

CNR

EQUIPMENT

the microphone box at gate 5, a push button switch was added. This switch cuts off all speakers except those in the train sheds. This feature is used to

affects frequencies up to 500 cycles, and the treble control affects frequencies above 1,000 cycles. The amplifiers have two-channel mixers, so that they can be

General Equipment Engineer, and A. S. Walker, Assistant Engineer.

## New Flat Cars for C.N.R.

Among the equipment received by Canadian National Rys. in recent months, on orders which were noted in these columns at the times they were placed, have been 300 52 ft. steel flat cars which were built by Canadian Car and Foundry Co.

These new cars, one of which is illustrated herewith, are of the fish belly center and side sill type, weighing approximately 43,400 lb. and capable of

carrying a load of 125,000 lb. They are 9 ft. 6 in. wide, and the floor is of wood construction. Journals are 5½ x 10 in.

These cars form a particularly acceptable addition to C.N.R. rolling stock at the present time, as the type is in great demand for the movement of heavy machinery, lumber, etc., required in connection with the war effort. Each car has been placed in service immediately upon receipt.

## New Equipment on U.S. Roads

In the first 11 months of 1942, the Class I railways in the United States placed 61,220 new freight cars in service, included having been 34,250 box, 22,237 coal, 2,487 flat, 621 refrigerator, 100 stock and 1,406 miscellaneous freight cars. New freight cars on order on Dec. 1, 1942, totalled 28,108, compared with 76,492 on order on Dec. 1, 1941. The cars on order on Dec. 1, 1942, included 8,159 box, 17,249 coal, 1,425 flat, 800 refrigerator, 200 stock and 205 miscellaneous.



One of the New Flat Cars on the C.N.R.

February 1943



**Testing Amplifiers at the Windsor Station Public Address System.** These three amplifiers, small and compact, control the C.P.R. Windsor Station Public Address system, which includes seven microphones and 18 loudspeakers, located at strategic points throughout the station building and train sheds. These amplifiers are in a small room behind the information desk in the central waiting room. Handling the microphone in the illustration is Mr. A. W. Past, Chief Engineer, C.P.R. Communications Department. P. G. Weber, General Equipment Engineer, while A. S. Waller, Assistant Engineer, looks on.

issue orders direct to station crews serving trains.

The three amplifiers are located in a small room at the rear of the information booth. These amplifiers have an overall gain of 140 db, and a nominal rating of forty watts with a 4% harmonic distortion at thirty watts. The mono distortion at thirty watts. The frequency response is plus or minus 5 db from 30 to 11,000 cycles. They are equipped with Electronic tone controls, to vary the frequency response to suit acoustic conditions. The basic control affects frequencies up to 400 cycles, and the treble control affects frequencies between 30 and 11,000 cycles. This feature is used to two-channel mixers so that they can be

switched from one microphone circuit to another in case of trouble. Microphones for testing purposes, and a monitor loudspeaker is installed nearby. The speaker can be plugged into any output in order to check the operation of the amplifier and its speaker circuit.

The large number of speakers in the concourse was necessary in order to overcome acoustic difficulties. What Windsor Station was built, acoustic engineering was in its infancy, and little consideration was given to sound treatment of buildings of this type. To keep the reverberation at a minimum, a large number of loudspeakers was installed, all operating at a relatively low level. This practically eliminates echo effects which would decrease the intelligibility of the announcements.

The initial installation in the train sheds for the benefit of passengers on the platforms, consisted of twenty outdoor speakers. It is expected that this system will be extended by the addition of three loudspeakers and another group of speakers to carry announcements to the end of the train sheds, which are over 1,000 feet long.

The gatemen, who do the train announcing, have all been receiving special instruction from the communications engineers, in order to perfect their station and timing over the new public address system. Instructions as to the operation of the system and care of the microphones have also been issued to those who are handling the equipment. The public address system works continuously from 8:30 a.m. to 11:45 p.m. daily.

The installation was made under the supervision of L. A. W. East, Chief Engineer, C.P.R. Communications Department, and was in charge of P. S. Fisher, General Equipment Engineer, and A. S. Walker, Assistant Engineer.

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All the equipment is interchangeable, and can be moved from one circuit to another without disrupting service. In the telephone box at gate 5, a push button switch was added. This switch cuts off all speakers except those in the train sheds. This feature is used to two-channel mixers so that they can be

## Tele

*Marine air  
and cable in*

**STATISTICAL information** telegraph and cable services is furnished by the Dominion Bureau of Statistics Transportation Utilities Branch, is reviewed below. The figures relate to the departments of the Canadian Pacific, Northern and Central, and N.O. North American Telegraphating north and west of Kitchener, Government Telegraph Department (operating line Scotia, New Brunswick, N.B., the western provinces, Yukon Territory, and a small portion of British Columbia).

TABLE I - TELE

Canadian Marine Telegraph	Canadian Cable	Canadian Northern Telegraph	Canadian Central Telegraph	North American Telegraph	Total
Cost of Property and Equipment	20,022,505	1			
Revenue					
Canadian telegraph					
Total	1,361,411				
Telephone tolls on stable measure	100,699				
Cross traffic tolls	40,132				
News and commercial telegrams	41,777				
Weather reports	17,062				
Ticker feeds	14,722				
Other telephone transmission fees	10,777				
Telephone offices	3,378				
Commercial cables	1,340,137				
Partial cable bills	4				
Other cable trans- missions revenue	1,334,846				
Revenue from leased lines and wires	12,659				
Meter reader pay- ments	3,041				
Other telecommunications	29,041				
Telephone revenue	60,031				
Total	1,347,065				

## New Equipment on U.S. Roads

In the first 11 months of 1942, the Class I railways in the United States placed 61,220 new freight cars in service, included having been 34,250 box, 22,237 cost, 2,487 flat, 631 refrigerator, 100 stock and 1,406 miscellaneous freight cars. New freight cars on order but placed at present time to C.N.R. rolling stock at 1,136, totalled 28,108, compared with 76,348 on order on Dec. 1, 1941. The cars on order on Dec. 1, 1942, included 6,150 box, 17,249 flat, 1,495 tank, 800 re-

## New Flat Cars for C.N.R.

Among the equipment received by Canadian National R.R. in recent months, on orders which were noted, in those construction, columns at the times they were placed, have been 380 62 ft. steel flat cars which are of wood construction. These cars form a particularly acceptable type in freight service. The present time to C.N.R. rolling stock at 1,136, totalled 28,108, compared with 76,348 on order on Dec. 1, 1941. The cars on order on Dec. 1, 1942, included 6,150 box, 17,249 flat, 1,495 tank, 800 re-

Establishment of road haul requirements	1,337
Salaries of op- erations	1,334,846
Operations	1,334,846
Channelling - ex- penses	28,223
Salaries of general heads and general staff	1,336,733
General office ex- penses	52,277
Total	10,777



railway equipment: fullest possible ex-

periment recommended refusal of the appu-

bility.

