March 27, 1934. S. M. ANDERSON 1,952,833

PORTABLE AIR CONDITIONING APPARATUS

Filed March 2, 1933 2 Sheets-Sheet 1

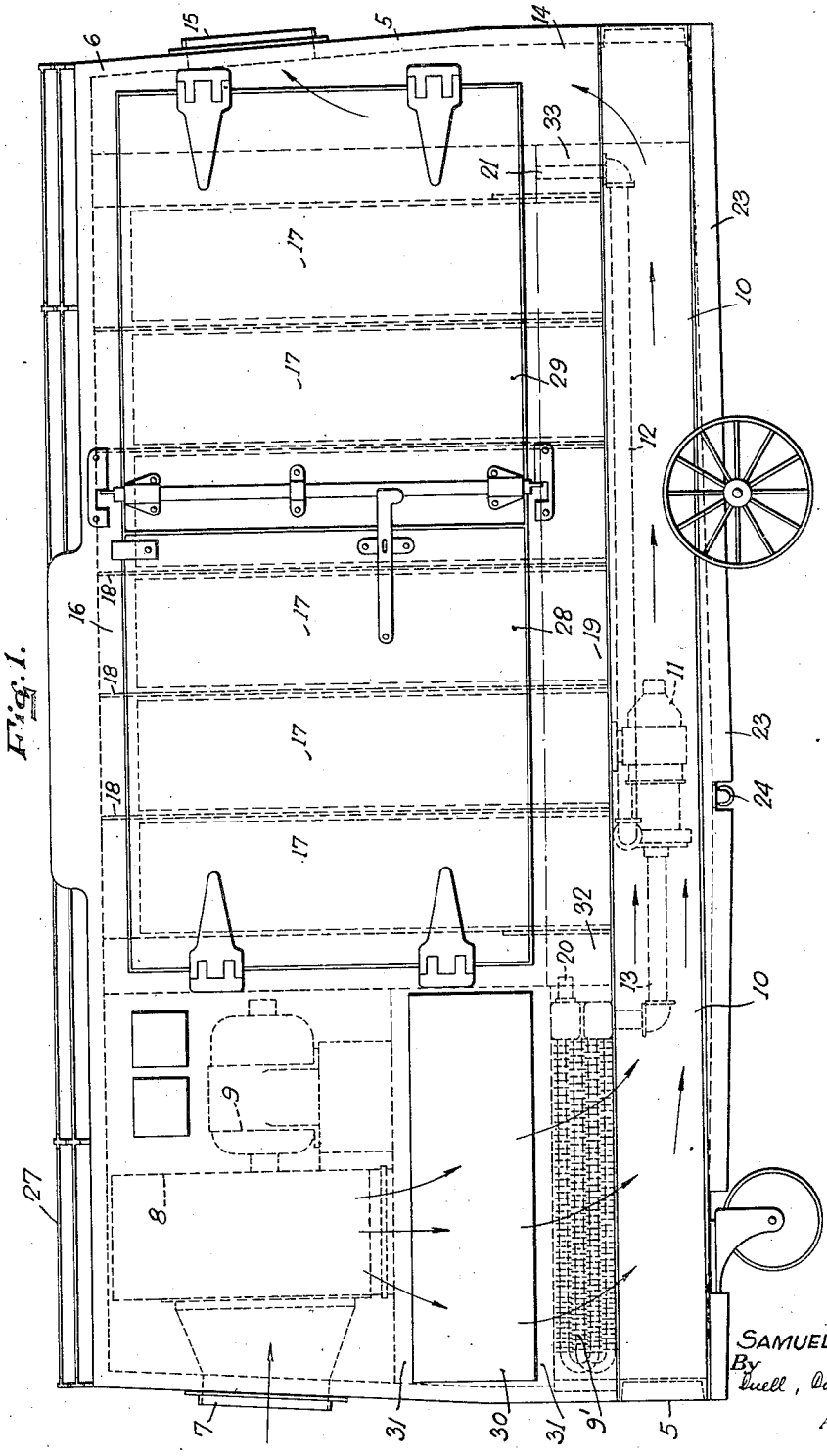

Fig. 1.

