Aug. 21, 1945. C. K. STEINS 2,383,423

AIR PURIFYING AND CONDITIONING SYSTEM

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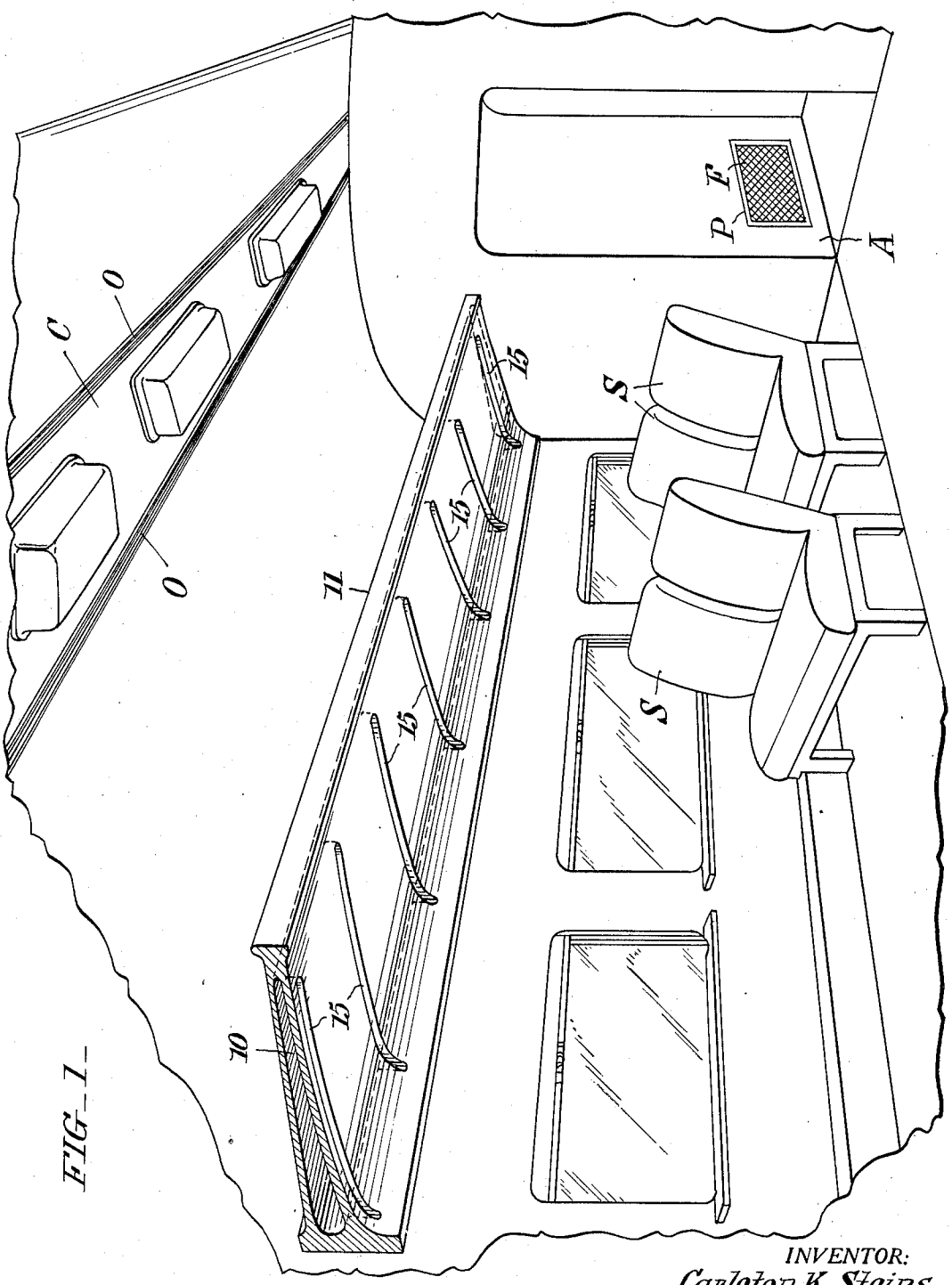


FIG. 1.