## C.N.R. Builds Cabooses

New cabooses to a total of 250 are being built at the C.N.R. Point St. Charles freight car shops. They are marked by many modern features, and great interest is shown special

A VALUABLE contribution to the war effort of Canadian National Rys., in so far as freight transportation is concerned, is being made by the officials and employees of the Point St. Charles (Montreal) freight car shops, where, in addition to the carrying on of the regular car repair and maintenance work, new cabooses to a total of 250 are being built. Between June, 1942, and early December, 183 cabooses had been built, and work was well under way on the remaining 67.

at Point St. Charles are equipped with clothes lockers for double crews. Sleeping accommodation for three crew members, on 4 in. upholstered mattresses supported on bed springs, is provided. This desirable sleeping accommodation is secured by having three bunks built along the walls, with the folding steel beds lowered over these bunks for sleeping and folded back against the wall when not in use. Under the cupola, there are three cupboards of generous size, and

were cut off behind the bolsters and reduced to the standard length of 35 ft. Then the body bolsters, together with the draft sills and side channels, were moved back toward the frame center, to meet the requirement as to distance between truck centers, viz., 20 ft. 9 in. The side sill channels were cut back, to permit the inclusion of standard gallery end steps. The center sills were reinforced through the bolsters with 3 ft. x 6 in. channel pressings.

The original trucks were all dismantled; the axle bars were annealed, and the trucks were rebuilt, with 6-leaf elliptic springs applied, to secure smooth riding.

Gallery and railings were made, and applied with steel splash plates and center rail locking device substituted for the safety chains. Steel ladders were applied at each end, with the extension arms over the roof. Standard hand brakes are applied at each end of the caboose, and the air brake equipment applied is the Westinghouse schedule C. The conductor's air brake valve, of latest type, is applied in the cupola, together with trainline pressure gauge.

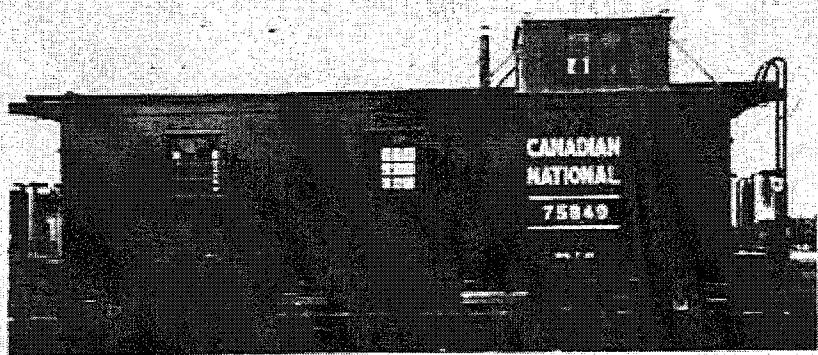
The bodies are framed in 2 $\frac{1}{2}$  x 5 in. B.C. fir, well braced and with top and bottom post notching, with one setting and 4 x 6 in. side sill fillers and side plates.

After the outside sheathing of B.C. fir was applied, two courses of one inch insulation were applied between the framing, and covered two layers of Black Diamond paper. Blind lining,  $\frac{1}{2}$  in. thick, was placed lengthwise, and the interior V painted B.C. fir lining was applied vertically.

The  $\frac{3}{4}$  in. deadening material between the floor sills, covered with two courses of one inch insulation and one course of rubberized paper. This is covered with box car lining, and the top floor, laid longitudinally, is of  $1\frac{1}{2}$  in. B.C. fir. The carliners are of the arch type, and in each bay is laid two layers of one inch insulation, well cleated to the carliners.

The ceiling is of  $\frac{3}{4}$  in. B.C. fir, applied lengthwise. The roof is of plastic type, with one layer of  $\frac{3}{4}$  in. roof boards placed from ridge to side plates, followed by one course of plastic roofing, with the top course applied in similar manner. The cupolas were framed and practically completed in the wood mill before being raised into position on the caboose roofs, where they are secured with tie rods and bolts.

In the interior, the B.C. fir lining is finished with two coats of clear varnish. The exterior is painted with three coats of freight car brown. With inside dimensions of 29 ft. 6 in. length, 8 ft. 5 in. width and 6 ft. 6 in. clear height, average weight of these cabooses is 42,000 lb.



One of the New Cabooses on the C.N.R.  
Utilising the cut down and rebuilt steel underframes of former box cars, and their rebuilt trucks,  
250 cabooses of this type are being turned out at the Point St. Charles Shops.

This new caboose equipment includes many improvements designed to promote the safety and comfort of the crews, and the interior, particularly, has fittings which have been conspicuous by their absence in the usual caboose of former years. For example, the average caboose has never been equipped with bed springs and mattresses, for the accommodation of crew members during layover periods. Also, the interior of the average caboose has been somewhat roughly finished, as compared with the refinements which are being incorporated in these new units. Again, the average caboose has not been fitted with storm windows or screen doors, and has not had any weather-stripping applied to prevent draughts, but, in these new cabooses, the car body is completely insulated, with the result that draughts are greatly reduced, heating is easier and many train noises are eliminated from the interior. In the past, the average caboose has not boasted a lavatory or built-in wash basin. This equipment is included in the new units.

The new cabooses are far more substantial than those common to railway operation a generation ago, and are sturdier, because of the use of steel underframes and also because of stouter construction throughout the body of the car. They ride better, and the facilities generally make for better working conditions. The units of this lot being built

are well constructed refrigerator, with proper ice racks and drain. Also, the equipment includes a stove fitted with oven, a desk, a sink, a lavatory, two long seats with cushions for lookout men in the cupola, and a large exterior equipment box, attached to the underframe. Very adequate natural lighting is provided, there being two windows at each side, these being fitted with storm sash for winter use. The car body is exceptionally well insulated, to provide protection against cold. The two end doors are of half glass, and are fitted with outer storm doors for winter use and with screen doors for summer use. The cupolas are of standard design, with ample headroom, and provide clear vision. The cupola side windows are of the sliding type, while the front and rear windows are fitted with storm sash. For the privacy of the crews, the doors and windows are equipped with roller blinds.

The steel underframes employed in the construction of these cabooses were taken from 30-ton box cars which were built in 1912 and 1913 and later equipped with Miner friction draft gear and striking castings and 6 x 8 in. couplers. These box cars were placed on stripping tracks, where the superstructures were entirely removed, and the underframes, on their own trucks, were then shopped. To get the underframes ready for incorporation into the new cabooses, the center sills

February 1943

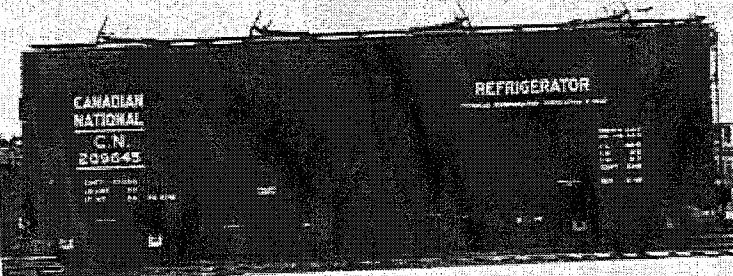
# Canadian Transportation

## **Construction of C.N.R. Refrigerator Cars**

The great advances effected in railway refrigeration service during the past decade are well known in railway circles. The adoption of overhead refrigeration has produced greatly increased efficiency and consequent improved service in long distance transportation of perishable products. In the following we furnish the greater part of a description of the construction of overhead type refrigerators at the C.N.R. Transcona shops, as prepared by P. Tidbits, Unit Foreman, C.N.R., Transcona.