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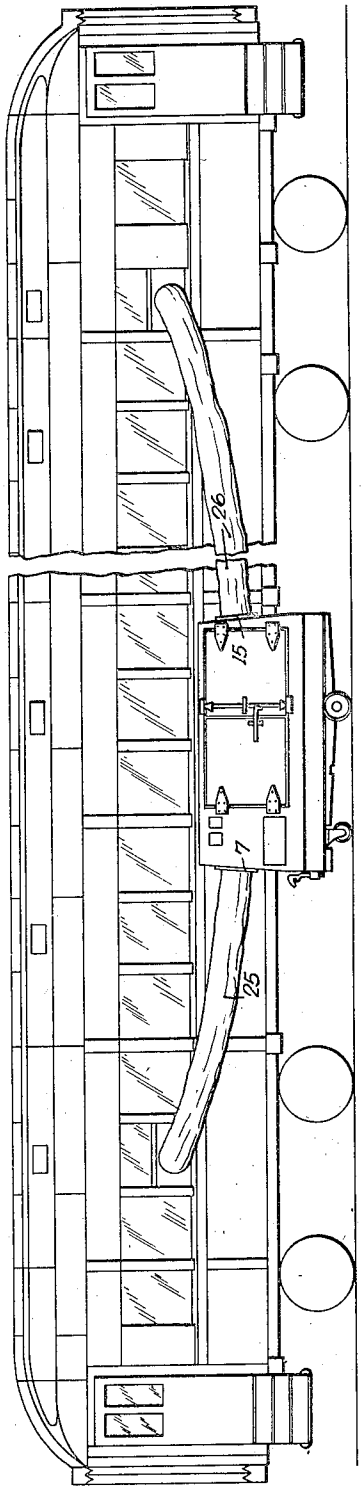

Fig. 3.

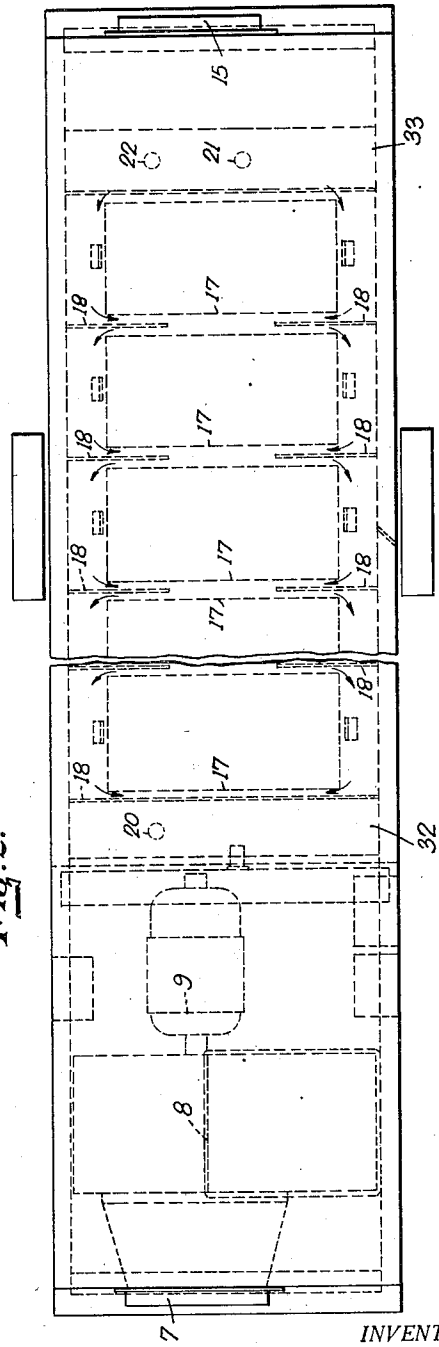

Fig. 2.

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PORTABLE AIR CONDITIONING APPARATUS

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6 Claims. (Cl. 62—24)

This invention relates to air conditioning apparatus and relates more particularly to air cooling apparatus of the portable type which may be used for pre-cooling passenger vehicles.

Metal passenger cars on railways are in almost universal use, and in summer the railway cars which go to make up a train usually stand on a siding exposed to heat from the sun prior to being assembled and switched into a railway station to receive passengers. As a natural result, the air within the cars is very hot and uncomfortable to the passengers.

It has previously been proposed to cool the air within a car standing in a station by means of portable apparatus standing on the station platform. The usual apparatus comprises a truck having a housing mounted thereon containing cakes of ice over which the heated air is blown by a fan, the cooled air being supplied to the passenger cars and displacing therein the heated air. Such devices, as have previously been proposed, are, however, inefficient in that they are mere expedients which are not efficient in that they do not take sufficient advantage of the inherent cooling possibilities contained in ice cakes or other stored cooling mediums.