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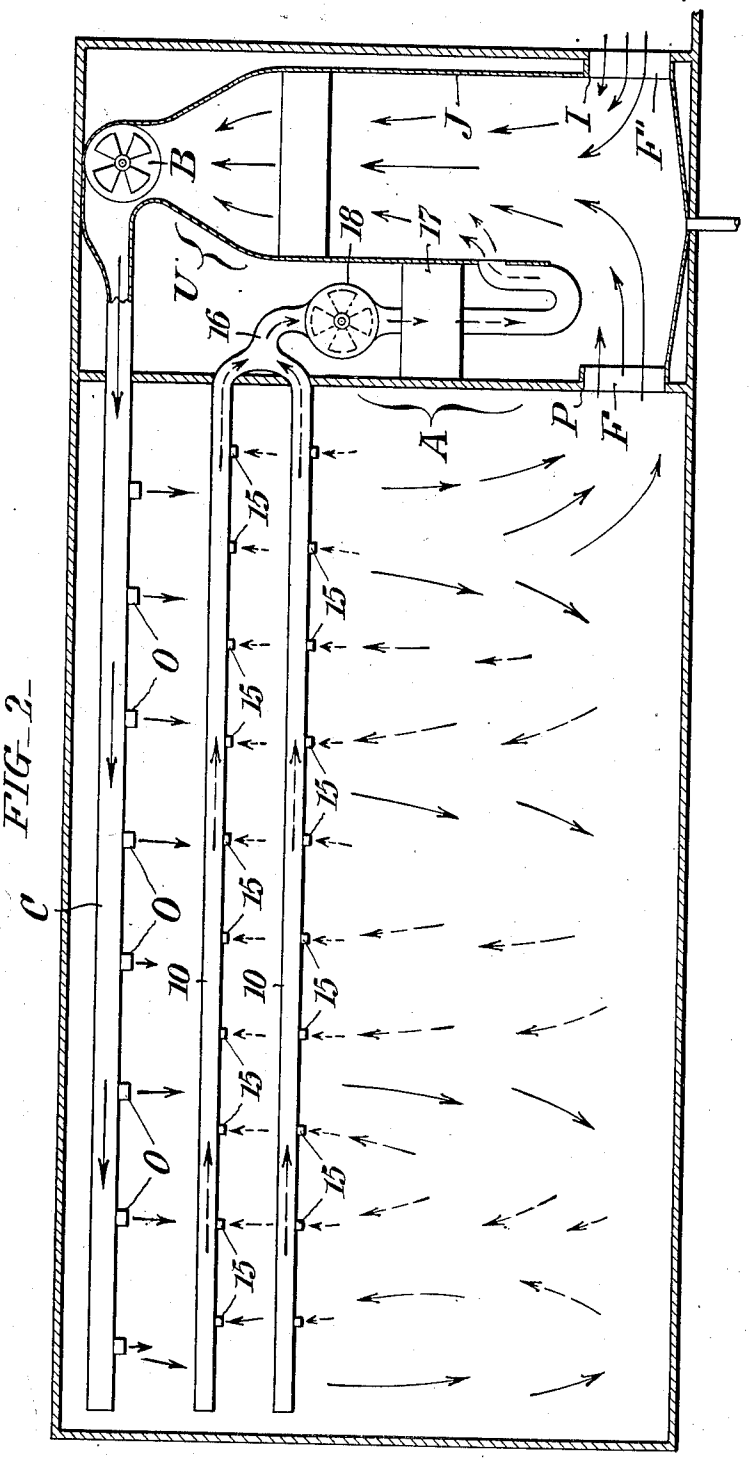


FIG. 2.

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FIG. 3.

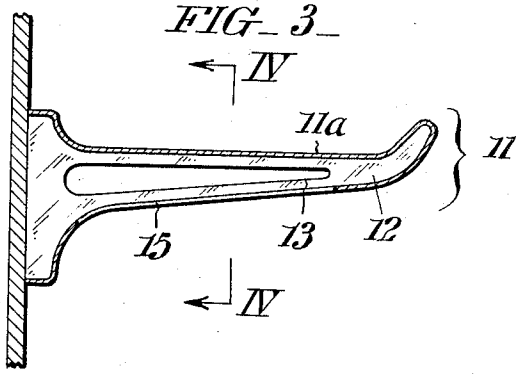


FIG. 4.