THE possibilities of modern refrigeration were quickly recognized by the transcontinental railway systems faced with the problem of transporting over great distances, and delivering in perfect condition, huge quantities of grapes, peaches, other soft fruits and vegetables, fish, butter, cheese, beef, bacon and other perishable commodities. The early types of railway refrigerator car were of all-wood construction, heavily insulated and with four ventilating brine tanks located at each end, providing air circulation from the ends of the cars to the doorway. However, with the trend toward heavier equipment, the all-wood car became inadequate, and it was found necessary to introduce steel underframe reinforcement. Many cars were built to this design. Throughout the years, various changes and improvements were made, the brine tank being replaced by a wire divided basket bunkar, into which, when heated service was required, a charcoal heater was lowered by means of hook and rope. Today, however, this heating system is being rapidly replaced by one utilizing an externally operated underframe heater, permanently attached to the outside of the car.

With growth in tractive effort of locomotives, and with increase in average number of cars per freight train, designers of railway equipment were soon confronted with the necessity of developing a refrigerator car not only capable of carrying greatly increased load, but also of sufficient strength to withstand the greater strains and stresses of modern railway freight service. It was logical, therefore, for them to turn to the all-steel box car as the basis for new refrigerator car design, and an all-steel refrigerator car was planned as one to meet all essential durability requirements. The next problem was that of providing a refrigerator car with not only increased load capacity and increased strength, but also one affording the necessary capacity without enlargement of car dimensions. Consideration of this directed attention to the amount of loading space which was being taken up by the end bunkers or brine tanks in the refrigerator cars which were in operation. As a result of the fore-



One of the New Type, Exterior Steel Construction Refrigerator Cars, Built at the C.N.R. Shops.

igated policy of railway management and the close study of the railway technical officers dealing with the matter, much fruitful experimentation in the principles of general refrigeration was conducted over a number of years. In the C.N.R. two steel underframe cars with wooden superstructure were converted

length over couplers  
Width over heelplate  
Width broad of frame  
Length available for loading  
Height inside top of shear frame by underbody  
    repeat rates  
Crushed live capacity of tanks and overhoppers  
    tanks respectively  
Capacity, cu. ft.  
Capacity, cu. m.  
Gross weight, lbs.

cars demonstrated the value and increased efficiency of overhead refrigeration, and incidentally, continue to provide excellent service. Encouraged by the results of the experimental work, the C.N.R. management decided in 1938 to build in the Transcona shops 100 all-steel refrigerator cars employing the overhead icing principle. These cars demonstrated such a high degree of refrigerating efficiency, and met with such an enthusiastic reception from perishable freight shippers and consignees, that it was considered desirable, as a contribution to the war effort, as concerns the large movement of bacon and other perishables to the Atlantic seaboard for export overseas, to build an additional

It will be noted that while the length over all, width inside and width outside are almost identical for the two classes of cars, the car used by overhead tanks provides 150 cu. ft. more capacity than that used from the ends. This increased capacity is greatly appreciated by railway patrons, who are not only able to load an additional 22,000 lbs. of perishables in the car used from overhead, but are provided better refrigeration, over greater distances, with 1,500 lb. less ice than required by the end bunker car.

The cars with overhead icing are equally adaptable for handling frozen commodities under intensive refrigeration and for handling shipments requiring ordinary refrigeration, under heat or ventilation, and an important feature of

these cars is the economical operation provided by conservation of loading space and the elimination of practically all temperature gradient between top and bottom of car. In two test shipments of frozen fish from Prince Rupert to Jersey City and Chicago, under intensive refrigeration, during the heat of summer, re-icing in transit was required at only three icing stations in the first shipment and one in the second, while the temperature gradient was only two degrees throughout the trip. Similar shipments in cars equipped with end bunkers would have required re-icing at each of the seven regular icing stations, with, in many instances, a temperature gradient as high as 12 degrees. In extensive use in the shipment of bacon from Edmonton and Winnipeg to Montreal, equally fine performances have been obtained with the overhead tank cars with only one re-icing in transit. Thus the C.N.R. provides practical evidence of its desire to provide the public with maximum service by efficient and economical means.

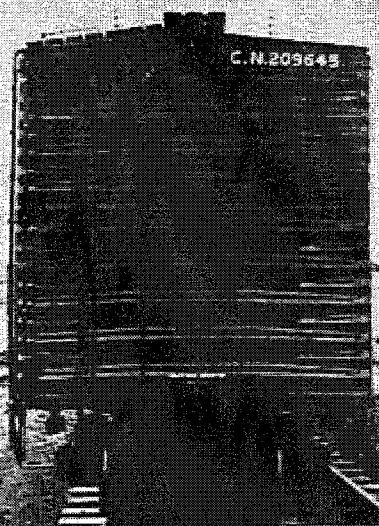
A feature of the latest refrigerator cars is the application of liquidometer thermometers, by which outside dial readings record the prevailing temperatures in the car interior, at top, and bottom.

To follow the progress of the refrigerator car construction work through its various stages is very interesting, not only to the mechanics who take pride in their ability to build this class of equipment, but also to the average individual introduced to the structural details for the first time. It is particularly absorbing to those charged with the responsibility of studying each individual drawing in detail, making up material lists and placing the necessary requisitions, without which preparatory work actual construction could not be initiated.

#### Overhead Tank Car Construction Described

While awaiting delivery of material which under present conditions covers an extended period, all preliminary planning and organization is completed, so that, immediately material is received, it can be placed directly in shop for fabrication incidental to assembly.

Construction of this type of car involves approximately 550 different items,



End View of One of the New Refrigerator Cars, of which 300 steel parts of various designs, together with 50 miscellaneous lumber items, are fabricated and milled, in the Transcona shops, the balance consisting of rivets, bolts and nuts, screws, nails and other specialized parts, purchased through the usual supply channels.

Immediately sufficient material is on hand and assurances received that the balance will be delivered in such manner as to obviate any likelihood of retarding continuous production, the organization is set in motion.

All fabricated material is placed at the most convenient point of assembly and two "Z" shaped center sills, 12 13/16 in. deep, weighing 313 lb. per foot, 41 ft. 4 1/2 in. long, with top flange welded the full length of car, are set up on trestles preparatory to assembly of the underframe.

The underframe consists of eight pressed steel plate continuous hinged bolster diaphragms, four crossbeamer diaphragms of similar design, and eight cross tie diaphragms with top and bottom cover plates extending across the car from side sill to side sill and riveted thereto.

The side and end sills, made from 6 x 3 1/2 x 5/16 in. angles, form a junction with pressed steel diagonal braces extending from body bolster and center sill, and together with floor support angles, running longitudinally between center and side sill from bolster to bolster, constitute the main features of the underframe.