An object of this invention is to provide an efficient pre-cooling unit for passenger vehicles.

Another object of the invention is to efficiently pre-cool passenger vehicles.

Another and more definite object of the invention is to provide a compact and efficient pre-cooling unit which utilizes to the maxium degree, the heat removal possibilities of stored cooling mediums, such as cakes of ice.

One embodiment of apparatus, according to this invention, comprises a storage refrigerator for a stored cooling medium such as cakes of ice. A finned cooling surface is provided for cooling the air to be conditioned, which air passes over the extended surfaces of the cooling fins rather than over the ice surfaces, such as has been the practice in the past. Water is circulated by a pump through a tortuous passage including the sides of the stored ice cakes and then through the cooling coils. The air being cooled after passing over the cooling coils flows the length of the unit and contacts with all of the piping through which the cold water passes with surfaces of the ice and water bins, and with the water overflow, and is cooled an additional amount by this further contact with cooling surfaces.

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

Fig. 1 is a side view of a complete pre-cooling unit, according to this invention, the apparatus in the interior of the unit being indicated by dotted lines;

Fig. 2 is a plan view looking down upon the cooling unit of Fig. 1, and

Fig. 3 is a side elevation showing a typical arrangement of the unit in operation, cooling the air within a railway coach.

The pre-cooler, according to this invention, comprises a well-insulated heavy steel plate casing within which is mounted the air conditioning apparatus, and which itself is mounted upon a standard type of tractor equipment, used for hauling baggage about the station. The outer steel casing is indicated on the drawings by numeral 5, and there is an inner galvanized casing 6. Between the inner casing 6 and the outer casing 5, cork insulating material (not shown) is provided to prevent the absorption of heat from the air surrounding the unit by the cooling apparatus mounted within the unit. The cooling apparatus comprises the air inlet 7 which is connected to the intake of the centrifugal fan 8, which, in turn, is driven by the electric motor 9. The warm air enters the intake 7 under the influence of the fan 8, passes through the diffusion chamber 31, and takes the path indicated by the arrows, passing over the finned cooling coils 9 and then through the channel 10, which extends the length of the unit, and in which is supported the cold water pump 11, the piping 12 from the cold water pump to the water sump, and the piping 13 from the coils 9 to the pump. The air leaving the channel 10, after passing over the surfaces of the pipes 12 and 13, and the pump 11, passes through the exit channel 14 and the outlet duct 15.

With in the cartridge feed ice bin 16, six 300-lb. cakes of ice 17 (see Figs. 1 and 2) are mounted so as to stand on end and are separated from each other by the baffles 18. The water tank 19, in which the lower ends of the ice cake 17 extend, receives the water from the melting ice, which water is forced first, from an end water bin 32, through the water intake 20 into the first of the cooling coils 9, then passes through all of the cooling coils, and is exhausted therefrom through pipe 13 to pump 11, and is then returned by pump 11 through pipe 12, through pump discharge 21 into another end water bin 33. The water discharge from the pump discharge 21 passes in contact with the lower portions of all of the cakes of ice and travels a tortuous passage defined by the sides of the baffles 18. This tortuous passage is indicated by the arrows on Fig. 2 of the drawings. It is thus seen that the warm water passes the entire length of the ice tank toward the cooling coils, around each cake of ice, and through a tortuous passage defined by the baffles where it gives up its heat by melting more ice and is ready for reuse again in the cooling surfaces.

Water from the melting of the ice, warmed after passing through the cooling coils, overflows at the rear end of the tank 19 through the overflow pipe 22, where it drips to the drain pan 23 along the surface of which it runs to the center of the truck

and out the drain discharge pipe 24 to the track bed.

The air passage 10, through which the cooled air, passing over the coils 9, passes on its way to the exit 15, has as its lower wall the drain pan 23, and accordingly the excess water passing from the end of the unit to the center, counter to the air flow, absorbs additional heat from the air.

The upper wall of the air passage 10 is the lower wall of the bins 32 and 33 and the compartment 19, which bins and compartment contain cold water and ice respectively. Accordingly, this upper wall of the passage 10 is cooled to a considerable degree, and serves, therefore, to cool additionally the air passing through the passage 10 on its way to the exhaust outlet 15.