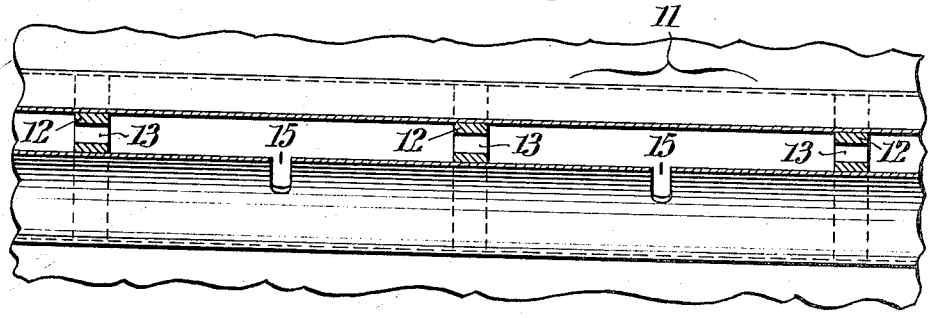


FIG. 5.

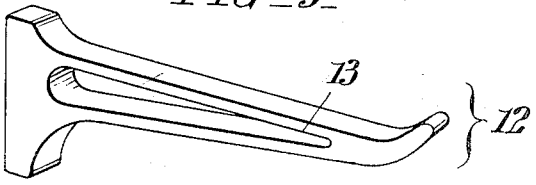
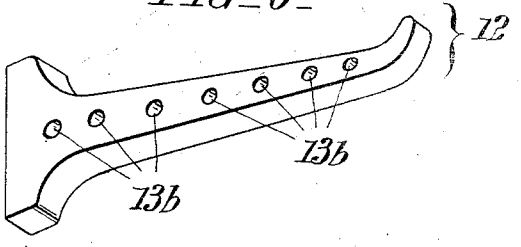


FIG. 6.



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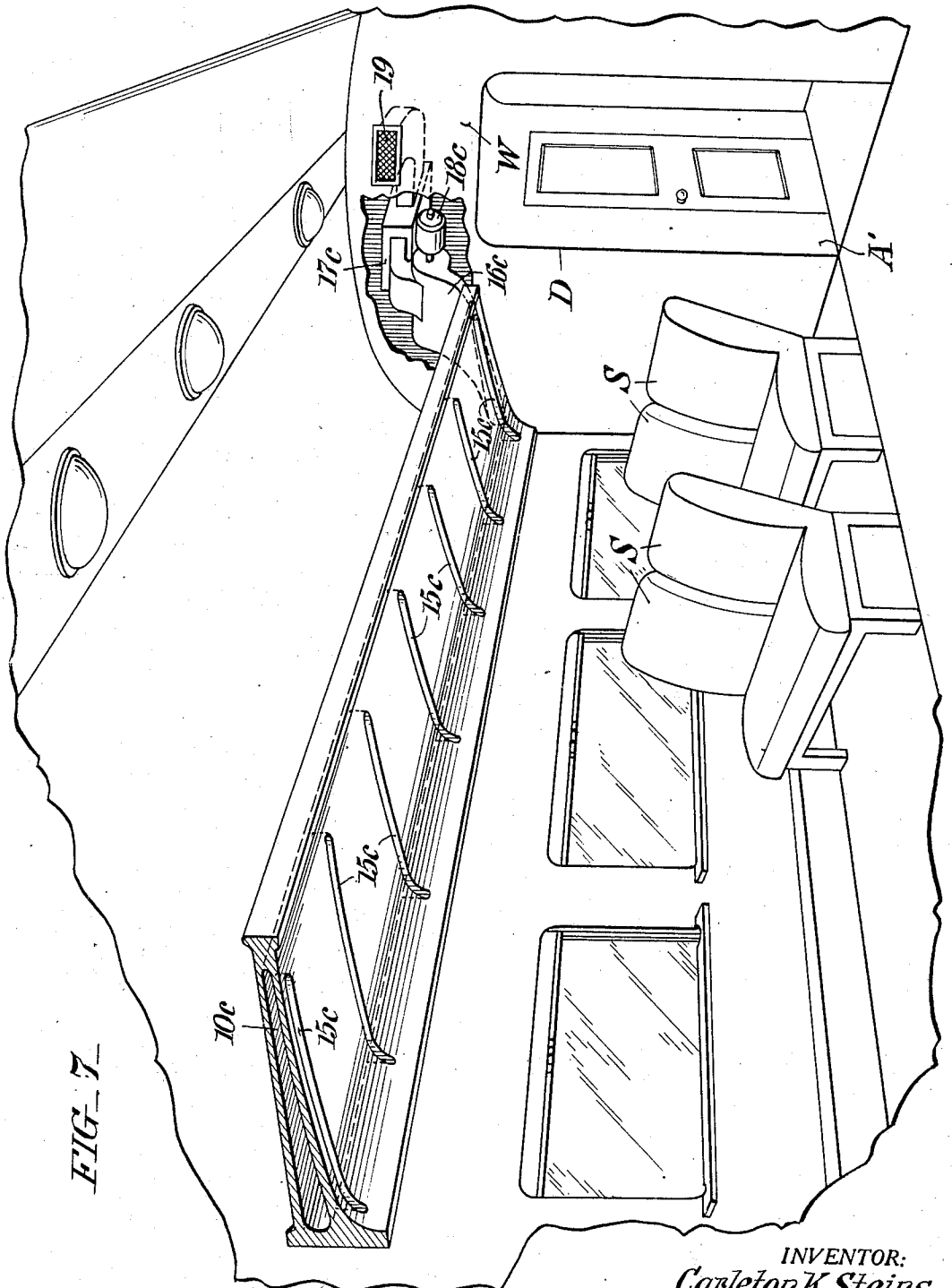