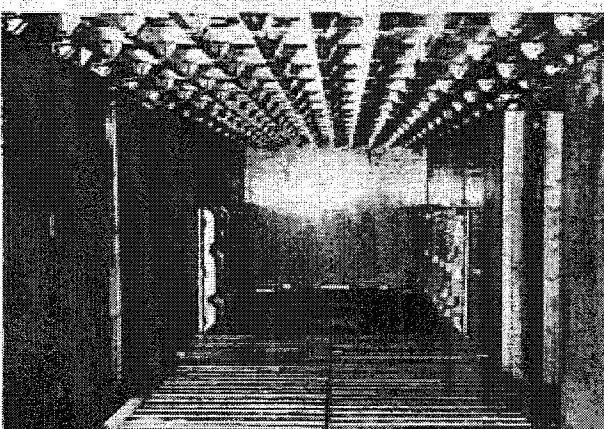
The side sills are reinforced at the bolster by a 6 in. x 15.5 lb. ship building channel, and further support is added by application under door opening of a special bulk angle 6 in. x 10.7 lb. x 17 ft. 6 in. long.

With the underframe assembled and riveted together, the greater part of the air brake piping is applied and installation of the A.B. air brake equipment takes place, following which the underframe is placed on its permanent stabilized truck, equipped with steel side frames, previously assembled in readiness.

In building all steel equipment of this design, builders have been confronted with the problem of preventing, during erection, the buckling of the side sheets, which being formed from roller levelled copper bearing sheet plate only 0.10 inch thick, although offset and lapped to provide a watertight joint, do not offer much resistance until reinforced by pressed steel inside side posts and girth channels riveted thereto. To overcome this undesirable feature, a frame or trestle has been erected, sloping at an angle of 23 degrees, in order to give the workers necessary purchase when assembling and riveting.

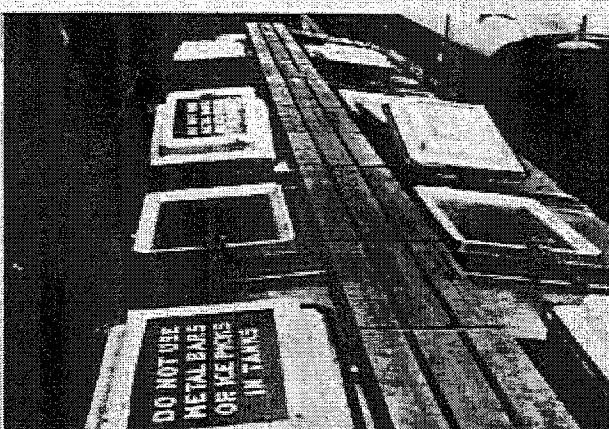
The frame is laid out in such a manner as to permit mechanics to assemble the whole steel superstructure side in its entirety, which when riveted together is bound to be perfectly straight, and can be lifted, placed and held in position by overhead travelling crane until permanently secured to the underframe.

This procedure is duplicated in respect of the two piece Dreadnought steel ends, which, in conjunction with power hand-brakes, brake platform, running board brackets and other incidental fittings are all assembled and riveted together on the floor of the shop before being applied to the underframe, thereby not only contributing greatly to general productive efficiency, but reducing the hazards occa-



Left, Interior View of One of the New Refrigerator Cars. Right, New Refrigerator Car Roof, Showing New Type Hatchets for the Overhead Ice Tanks. In the view at the left, note the floor racks of steel and hardwood construction, and the manner in which they look against the car sides for floor cleaning.

In the roof view, note that the car is equipped with eight overhead ice tanks, instead of the former two bunkers located at each end.



sioned by the operation of power hand tools under less favourable conditions.

One of the most important and essential features of refrigeration is the insulation, but before this can be applied it is necessary to spot weld to the top of the underframe a deadening floor of no. 16 gauge copper bearing steel sheets. On top of this is laid four layers of 1 in. hair insulation, each layer in one piece, covering the entire width and length of car. This is covered by one course of  $1\frac{1}{2}$  in. x 5  $\frac{1}{2}$  in. t. g. flooring laid longitudinally and supported at sides and ends by 6 in. x 3  $\frac{1}{2}$  in. sub-sills, with center stringer 2 in. x 4 in. supported by four spacers bolted to center sills in order to prevent compression of hairfelt.

With a firm foundation undercut it becomes much easier to apply the side and end insulation, which, consisting of four 1 in. layers extending from bottom side sill to top side plate and running in one continuous piece from door post around each end of car to opposite door post, is held in position by special holders designed to keep the insulation in place without reducing its efficiency through compression.

The side and end insulation in place, an inside steel framing, made up of inside side sill angle specially formed to take care of duct application, inside Z bar posts to which are bolted wood filler posts and meat rack carrier plates with brackets attached to support meat rack carriers, the whole having been previously riveted together and assembled outside the car, is lifted by overhead crane and dropped into place on each side of the doorway before the roof is applied. This operation, while quite simple and efficient on new construction work, presents considerable difficulties when involving necessary repairs. Inside framing is screwed to the wood floor and bolted to the wood top plate.

Representing an entirely new departure from the conventional refrigerator car floor is a specially designed 14 gauge steel floor; cadmium plated and non-corrosive; it is so formed, when laid in sections and sealed with permagum covered by a metal cap strip, as to provide a continuous waterproof floor with a gutter running longitudinally each side of car, by which means brine is disposed of through the usual drain traps located at each corner of the car. It is equipped with supports for floor racks and heater pipes. Before laying the metal floor in place, an additional layer of 1 in. insulation is laid on top of the wood sub-floor, but, unlike other insulation applied in one complete piece, this is applied in sections between  $1\frac{1}{2}$  in. x 6 in. wood stringers which lend support to the center of the metal floor, the outside edge of which is secured to brackets on inside side sill by stainless steel self-tapping screws.

In order to prevent at this stage the spreading of the superstructure, eight ceiling carlines of  $1\frac{1}{2}$  x  $1\frac{1}{2}$  x  $3\frac{1}{16}$  in. angle, with a similar number of channel tank carriers are bolted to brackets previously riveted to inside side plate, and a new type of resin-bonded weatherproof plywood ceiling, superseding the usual "V" joint ceiling, is secured to furring on ceiling carlines, tank carriers and ridge pole.

On top of ceiling is then laid four 1 in. layers of insulation with eight openings cut out for hatch frame, following which is applied a specially designed air steel roof made up of twelve 14 gauge galvanized sheets extending from side plate to side plate, four of which are formed integrally with eight steel hatch frames, the whole being riveted together at outer corners.

A further improvement, in what is still an experimental though practical design, is the application to these cars of four 22 gauge pressed steel galvanized end ducts, which, although not intended to carry away ice meltage, are so applied as to provide additional and more efficient air circulation.

An additional change from the original design is the equipping of cars now under-construction with an all galvanized overhead ice tank.

Replacing a tank of lighter and less durable construction which was formed in two sections bolted together with cadmium plated bolts, these tanks are fabricated entirely at this point.

Requiring eight tanks per car, the body is made from 12 gauge galvanized steel, and the ends from 8 gauge open hearth steel pressed to form a flanged diaphragm to which is riveted supporting angle brackets and baffles, the whole being hot galvanized before it is riveted to the body, forming a complete unit. All rivet heads and seams are soldered to prevent erosion.

