within the normal floor line of the car and protected by the usual floor covering. The installation within the car is inconspicously arranged and so disposed as not to interfere with the ordinary functions of the train crew or movements of the passengers.

What I claim is:—

1. In a railway passenger car, the combination with upper deck framing including transverse and connecting longitudinal members, of ceiling, wall, and removable floor panels suspended from certain of said longitudinals and defining an air chamber above the space normally devoted to service and accommodation requirements and divided into compartments, a cooling coil in one of said compartments supported independently of adjacent floor panels, a mechanical refrigerating apparatus suspended beneath the car and having fluid connection with said cooling coil, and valve means in another of said compartments controlling the supply of refrigerant from said apparatus to the cooling coil.

2. In a cooling and ventilating system for railway passenger cars, the combination with upper deck framing including transverse and connecting longitudinal members, of ceiling, wall, and removable floor panels suspended from said longitudinals and defining an air chamber above the space normally devoted to service and accommodation requirements and having a plurality of compartments, a cooling coil in one of said compartments supported independently of adjacent floor panel, a mechanical refrigerating apparatus suspended beneath the car and having fluid connection with said cooling coil, valve means in another of said compartments, controlling the supply of refrigerant from said apparatus to the cooling coil, an air filter forming one wall of said coil compartment ,and a cold air duct leading from said filter.

3. In a cooling and ventilating system for railway passenger cars, the combination with upper deck framing including transverse and connecting longitudinal members, of ceiling, wall, and removable floor panels suspended from said longitudinals and defining an air chamber above the space normally devoted to service and accommodation requirements and having a partition dividing said chamber into compartments, a cooling coil in one of said compartments and controlling valve means on the opposite side of said partition and each supported independently of the respectively adjacent floor panels, a mechanical refrigerating apparatus suspended beneath the car and having fluid connection with said valve and coil, an air filter forming one wall of said coil compartment, and air circulating means in communication with said coil compartment.

4. Apparatus for conditioning the air in a passenger vehicle comprising means for circulating refrigerant, a cooling compartment located in the vehicle above the space occupied by the passengers, a surface cooler in said compartment receiving refrigerant from said means, said compartment having an outside air inlet and a recirculated air inlet and means for drawing air through said inlets passing it over said cooler and then forcing the air over the space occupied by the passengers in said vehicle.

5. Apparatus for conditioning air in a passenger car comprising means for circulating a refrigerant, a cooling compartment located in one end portion of the car above the space occupied by the passengers, a surface cooler in said compartment receiving refrigerant from said means, a fresh air inlet to the compartment receiving air from the outside adjacent to the same end of the car, a recirculated air inlet receiving air from the car interior adjacent to the same end of the car for recirculation with the fresh air to the space occupied by the passengers, and means for drawing air through said inlets and forcing it over the space occupied by the passengers in the car to points remote from the recirculated air inlet.

6. Apparatus for conditioning air in a car, comprising refrigeration producing equipment on the underside of the said car, a cooling chamber located in the upper portion of one end of the conditioned area, a surface cooler in said chamber, connections for circulating a cooling medium through said equipment and said cooler, an outside air inlet for said chamber, a recirculating inlet for said chamber, and means for drawing air through said inlets, passing it over said cooler and discharging it into the space occupied by passengers in said car.

7. In apparatus for conditioning air in a passenger car, a copious cooling chamber located in the roof zone of the car, provided with an

inlet for fresh air from the outside, an inlet for returned air from the car, and an outlet for conditioned air, valve means for controlling the inlets, a duct connecting the outlet with the passenger space overhead, a surface cooler in the cooling chamber, refrigeration producing equipment beneath the car, connections for circulating a cooling medium through said equipment and the surface cooler, and means for drawing air through said inlets, passing it over the cooler and delivering it over the passenger space remote from the returned air inlet.

8. Apparatus for conditioning air in a passenger vehicle, comprising refrigeration producing equipment on the underside of said vehicle, a cooling chamber located adjacent the ceiling at one end of said vehicle, a surface cooler in said chamber, connections for subjecting a cooling medium to the action of said equipment and circulating said medium through said cooler, an outside air inlet connected to said chamber, a recirculated air inlet connected to said chamber, and means for drawing air through said inlets, passing it over said cooler, and discharging it into the space occupied by passengers in said vehicle at a plurality of points remote from the cooler.

9. Apparatus for conditioning air in a passenger vehicle comprising a cooling chamber located adjacent the roof and at one end of the car, an air inlet for admitting outside air to the chamber, an inlet for admitting air from the car to the chamber, and an outlet for discharging conditioned air from the chamber, means for controlling the admission of air through said inlets, a duct located above the passenger area and connected to the outlet, dehumidification equipment in the cooling chamber, refrigeration producing equipment beneath the car, said equipment being arranged to treat a cooling medium, the cooling medium being circulated in a circuit including the dehumidification equipment, and means for drawing air through said inlets, passing it through the dehumidification equipment and discharging it into the duct for delivery within the car through a plurality of outlets from the duct spaced at points remote from the chamber.

10. Apparatus for conditioning air in a passenger vehicle, comprising refrigeration producing equipment on the underside of said vehicle, a cooling chamber located adjacent the ceiling, a surface cooler in said chamber, connections for subjecting a cooling medium to the action of said equipment and circulating said medium through said cooler, an outside air inlet connected to said chamber, a recirculated air inlet connected to said chamber, and means for drawing air through said inlets, passing it over said cooler, and discharging it into the space occupied by passengers in said vehicle.

11. Apparatus for conditioning air in a passenger vehicle comprising a cooling chamber located adjacent the roof of the vehicle, an inlet for admitting outside air to the chamber, an inlet for admitting air from the car to the chamber, and an outlet located above the passenger space for discharging conditioned air from the chamber, means for controlling the admission of air through said inlets, dehumidification equipment in the cooling chamber, refrigeration producing equipment arranged to treat a cooling medium, the cooling medium being circulated in a circuit including the dehumidification equipment, and means for drawing air through said inlets, passing it through the dehumidification equipment, and discharging it into the vehicle through the outlet.

EDWARD F. CARRY.