FIG. 7.

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FIG_8_

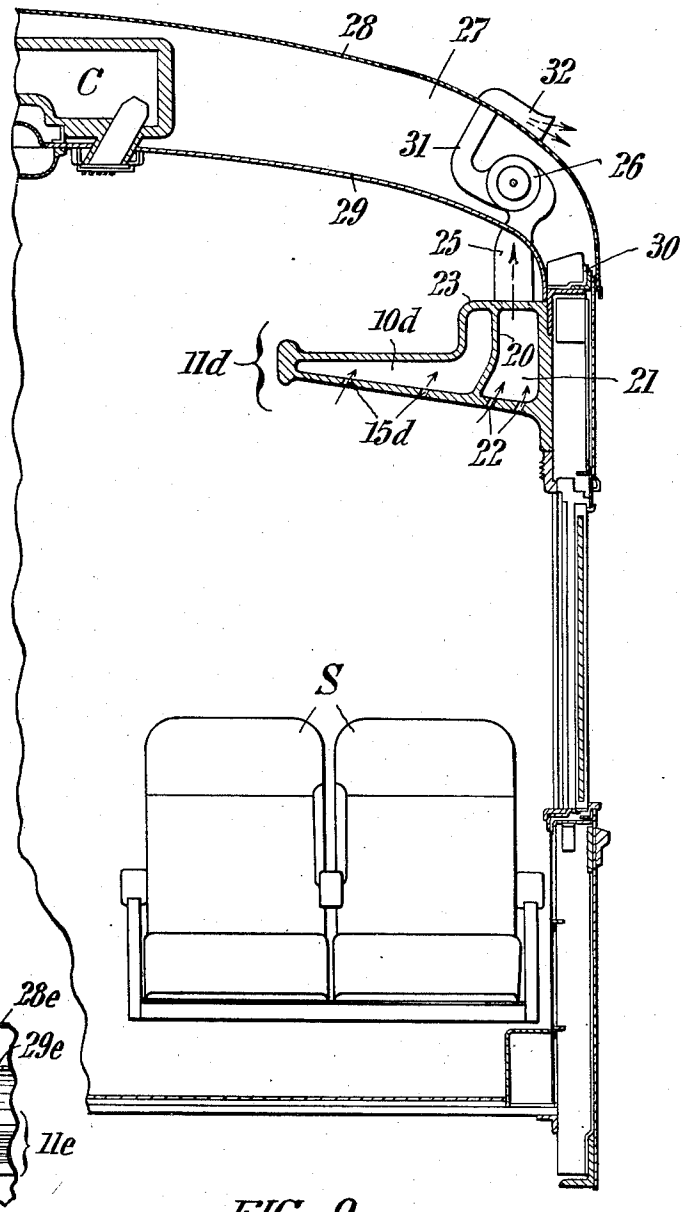


FIG_10_

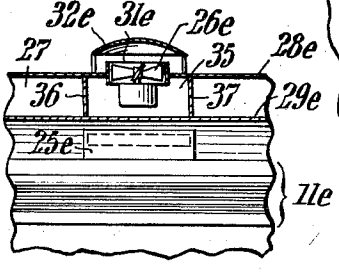
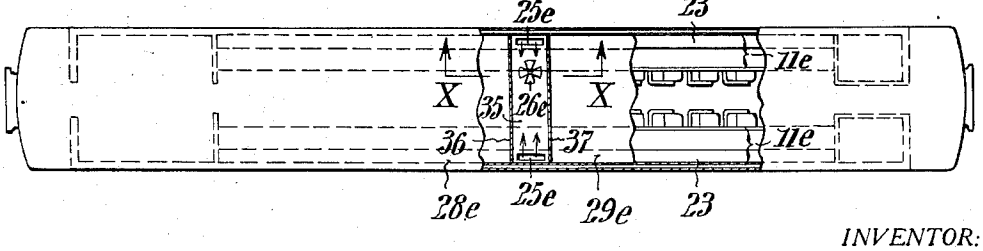


FIG_9_



INVENTOR:
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Patented Aug. 21, 1945 2,383,423

UNITED STATES PATENT OFFICE

2,383,423

AIR PURIFYING AND CONDITIONING SYSTEM

Carleton K. Steins, Merion, Pa., assignor to The Pennsylvania Railroad Company, Philadelphia, Pa., a corporation of Pennsylvania

Application August 27, 1943, Serial No. 500,220

9 Claims. (Cl. 98—10)

This invention relates to air purifying and conditioning systems for passenger vehicles such as railway or street cars, buses, and other enclosures intended for human occupancy.

My invention is directed toward making it possible to prevent the spread within closures of the kind referred to, of tobacco smoke and other fumes emanating from individual occupants as well as of dust stirred up by them, and to eliminate such impurities before they can reach and annoy other occupants, particularly those who are non-users of tobacco or who would be offended by the smell of it or of other fumes.

This objective is realized in practice as hereinafter more fully disclosed through provision of a purifying apparatus which can be used either alone or incorporated with an air-conditioning system, and which is characterized by having an air suction duct or ducts with suitably spaced inlets directly above the seats or chairs of the occupants of the vehicle or other enclosure, by way of which duct or ducts the smoke, dust and fume-laden air is withdrawn. In certain forms of embodiment hereinafter illustrated, the apparatus is further characterized by having means for maintaining the air in continuous circulation, and filtering means for removing the impurities before the air is returned to the space of occupancy. When the purifying apparatus is incorporated with an air-conditioning system, the cleansed air, instead of being directly released into the space of occupancy may be introduced into the air-conditioning apparatus at the suction side of the means by which circulation is maintained and thus conditioned with the greater volume of air continuously circulated within the vehicle or enclosure, or a portion of the air which is withdrawn from the vicinity of the individual passengers discharged directly into the outside atmosphere.