The tank is 8 ft. 9 in. long and 3 ft. 3 in. wide, upright sides being  $3\frac{1}{2}$  in. deep at outside,  $6\frac{1}{2}$  in. deep at inside, and is applied with shallow side plates at center of car in such manner as to permit emission of brine overflow by means of six 1 in. holes, covered by baffle, located on the shallow side of the tank. It is equipped with a special brass cock for brine drainage, to which is attached an extension rod and handle extending through drain pan flange, to be manually operated from the center of the car.

Each tank when completed weighs 407 lb. and has a crushed ice capacity of 812 lb.

Located directly under each ice tank is an overhead drain pan.

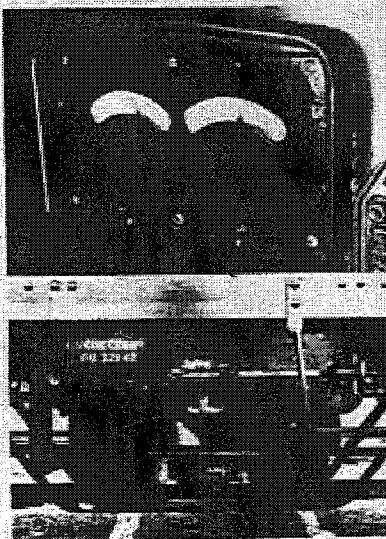
Formed by five ply  $\frac{1}{8}$  in. thick plywood panels and wood furring, on top of which is applied a 22 gauge O.H. steel sheet with an enamel finish, the vertical wall located at center of the car acts as a baffle in preventing ice meltage from tanks overflowing on to shipment, and in addition to directing dispersal of brine through ducts to its proper exit, by forming a continuous channel from end to end of car it also facilitates adequate circulation of air.

To provide ready access to the tank valve, very often necessary under service conditions, a removable valve pan and cover is applied to the drain pan, which assists greatly in the removal of any possible obstruction to the drainage system.

The overhead tanks are attached to and supported by tank carlines, the drain pans being secured by brackets bolted to both tank and ceiling carlines.

Overhead ice tanks and drain pans securely in place, the open ducts are covered by a special porcelain treated metal sheet, and in place of the usual fur lining,  $\frac{1}{8}$  in. five-ply waterproof glued fur panels extending from  $\frac{1}{4}$  in. below floor racks to underside of meat rack supporting plate at side, and to drip pan and ceiling at ends, are secured with galvanized flat head wood screws to filler posts previously applied to inside framing and ends.

With all joints sealed by a strip of



Upper View, a Liquidometer of the Type Installed on the New Refrigerator Cars. Read from the Car Exterior, and Recording the Temperature at Top and Bottom in the Car Interior. Lower View, Undercar Heater and Control Mechanism for New Type Refrigerator Car.

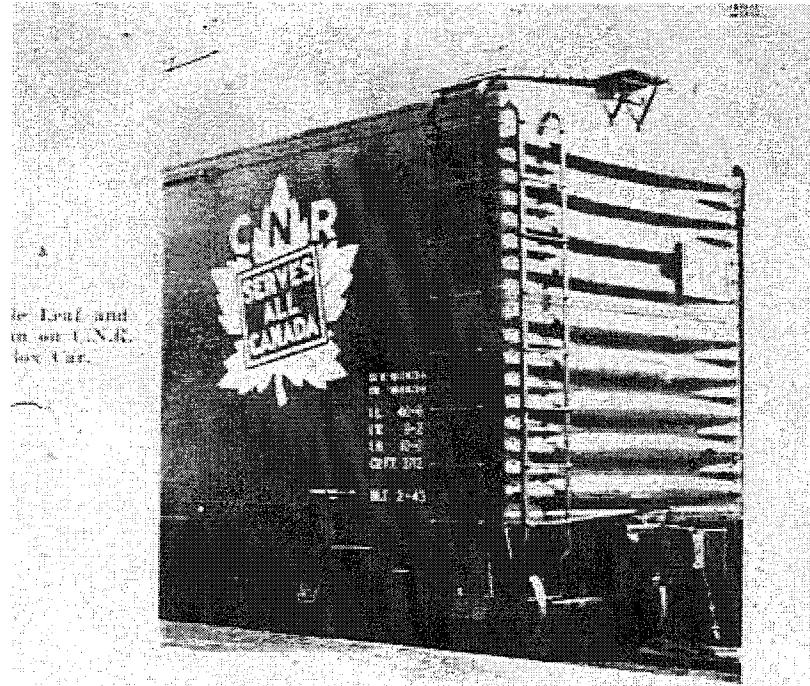
side side plate, with outside roof carlines extending in one piece from side to side. Replacing the old type hatch plug and cover is a combined built-up unit of wood and steel.

This consists of a pressed steel cover to which is bolted an oak wood frame containing five 1 in. layers of insulation; the edge is sealed with canvas covered hair insulation and the top with sponge rubber cemented to the hatch frame, and when equipped with an improved type of hatch closure fittings, an easily operated, perfectly sealed unit is provided.

With the application of longitudinal and lateral running boards, the roof is completed. A source of trouble and expense to all operators of the old-type refrigerator car was infiltration of moisture, particularly at each end of the car. This results in serious deterioration and renders useless the insulation upon which proper refrigeration depends, and in an endeavor to overcome this, designers have conducted extensive experiments in perfecting the evolutionary idea of overhead icing.

Based on the premise of providing assisting air channels for cold air to follow its natural downward movement, and hot air the reverse, a series of pressed steel side ducts, made of 22 gauge steel with a baked porcelain-like finish, built into walls contingent to insulation, was designed, not only to carry away overhead ice meltage, but in so doing to provide additional refrigeration value in maintaining an even temperature.

MARCH 1943



Aug. 29 to crossing and being  
by bending car of train which was  
over crossing, respectively.

In three automobile, a truck,  
pedestrian, through carelessness  
turnpike and the track driving  
crossing and being struck by  
in the pedestrian, standing by  
waiting for northbound train to  
be struck by locomotive or other

in Columbia, one, an automobile  
carelessness in driving or  
being struck by train  
and Time of Crossing Accidents  
took place at unexpected  
and fear at protected crossing  
after arrival and sight  
and.

#### Steel

After much discussion of the merits of  
recent statement to the rail  
permanence "Bowed and the Wheel",  
it may, might be chosen as the  
one of the wrought steel wheel  
which rewards in part the  
switch runs by fifth and the  
head runs by the force of God.  
Examination of the present-day  
wheel, this seems very per-  
300-ton, 1,000-lb. Disadvantages  
negative train on rolled steel  
in diameter. Each wheel  
over 122 tons on its one-quarter  
inch of contact area with the rail  
m.p.h., the wheels are turned  
more than 900 times a minute or  
the 15 times a second. Punish-  
this speed is severe. To the  
engaged from rail joints and at  
crosses and crossings, has added

#### New Dress for C.N.R.

#### Box Cars

The accompanying illustration shows  
one end of a new box car for Canadian  
National Ry., this car being the first  
delivered out of 100 ordered, and  
is built box cars painted with Canadian  
Car and Foundry, Co., Ltd. The  
body of the car is painted in the standard  
box car red, with a triple leaf, and  
the slogan "Serves All Canada" prominently  
superimposed in white. The car  
lettering, numbering, and specifications  
are in white also.