According to a feature of this invention, the air to be cooled not only passes over the cooling coils to be cooled thereby, but also passes the entire length of the precooling unit prior to being discharged and is exposed during this passage to all of the supply piping through which the chilled water is circulated. It also passes in contact with the excess water discharged from the unit for a considerable period of time, defined by the extended path which the discharged water is forced to take on its way from the overflow passage at one end of the unit to its discharge outlet at the center of the unit. Air also passes in contact with the upper wall of the passage 10, which upper wall is the lower wall of the compartment 19 and bins 32 and 33, which is cooled by the contained ice and ice water. Due to the fact that heat is thus absorbed from the air at every point, it is found that when the device is used for cooling on a normal midsummer day the water is discharged from the unit at approximately 60° F., having absorbed all of the heat from the air being cooled that it is practically possible to absorb.

According to another feature of this invention, air to be cooled does not contact with the ice or other stored cooling medium, but contacts only with the metal cooling surfaces placed in its path, and with the excess water as it drains from the unit.

Fig. 3 of the drawings illustrates the arrangement of a pre-cooling unit, according to this invention, in position for cooling the air supplied to a railway coach. A flexible intake duct 25 is connected to the air intake 7, and a flexible discharge duct 26 is connected to the discharge duct 15. Referring now to Fig. 1, a rack 27 is provided for receiving the flexible air ducts when not in use.

The ice, or other stored cooling medium, is supplied to the pre-cooler unit through two doors 28 and 29, which are of the ordinary refrigerator type, and since forming no part of this invention, will not be described here. An access door 30 is provided for permitting access to the diffusion chamber 31, the fan 8, and the cooling coils 9.

Whereas one or more embodiments of the invention have been described for the purpose of illustration, it should be understood that the invention is not limited to the exact embodiments disclosed, since many departures may be made from these disclosures without departing from the spirit of the invention.

What is claimed is:

1. A portable pre-cooler comprising a storage compartment containing cakes of ice, a tank containing water, a surface cooler, means for circulating water from said tank through said cooler, a passageway connecting with the output side of said coler and having as its upper wall the lower wall of said tank and said compartment, and a fan for passing air over said cooler, through said passage in contact with the lower walls of said tank and said compartment, and into the space being cooled.

2. A portable pre-cooler comprising a storage compartment containing cakes of ice, a tank containing water, a surface cooler, means for circulating water from said tank through said cooler, a passageway connecting with the output side of said surface and having as its upper wall the lower walls of said tank and said compartment, and having as its lower wall the drain pans for the water drained from said unit, and means for forcing air over said cooler and through said passageway in contact with the upper and lower walls thereof, and into the space being cooled.

3. A portable pre-cooler comprising a storage compartment containing cakes of ice, a tank containing water, a surface cooler, a pump for circulating water from said tank through said cooler, a passageway connecting with the output side of said cooler and having as its upper wall the lower wall of said tank and said compartment, means for supporting said pump in said passage, and a fan for passing air over said cooler, through said passage in contact with the lower walls of said tank and said compartment, and into the space being cooled.

4. A portable pre-cooler comprising a storage compartment containing cakes of ice, a tank containing water, a surface cooler, a pump for circulating water from said tank through said cooler, a passageway connecting with the output side of said cooler and having as its upper wall the lower walls of said tank and said compartment, and having as its lower wall the drain pans for the water drained from said unit, means for supporting said pump in said passage, and means for forcing air over said cooler and through said passageway in contact with the upper and lower walls thereof, and into the space being cooled.

5. A portable pre-cooler comprising a storage compartment containing cakes of ice, a tank containing water, a surface cooler, a pump for circulating water from said tank through said cooler, a passageway connecting with the output side of said cooler and having as its upper wall the lower wall of said tank and said compartment, means for supporting said pump in said passage, pipes connecting said pump to said cooler and said tank supported in said passage, and a fan for passing air over said cooler, through said passage in contact with the lower walls of said tank and said compartment, and into the space being cooled.

6. A portable pre-cooler comprising a storage compartment containing cakes of ice, a tank containing water, a surface cooler, a pump for circulating water from said tank through said cooler, a pasasgeway connecting with the output side of said cooler and having as its upper wall the lower walls of said tank and said compartment, and having as its lower wall the drain pans for the water drained from said unit, means for supporting said pump in said passage, pipes connecting said pump to said surface and said tank supported in said passage, and means for forcing air over said cooler and through said passageway in contact with the upper and lower walls thereof, and into the space being cooled.

SAMUEL M. ANDERSON.