In connection with air purifying apparatus having the above attributes and intended more especially for railway passenger cars or buses, it is a further aim of my invention to enable use of the baggage racks above the row seats along opposite sides of such vehicles as the suction ducts, wherefore, as also hereinafter more fully set forth, I construct the baggage racks with continuous hollows and provide them with intake apertures in their bottoms directly over the individual row seats.

Other objects and advantages will appear from the following description of the attached drawings, wherein

Fig. 1 is a fragmentary perspective view of the interior of a railway passenger car equipped with a combined air purifying and conditioning system conveniently embodying my invention, in which the baggage racks are constructed to serve as the suction ducts for withdrawal of the tobacco smoke, dust and fume-laden air.

Fig. 2 is a diagrammatic view in longitudinal section showing the manner in which the air is circulated within the car.

Fig. 3 is a fragmentary detail view in cross section showing an alternative form of baggage rack construction.

Fig. 4 is a fragmentary view in longitudinal section looking as indicated by the angled arrows IV—IV in Fig. 3.

Fig. 5 is a perspective view of one of the bracket members used in the alternative form of baggage rack shown in Figs. 3 and 4.

Fig. 6 is a view like Fig. 5 of a modified form of bracket.

Fig. 7 is a view corresponding to Fig. 1 showing the apparatus as a system arranged for smoke and fume-extraction alone.

Fig. 8 is a fragmentized cross section of a railway passenger car showing another alternative embodiment of my invention.

Fig. 9 is a broken-out view partly in plan and partly in horizontal section of a railway passenger car showing a further modification; and

Fig. 10 is a fragmentary view in longitudinal section taken as indicated by the angled arrows X—X in Fig. 9.

