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REFRIGERATOR CAR

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2 Sheets-Sheet 2

Fig. 1a

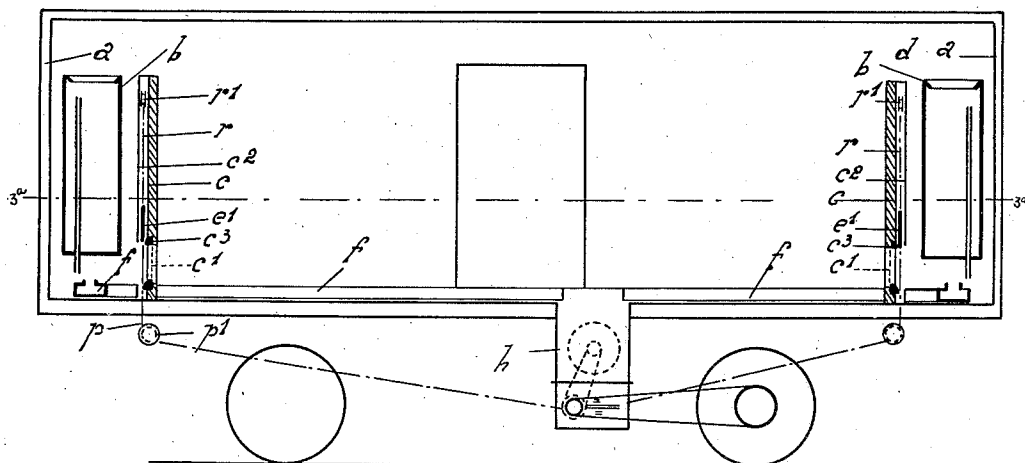
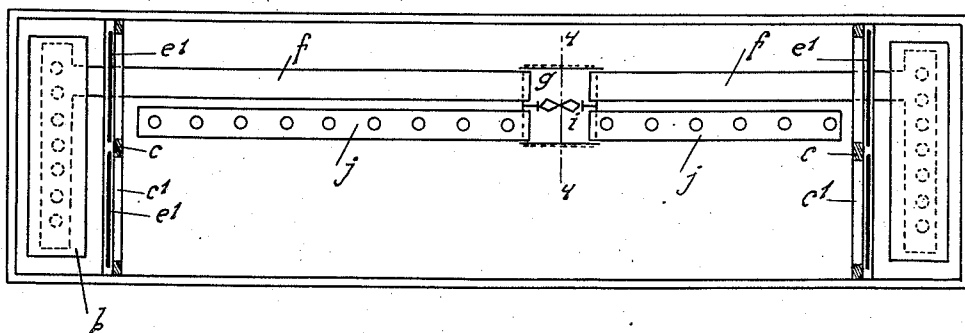


Fig. 3a



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REFRIGERATOR CAR.

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Refrigerator cars have their walls suitably heat-insulated; they may have at each end a certain quantity of ice which is arranged in kinds of metal-cages, in apertured chests or
5 in wing-fitted tanks.

The natural circulation of the air is ensured in these refrigerator cars by means of a partition placed in front of the refrigerating systems; this partition, which is more or
10 less thick and is a bad conductor of heat, is open or cut away at its upper end and at its lower part, in such a way that the relatively hot air enters by the upper apertures, is cooled in contact with the ice or the metal
15 wall, and becoming denser, passes out by the lower aperture in the partition.

This circulation of air is necessarily slow; its feeble activity is concentrated in the vicinity of the partitions, that is to say, in
20 front and rear of the car or wagon; it reaches with difficulty merchandise or commodities arranged in the middle of the car, especially when such articles are heaped up or stacked upon one another as is the custom.

It is well known and easily understood that in the majority of cases, an active circulation of the air is necessary to obtain a rapid cooling and a proper preservation of the commodities placed in cold storage
30 compartments.

It has already been proposed to effect this forced circulation of air by means of a fan which is actuated by one of the axles of the car and is in communication with pipes
35 which cause a large volume of air to pass over the refrigerating systems and the merchandise or commodities located in the car.