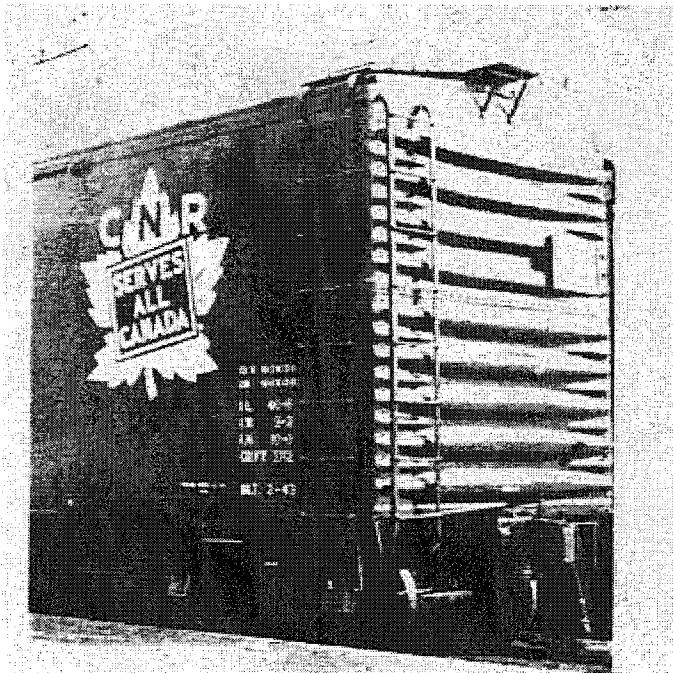
The red on which the car body is  
painted has been extended to the truck  
wholes and all underframe equipment  
previously painted in black.

When the first of the new box car  
was delivered at Montreal, it was inspec-  
tored at the manufacturer's plant by a  
group of C.N.R. officers, including N. B.  
Walters, Vice-President, Adminis-  
trative Services; K. L. Vice-President, Traffic;  
L. R. Shirley, Chief of Motive Power and  
Car Equipment; J. P. Johnson, Chief of  
Transportation; F. Simpson, Assistant  
Vice-President, Operations, and G. E.  
McCoy, Assistant Chief of Car Equipment.

The weight is 40 ft. 6 in. long, 10  
side 13 ft. 8 in. high, 10 ft. wide  
at eaves and a step width of 10 ft.  
3 in. 9 ft. 2 in. wide inside and 9 ft.  
high inside. Capacity is 3,712 cu. ft.

Advice received since the foregoing  
was written is to the effect that the  
slogan shown in the accompanying illustration  
will be placed on approximately  
100 cars, and that very probably similar  
slogans will be used on other cars. In

MAY  
1943



Progress and Being... New Dress for C.N.R.  
and trains which...

**Agent.** **Robert McPHERSON**, B.C., has been appointed Superintendent, Law Department, Toronto.

**A. MAHON** was appointed acting Foreman, Timmins, Ont., Toronto, May 1.

**J. V. MILLION**, previously Third Agent, Union Station, Toronto, was appointed Traveling Passenger Agent, Montreal, April 26, with territory east of Toronto, including the Province of Quebec, but not the Lake Ontario,桂湖, and Lake Huron Districts, and not the Great Lakes Districts, the lines from Nipigon Bay to Sault Ste. Marie, via S. E. Baker, promoted.

**G. F. NELSON**, previously General Manager, Toronto Terminal, was appointed Assistant Superintendent, Passengers, terminally Montreal, May 1.

**W. H. PIGGOTT** was appointed Electric Locomotive Foreman, Montreal Diesel, Montreal, May 1. He will have jurisdiction over the maintenance of electric railcars and multiple-unit cars operating in the electrified zones.

**C. E. RICHARDSON**, previously Chief of Information Bureau, Toronto, was appointed Assistant Third Agent, Union Station, Montreal, April 26, from G. E. Chapman, promoted.

**M. J. RIESBERRY** was appointed General Agent, Toronto, May 1, via D. F. McGehee, transferred.

**N. H. STEVENS** was appointed Mechanical Foreman, Quebec District, Charlottetown, April 26.

**J. P. WHITETT**, previously Chief Clerk, General Passenger Agent, Toronto, was assigned Assistant to Manager, Vancouver Section, Vancouver, Montreal, April 16.

**C. M. WILSON** was appointed acting Superintendent of Transportation, April 26, via W. J. Rogers, on basis of transfer while with the Arctic Forces.

#### Canadian Pacific Railway

**R. A. BAKER**, previously Shop Foreman, Winnipeg, was appointed Shop Foreman there, April 26, via A. Person, transferred.

**E. M. BEATTIE**, previously Boiler Foreman, Galt, was appointed Assistant Boiler Foreman, Western Shops, Winnipeg, May 1, via F. E. Miller, transferred.

**A. BETTON**, previously Night Foreman, Wilmette, Illinois, was appointed Shop Foreman, Chicago, Illinois, April 26, via A. Clark, transferred.

**J. P. BISHOP**, previously charged with Removals, Atlanta, was appointed Shop Foreman, Wil-

man, Victoria, B.C., was appointed Assistant Foreman, Coalition, B.C., May 1, via J. Morris, retired.

**S. G. HUGHES**, previously Locomotive Foreman, Duluth, Minn., was appointed Locomotive Foreman, Swift Current, Sask., May 1, via F. L. Faubel, transferred.

**J. HUTCHINSON**, previously Shop Foreman, Inverary, Sask., was promoted Shop Foreman, Western Shops, Winnipeg, April 26, via L. P. Hall, retired.

**J. O. JOHNSTON** was promoted Assistant Superintendent, London Division, London, Ont., transferred.

**Quebec Power Company-Quebec Rail-way, Light and Power Company**

**J. N. SMITH**, previously Assistant Superintendent, Quebec, Que., was appointed General Manager, Quebec, via J. E. Laramée, promoted.

**J. E. TUNICAYA**, previously General Manager, Quebec, was appointed Vice-President and Managing Director, Quebec.

## New Baggage Cars on C.N.R.

Fifteen baggage and express cars built by National Steel Car Corporation for Canadian National Ry. are all-steel construction, with steel tops, roofs, and are equipped with electric lighting and Vapor heating system.

THE accompanying illustration shows one of an order of 15 baggage and express cars built for Canadian National Ry. by National Steel Car Corp., Ltd., Hamilton, Ont., of all-steel construction; these cars have a built-up underframe, including cast steel platform and buffer castings, fish-belly center sills, Z bar and angle iron side sills, built-up bolsters and cross-sills, and pressed section floor beams.

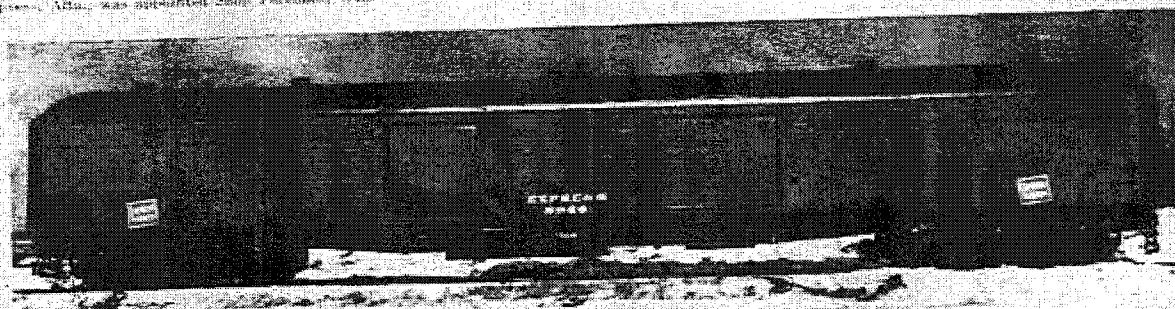
The insulation in the floor, sides, ends and roof is light weight Salamander hair. Corrugated sheets, 1/16 in. thick, comprise the side and end finish.