With more detailed reference first more particularly to Fig. 1, the railway car there shown for convenience of exemplification, has rows of chairs or seats such as indicated at S arranged along opposite sides of its passenger space. At one end of the car is a refrigerating compartment A with a central air discharging and diffusing channel C leading from the top thereof and extending longitudinally of its roof. As shown, the channel C has outlets O at intervals of its length through which the conditioned air is released into the passenger space. In the inner side wall of the refrigerating compartment A is a passage P with a filter F through which the air, after having traversed the passenger space returns to said compartment; and in the rear wall of said compartment is an inlet I with a filter F' (Fig. 2) through which a definite proportion of fresh air is constantly admitted into the system. At B is conventionally indicated a blower means by which the air is circulated in the system. The refrigerating means employed may be either block ice suitably supported within the compartment A;

or it may be in the form of a mechanical refrigerating unit as diagrammatically represented at U in Fig. 2.

For the purpose of withdrawing tobacco smoke, dust and fume-laden air from the passenger space within the car, I provide, in accordance with my invention, suction ducts, one above each row of the seats S, as instanced at 10 in Fig. 1. These ducts 10 may be in the form of continuous hollow baggage racks 11 of integral construction as shown in Fig. 1, or they may be of composite construction as shown in Figs. 3 and 4. In the latter instance a cross sectionally conformative sheathing 11*a* of sheet metal or the like is placed over a plurality of supporting brackets 12 reaching inwardly from, and secured at intervals of the length of the car to the side walls of the latter, one such bracket being separately illustrated in perspective in Fig. 5. As shown, the brackets 12 are of open configuration, i. e., transversely apertured as at 13 for continuity of the ducts. Instead of having single elongate apertures as in Fig. 5, the brackets 12 may have several suitably spaced circular apertures as shown at 13*b* in Fig. 6. In any case the ducts 10 are provided in their bottoms with inlets 15, preferably one above each of the seats S, through which the contaminated air is drawn into said ducts. These inlets 15 may be in the form of narrow transverse slots as shown in Fig. 1 or they may be in the form of serially arranged perforations as desired to harmonize with the scheme of decoration of the car interior. Within the compartment A, the ducts 10 merge into a conduit 16 which discharges into the lower part of the jacket J of the refrigerating unit U directly above the passage P and ahead of the suction side of the blower means B. Interposed in the conduit 16 is a suitable filter 17 for extracting the smoke and fumes from the air so that the latter is purified before discharge into the jacket J of the refrigerating unit U from the delivery end of said conduit to comingle with the greater volume of circulated air entering the compartment A by way of the passage P. Also interposed in the conduit 16 is an auxiliary blower means 18, which induces air flow in the ducts 10 and in the conduit 16 in the direction indicated by the broken line arrows in Fig. 2.

In some instances, the auxiliary blower means 18 may be dispensed with and the blower means B of the conditioning system depended upon to create the suction necessary for maintenance of the flow in the smoke ducts 10 and conduit 16.

For vehicles or enclosures where air-conditioning is not desired or required, I resort to the arrangement shown in Fig. 7, wherein each smoke duct 10*c* extends, with interposition of a blower means 18*c* to a filter 17*c* in the top of a toilet compartment A', and wherein, after filtering, the air is returned to the passenger space by way of a discharge outlet 19 in the transverse inner wall W of the car above the doorway D leading to the vestibule. In all other respects, the apparatus or system of Fig. 7 is identical with that shown in Fig. 1 as will be readily seen by comparing the two illustrations.

As a consequence of the allocation of the inlet slots in the bottoms of the ducts 10 (Fig. 1) and 10*c* (Fig. 7) directly above the respective chairs or seats S, the tobacco smoke or fumes emanating from an occupant of one seat will be withdrawn from such seat area and thus prevented from diffusing or spreading to annoy another passenger in the immediately adjacent seat or chair, or even a passenger sitting alongside the first mentioned passenger in the same seat. Thus, through my invention, the atmosphere within the space of occupancy is at all times kept free of smoke and other fumes which may be disagreeable to some of the passengers.