In accordance with the present invention, shutters or registers, which regulate or control certain of the openings formed in the walls arranged in front of the refrigerating systems, are actuated at the time of the travel of the wagon and therefore during
45 the operation of the fan, in such a way as to mask these openings and to compel the air, passing through other openings in these partitions, to circulate solely through the pipes bordering upon or communicating
50 with these refrigerating systems and the merchandise or commodities as soon as the train assumes a certain speed, whilst these shutters or registers uncover these openings and restore the natural circulation of the

air during stoppages in the travel of the wagon. 55

These shutters or registers are, preferably, operated by an arrangement which is driven by one of the axles of the car under the influence of centrifugal force, in such a way
60 as to bring these shutters or registers into operation as soon as the speed of travel of the car reaches a previously determined rate.

In the case of a forced circulation of air, without utilizing these shutters, a very large part of the heat-exchange surfaces either that of the ice, or of the vessels, is not utilized, whilst these surfaces are always in practice too small; on the other hand, during the forced circulation, the air is distributed along free passages around the refrigerating systems, directly returning to the intake orifices without actually reaching the merchandise, because nothing compels it to do so. This air is not properly passed
75 through the pipes and distributed as is necessary; there is a stirring up rather than a circulation of air and the object is not attained.

It is not the same thing when, according to this invention, regulating shutters are introduced. In fact, when these are closed, the air has only one free passage; it is forced to lick all the refrigerating surfaces and returns to the intake casings only through the commodities, or inversely; by means of a
80 grating placed upon the pipes and supporting the merchandise or commodities, these latter can be, to some considerable extent, well ventilated.

In order to ensure the preservation or the preliminary refrigeration of commodities or goods in stations or depots, the fan, which creates the forced circulation of air between the refrigerator systems and the goods, can be actuated during stoppages of the refrigerator car, by means of a suitable small auxiliary motor; one might also renew several times, if necessary, the supply of ice in the troughs or chests with or without the addition of salt. 100

The annexed drawing represents by way of example one form of carrying out the object of the invention.

Figure 1 is a view in longitudinal vertical section of one of the end parts of a refrigerator car according to the invention. 105

Fig. 1^a is a longitudinal vertical section through the center of the car.

Figure 2 is a corresponding view in transverse vertical section.

Figure 3 is a plan view of the fan device and of the pipes which ensure the forced circulation of air.

Fig. 3^a is a longitudinal section taken along line 3^a—3^a of Figure 1^a.

Figure 4 is a view in transverse vertical section showing the ventilator fan and the arrangement which actuates the shutters under the influence of centrifugal force, namely, a section on line 4—4 of Figure 3, and on a larger scale.

Figure 5 is a view in horizontal section on line 5—5 of Figure 4.

At each of the ends of the car or wagon, Figure 1, furnished with a well insulated wall *a*, there is arranged an ice chest or similar container *b* which is separated from the middle part of the car, which latter is intended to contain the commodities or goods, by means of a vertical partition *c*; this last mentioned is separated from the roof of the car by an opening or cut away part *d* and comprises at its lower part apertures *c*¹, which can be covered or uncovered by means of shutters *e* *e*¹ sliding in guides between the partitions *c* of wood, and also metal sheets *c*² arranged at a small distance from the partitions *c* and parallel to the latter.

Below each of the containers *b* there is an air casing *f* extending preferably across the whole width of the car, see Figures 2 and 3; these two casings *f* deliver at their other ends, see Figures 3 and 4, into one of the compartments *g* of a sheet metal container *h*; the other compartment *i* of this container is connected with two casings *j* which extend the whole length of the refrigerator car and below the commodities; the casings *f* and *j* are provided with orifices of a suitable number for the passage of air.

The container *h* is fitted in the floor boards or lower part of the car and is covered at its upper part by a cap or lid *h*¹, fitting above the casings *f* and *j*; in Figure 3, this lid is supposed to have been removed to show the compartments of the container and the casings which are connected therewith.

Between the compartments *g* and *i* of the container *h* there rotates a reversible fan *l* mounted upon the shaft *l*¹, journaled in the walls of the container *h* and rotated at a suitable speed from one of the axles of the car by means of any suitable transmission gear (not shown). According to the direction of travel of the refrigerator car, the fan turns in one direction or the other, and it creates a circulation of air through the pipes or casings *f* and *j* and the compartments *g* and *i* of the container *h*, either starting from the refrigerator systems *b*

towards the merchandise or from the merchandise towards the refrigerating systems; the result is the same in either case, and the air is supplied to the merchandise or commodities either by suction or by pressure.