There are two door openings at each side of the car, one 6 ft. wide and the

other 8 ft. wide, also there is a door at each end of the car. The cars are equipped with electric lighting equipment and with Vapor heating system.

These cars are 72 ft. 6 in. long over the end sills and 72 ft. 8 1/2 in. long inside. Width inside is 8 ft. 4 1/2 in. The trucks are the Commonwealth 6-wheel type, with 5 x 9 in. journals and clasp brakes. Other equipment includes ton Utility ventilators, type K couplers, Miner buffing gear, Miner draft gear, Fowler upper buffer spring arrangement, U.C. brakes, water cooler, stove, dry hopper, steel letter and waybill cases and equipment locker.

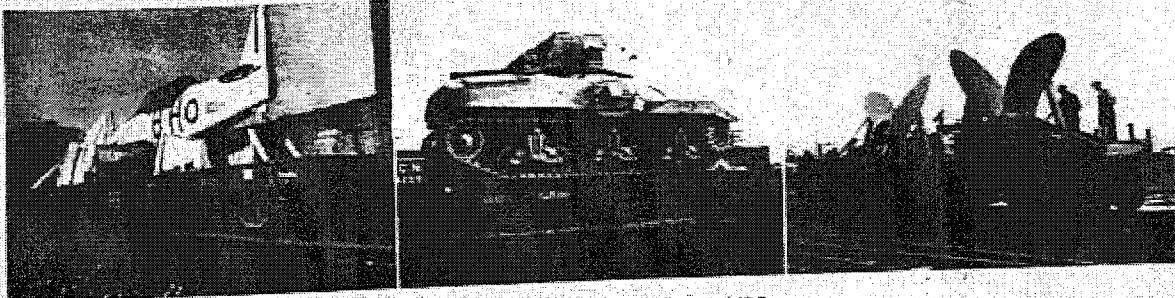
The cars are numbered in the series 8814-8828.



One of the C.N.R. New Cars for Baggage and/or Express Service.

JUNE 1943

ive and Tank Production Branch, Department of Munitions and Supply. Locomotives built in railway shops.



Transportation of War Equipment on C.N.R.  
If there were no Canadian railways, there would be no Canadian war effort. The photographs from which the above illustrations are prepared show scenes typical of thousands which may be seen along the main and branch lines of the transcontinental railroads every day. These views are of railway war loads on the Canadian National. The one at the left shows a trainer plane bound for a Canadian destination to be employed for instructional purposes. The central one shows one of the thousands of Canadian-built tanks which have been handled by rail to the seaboard, and the one at the right shows a set of propellers, manufactured at a Canadian plant, loaded on a C.N.R. flat car for delivery to an east coast shipyard which is engaged in the provision of tonnage to handle supplies on behalf of the United Nations. This shipyard, incidentally, receives all of its steel plates and other requirements over C.N.R. rails.

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CANADIAN TRANSPORTATION, JUNE, 1943

JUNE 1943

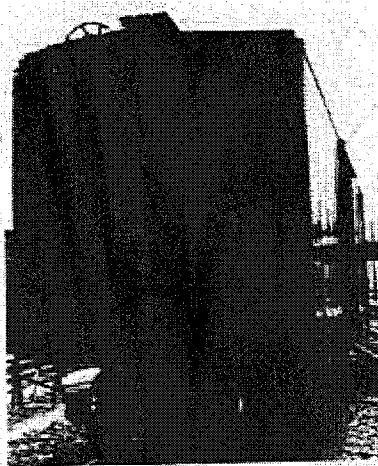
# Canadian Transportation

## New Box-Baggage Cars on C.N.R.

*Fifty new box-baggage cars built for the Canadian National by Canadian Car and Foundry Co. are suitable for either freight or passenger train service, and possess many new features, including a braking arrangement now being used for the first time on any railway in North America.*

THE accompanying illustrations depict one of the 50 new box-baggage cars built for Canadian National Rys. by Canadian Car and Foundry Co., Ltd., Montreal. These 50 cars, designed to cope with urgent wartime shipments, were requisitioned by the postal authorities as quickly as they were turned out of the builder's plant, to carry mail which must be transported on fast schedules. Each of the new cars loads approximately 1,000 bags of mail, containing more than 2,500,000 individual letters. Also, the cars are particularly suitable for inclusion in troop trains, to carry baggage or supplies. The design of the cars is such that they are suitable for either freight or passenger train service. As pointed out, recently, by E. R. Battley, Chief of Motive Power and Car Equipment, C.N.R., these cars have a box car exterior but improvements incorporated in their construction make them superior in character to previous types. The exterior color scheme harmonizes with C.N.R. standard passenger equipment, viz., green for the sides, black ends, roof, underframe and trucks, and yellow-gold lettering, the whole presenting a smart appearance. The trucks are heavier than those ordinarily used with box cars, giving the car a much smoother ride, and safety chains have been applied on the trucks.

**Brakes** — These cars are being equipped with the latest Westinghouse freight car brake equipment, known as the "AB-1-B" type, and being installed for the first time. The "AB-1-B" freight car brake equipment has been developed for cars operating in high



End View of One of the New Box-baggage Cars.

the "AB-1-B" valve, charging with air the selector valve portion. When a service reduction is made, brake cylinder pressure developed in the selector valve portion is connected to the safety valve, which opens and blows down pressure in excess of its setting of 60 lb., eliminating the pos-

sibility of flat skid wheels due to the higher brake pipe pressure carried in passenger service instead of the standard 70 lb. brake pipe pressure carried in freight service. During an emergency brake application, the brake cylinder pressure developed flows directly into the brake cylinder and develops full pressure, due to the fact that the safety valve is automatically cut out in an emergency application. Another important feature of the "AB-1-B" valve is that it is so designed, after being coupled to a passenger train equipped with signal line pressure, that it will develop a full brake cylinder pressure five times quicker than when the car is in ordinary freight service. This is due to the elimination of the three-stage brake cylinder pressure build-up which is desirable for smooth handling of long freight trains but is undesirable in passenger train service, as an immediate brake cylinder pressure is necessary in an emergency.