In the modification illustrated in Fig. 8, the hollow baggage rack 11*d* has a longitudinal partition 20 which sets apart an additional or auxiliary duct 21 with inlets 22. In this instance, the inlets 22 as well as the inlets 15*d* for the duct 10*d* are in the form of narrow slots which extend lengthwise of the car. For the purpose of increasing the cross sectional area and hence the capacity of the ducts 10*d* and 21, the rack 11*d* is formed with an upward longitudinal enlargement 23 adjacent the side wall of the car. The duct 10*d*, and the corresponding one (not illustrated) at the opposite side of the car may be connected for exhausting of the contaminated air either as shown in Fig. 2, or after the manner disclosed in Fig. 7. Leading upward from the auxiliary duct 21, at a suitable point in the length of the car, preferably at about the middle, is a trunk 25 which connects with a suction blower 26 disposed in a hollow 27 between the outer and inner roof sheets 28 and 29, said hollow being closed off at the tops of the side walls of the car by longitudinal structural members as instanced at 30 in Fig. 8. The exhaust from the blower 26 is discharged through the roof of the car by way of a trunk 31 whereof the discharge end is protected by an over-reaching shielding shroud 32 to preclude entry of rain or snow. It is to be understood of course that the exhausting arrangement just described is duplicated at the opposite side of the car. With the construction shown in Fig. 8, it will be seen that part of the air will be continually withdrawn from within the passenger space of the car by way of the auxiliary ducts 21 and discharged with the tobacco smoke, dust, odors and passenger body heat which it may contain, through the roof of the car by the action of the suction blowers 26, while the remainder of the air drawn into the ducts 10*d* will be filtered and re-circulated in either of the two ways hereinbefore described.

Figs. 9 and 10 show a modification which is generally similar to that of Fig. 8, except for use of a single suction blower 26*e* to draw the contaminated air into the auxiliary ducts 21*e* of the racks 11*e* at opposite sides of the car and to discharge such air through the car roof. Here, a relatively narrow crosswise passage 35 is set apart within the hollow 27 in the car roof by a pair of parallel transverse partitions 36 and 37, into which the trunks 25*e* directly connect and from which the smoke-laden air is discharged through an outlet 31*e* protected by a shield 32*e*.

Having thus described my invention, I claim:

1. An air purifying and conditioning system for railway passenger cars and the like having seats serially arranged along one of its side walls, comprising a refrigerating compartment at one end of the car; an air flow duct with lateral discharge openings at the ceiling of the car, connecting into the refrigerating compartment; an air return inlet into the refrigerating compartment adjacent the car floor; blower means within the refrigerating compartment for causing circulation of the air between said compartment and the passenger space in the car; a continuous hollow longitudinal shelf-like projection extending inwardly from the side wall of the car with inlet apertures in its bottom, directly over the seats, and constituting an auxiliary air return

duct which communicates with the suction side of the blower means in the refrigerating compartment; and filter means at the delivery end of the return duct for removing smoke and fumes from the air before it is released into the refrigerating compartment for recirculation in the car.

2. The invention according to claim 1, in which an auxiliary blower means operates to create suction within said auxiliary air return duct.

3. The invention according to claim 1, in which the shelf-like projection is formed by a plurality of spaced laterally-open brackets with ends abutting the side wall of the car, and by enveloping sheathing of sheet material with inlet orifices between brackets.

4. The invention according to claim 1, in which the inlet apertures in said auxiliary duct have the form of transverse slots respectively located directly above the individual seats.

5. The invention according to claim 1, further including means constructed and arranged to discharge a portion of the smoke-laden air collected by way of said auxiliary duct, directly into the outside atmosphere.

6. The invention according to claim 1, in which said auxiliary duct is subdivided by a longitudinal partition into two channels; in which one of the channels of the duct connects with the suction side of the refrigerating compartment through the filter means; in which the other channel of said duct communicates directly with the outside atmosphere; and in which a blower means operates to expel the air from the last mentioned channel of the auxiliary duct into the outside atmosphere.

7. Air purifying means for railway passenger cars and the like including a duct which extends lengthwise over serially-arranged seats within the car and which is subdivided by a longitudinal partition into two channels respectively having bottom inlet apertures; means for drawing a portion of the air from within the car into one of the channels, filtering it of smoke and other impurities and reintroducing it into the body of the car; and separate means for drawing another portion of the air from within the car into the other of the channels and discharging it directly into the outside atmosphere.

8. The invention according to claim 7, in which the duct is in the form of a continuous hollow shelf-like projection reaching over the seats from a side wall of the car.

9. The invention according to claim 7, in which the duct is in the form of a continuous hollow shelf-like projection reaching over the seats from a side wall of the car, said duct comprising a series of spaced laterally-open brackets with ends abutting said side wall and a sheathing of enveloping sheet material with the inlet apertures between brackets.

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