Below the sheet metal container *h* is journaled a hollow shaft *m*¹ connected to the shaft *l*¹ of the ventilating fan *l* by a suitable transmission device, for example a belt; this shaft *m*¹ is provided with an arrangement *m* similar to a ball governor. When the balls *m*², which are pivoted upon the sleeve *m*, separate from the axis of rotation of the shaft *m*¹ under the influence of centrifugal force, the bell crank levers *m*³ carrying these balls *m*² bear at their free end upon a slider *n* which is guided in longitudinal grooves in the hollow shaft *m*¹; this slider *n*, subjected to the action of a returning spring *n*¹, is made fast with a rod *n*² movable axially of the shaft *m*¹, and at the extremity of this rod *n*² is a ball-thrust device *n*³ which bears upon the smaller arm *o*¹ of a bell crank lever *o* which is pivoted upon a vertical axis *o*².

When the train attains speed and consequently the movement of rotation of the axle and of the shaft *m*¹ increases, the balls *n*² move away from the axis of rotation of the shaft *m*¹ by reason of centrifugal force; the ball-thrust *n*³ of the rod *n*² moves forward a slight distance under the action of the slider *n*, thereby pushing back the smaller arm *o*¹ of the lever *o*; the extremity of the large arm *o*³ of the lever *o*, which naturally moves to a much greater extent, is connected to two traction cables *p* and *q*, which are operated to close the shutters fitted to the partitions *c* at the two ends of the refrigerator car; one of these cables *p* passes directly to one of the extremities of the car whilst the other cable *q* passes around the jockey-pulley *q*¹ before proceeding to the other extremity of the car.

The cable *p*, after having passed over the roller *p*¹, is attached to one of the shutters *e*¹ which is suspended from a cable *r*, the latter passing over rollers *r*¹, and to the free end of this cable *r* is attached a counterweight *r*²; the other shutter *e* is suspended from a cable *s* which after having passed over rollers *s*¹ (see Figure 2) is attached to the run of the cable *r* which, as above stated, is fitted with a counterweight. This counterweight may be replaced by a spring, if desired. The arm *o*³ of the bell crank lever *o*, assuming the position shown in dotted lines in Figure 5, under the action of the centrifugal governor *m* *m*², exerts a pull on the cables *p* and *q* when the train attains speed; the cable *p* causes the shutter *e*¹ to descend and said shutter thereupon masks the corresponding opening *c*¹ in the partition *c*; the counterweight *r*² is raised in consequence

and the shutter e also falls under the action of its own weight and masks the corresponding opening e^1 in the partition.

When the train stops, centrifugal force no longer acts on the balls m^2 and the latter are brought closer to the shaft m^1 by means of the spring n^1 , which pushes back the slider n and consequently the lever m^3 which carries the balls m^2 ; the arm o^3 of the lever o is returned to the original position (shown in full lines in Figure 5); the pull on the cable p ceases and the shutters e e^1 are raised by the action of the counterweight r^2 and uncover the openings c^1 in the partition.

It is the same for the openings in the partition arranged at the other extremity of the refrigerator car in front of the refrigerator system, which openings are masked or uncovered by the shutters under the action of the cable q .

When the shutters mask the openings in the partitions, there is created a forced circulation of air between the chambers, limited by the partitions around the refrigerator systems, and the space occupied by the merchandise or commodities in the wagon or car, by means of the air pipes or casings f and j connected with the ventilating fan; on the other hand, as soon as these openings in the partitions are again uncovered by the shutters, the natural circulation of air is restored, the air passing both through the upper opening d of the partition and the lower apertures c^1 .

In order to ensure the tight closing of the aperture c^1 by the shutters e e^1 , the latter slide between the sheet metal c^2 situated behind the partition c , and rubber beadings c^3 arranged all round the openings c^1 in the partition, and in grooves in the latter. The shutters are formed from sheets of metal sliding behind the apertures in the partitions, these apertures being preferably protected by a grid or grating.

The arrangement acting on the shutters during the rotation of the axle and leaving them free when the train stops, can be replaced by any other suitable arrangement. For example, there may be utilized a cylindrical box movable around an axis which is rotated by one of the axles of the wagon and in the interior of which box there rotate two masses connected to this axle, but capable of separating from one another so as to rub against the interior wall of the box when this axle reaches a certain speed. Under this frictional action, the box is driven by the rotating axle and if the traction cables acting upon the shutters are connected to this box, they are wound either upon the latter or upon a small auxiliary drum and close the shutters; at the end of their movement, they immobilize the box in which the masses continue to turn but now rubbing idly, which entails a certain expenditure of

force, conduces to a wearing of the parts and a harmful heating effect. The centrifugal governor device described and shown is therefore preferable.

If it be wished to maintain always the same direction for the forced circulation of air in the refrigerator car, in spite of the change in the direction of travel of the latter, it is easy to actuate, by a suitable cam mounted upon the shaft m^1 of the centrifugal governor m m^2 , a two-plate clutch or a coupling device with two belts, the one straight and the other crossed. This clutch or coupling brings into engagement one or other disc, or the one or the other belt, according to whether the axle of the wagon turns in one direction or in the other, and in such a manner as to maintain always the same direction of rotation of the fan.

The refrigerator car which forms the subject of the present invention is supposed to serve especially for high speed or express transportation; but it can, nevertheless, be employed without harm or inconvenience for cars intended to travel at other or much lower speed. However, if the car is forwarded or run sometimes as an express car and sometimes as a slower moving car on the same journey, and if it is wished to cause the fan to work approximately always at the same speed, it is equally possible to achieve this result by utilizing a second centrifugal governor similar to the first but which comes into action only at a certain speed of rotation of the axle; this governor causes a clutch device to come into operation which drives a belt connecting two conical pulleys of which one operates the ventilating fan.

These somewhat complicated arrangements, easily carried out by ordinary mechanical means, nevertheless do not appear to be useful in practice.

This manipulation of the shutters might also be obtained by means of hinged or pivoted panels mounted upon the roof or below the car, which panels are inclined as soon as the train moves forward by reason of the air resistance; but these panels would be necessarily large and therefore cumbersome and moreover, their inclination would depend not only on the speed of the train but also on the direction and the force of the wind blowing in the direction of travel, or sideways, or from ahead; consequently, the manipulation of the shutters would no longer be ensured solely by the movement forward or the stoppage of the refrigerator car which is an indispensable condition; with the movable panels a strong wind might close the shutters of the partitions and suppress the natural circulation.

What I claim is:

1. A refrigerator car comprising ice-containers arranged at the ends of the car, trans-

verse partitions adjacent said ice containers
extending upwardly from the car floor and
terminating short of the roof thereof, aper-
tures at the bottom of said partitions
5 adapted to allow of natural circulation of air
between the end and middle portions of the
car, shutters slidably mounted upon said
partitions and adapted to close said bottom
apertures, a rotary fan driven by an axle
10 of said car for forced circulation of air, air
casings between said middle portions of said
car and the vicinity of said ice-containers,
and enclosing said rotary fan, and means
for automatically moving said shutters to
15 their aperture-closing position as soon as
the speed of travel of the train reaches a pre-
determined rate and for automatically mov-
ing said shutters to their aperture-uncover-
ing position during stoppage of the car.
20 2. A refrigerator car comprising ice-con-
tainers arranged at the ends of the car, trans-
verse partitions adjacent said ice containers
extending upwardly from the car floor and
terminating short of the roof thereof, aper-

tures at the bottom of said partitions 25
adapted to allow of natural circulation of
air between the end and middle portions of
the car, shutters slidably mounted upon said
partitions and adapted to close said bottom
apertures, a rotary fan driven by an axle 30
of said car for forced circulation of air, air
casings between said middle portion of said
car and the vicinity of said ice-containers,
and enclosing said rotary fan, and means
for automatically moving said shutters to 35
their aperture-closing position as soon as the
speed of travel of the train reaches a prede-
termined rate and for automatically moving
said shutters to their aperture-uncovering
position during stoppage of the car, said 40
means comprising an arrangement, actuated
by one of the axles of the car under the in-
fluence of centrifugal force, and operative
connections between said centrifugal ar-
rangement and said shutters. 45

In testimony whereof I have signed my
name to this specification.

HENRI CORBLIN.