**End Doors** — Another feature of these new box-baggage cars is that they are being built with a door at either end of the car with a small platform over the couplers, making for easy access when in passenger trains. These two doors, as well as the two regular freight car doors on the sides of the



January 1944

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**Brakes**—These cars are being equipped with the latest Westinghouse freight car brake equipment, known as the "AB-1-B" type, and being installed for the first time. The "AB-1-B" freight car brake equipment has been developed for cars operating in high speed freight service and associated in solid trains or for occasional operation in passenger trains. This brake equipment is the same as the standard "AB" equipment used on modern freight cars with the following addition:—A filling piece with selector valve portion which is applied to the standard "AB" valve. The filling piece with selector valve portion is installed between the pipe bracket and emergency portion of the "AB" valve, and is suitably designed for the inclusion of a poppet type safety valve. In the event of a car equipped with the "AB-1-B" valve being placed in a passenger train, the pressure in the signal line automatically cuts in

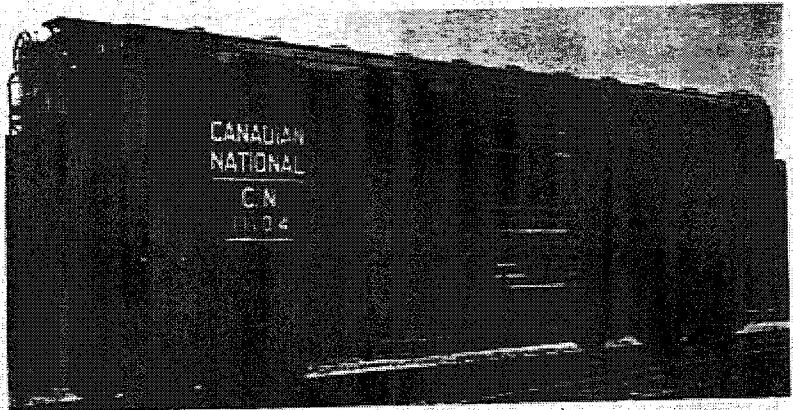
sibility of flat skid wheels due to the higher brake pipe pressure carried in passenger service instead of the standard 70 lb. brake pipe pressure carried in freight service. During an emergency brake application, the brake cylinder pressure developed flows directly into the brake cylinder and develops full pressure, due to the fact that the safety valve is automatically cut out in an emergency application. Another important feature of the "AB-1-B" valve is that it is so designed, after being coupled to a passenger train equipped with signal line pressure, that it will develop a full brake cylinder pressure five times quicker than when the car is in ordinary freight service. This is due to the elimination of the three-stage brake cylinder pressure build-up which is desirable for smooth handling of long freight trains but is undesirable in passenger train service, as an immediate brake cylinder pressure is necessary in an emergency.

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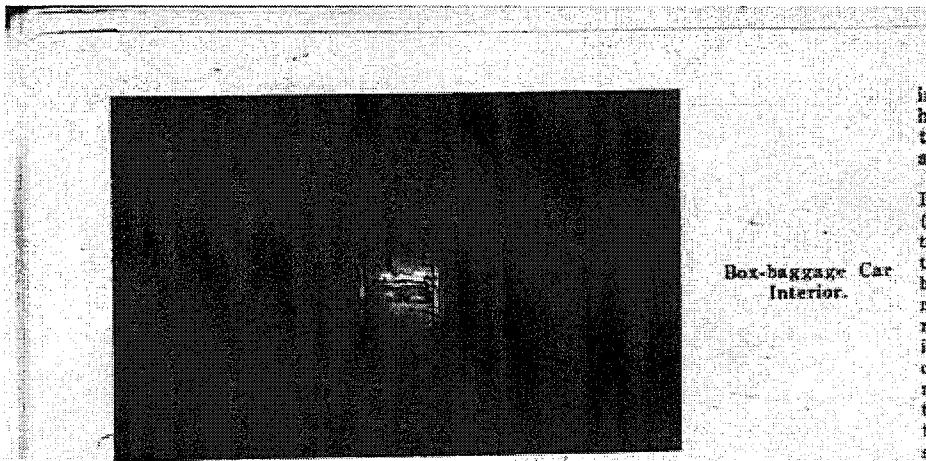


End View of One of the New Box-baggage Cars.

the "AB-1-B" valve, charging with air the selector valve portion. When a service reduction is made, brake cylinder pressure developed in the selector valve portion is connected to the safety valve, which opens and blows down pressure in excess of its setting of 60 lb., eliminating the pos-



One of the Canadian National's New Box-baggage Cars.  
These cars present a smart appearance, with their color scheme harmonizing with the road's standard passenger car series instead of being the conventional box car red. Suitable for operation in either fast freight or passenger service, these cars are available for the transportation of urgent wartime shipments. The contents of the above car on its first run consisted of approximately 1,000 bags of overseas mail.



Box-baggage Car  
Interior.

car, are equipped with a locking device so that they may be locked from the inside. The end doors can also be locked from the outside by a regular door lock.

**Lighting and Heating**—A plug-in electric light system has been installed in these cars, the current being obtained from an adjoining passenger car when necessary as no generator has been provided. To hold the connectors when not in use, a special rack has been installed on the inside end wall.

As these cars will usually be operated at the head end of passenger trains, a steam heat line is carried under the car in order to allow the steam to pass through to the other cars. Should it be decided later that heat is necessary in these new box-baggage cars it will be a simple matter to apply heating coils. If it should

happen that one of these cars be operated on the tail end of a train at night, special brackets have been applied to hold tail lights.

**Other Features—Dimensions**—It was found desirable also to equip these cars with passenger-type draft gears, in view of the fast service in which this rolling stock is employed. Steel tired wheels were also provided in view of this fact.

The cars are of all-steel construction and of 40-ton capacity. The principal interior dimensions are:—Length, 40 ft., 6 in.; width, 9 ft., 2 in.; height, 10 ft.; cubic foot capacity, 3,712.

For the interior finish, extra care has been exercised to present a smooth and neat appearance, and, according to Mr. Battley, the finish is the best that has so far been developed for this type of car.

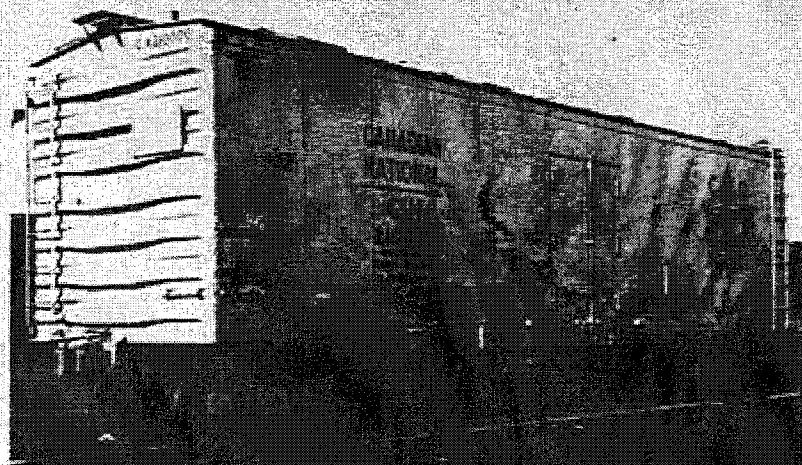
January 1944

# Handling Perishable Traffic on C.N.R.

By J. L. Townshend, General Supervisor, Perishable Traffic, Canadian National Rys.

(Editor's Note.—In Canadian Transportation for April, 1944, an article with the same title as this one, based on an address by Mr. Townshend before the C.N.R. Staff Service Club in Montreal, was published, and therein were explained and recorded the vast improvements made in handling perishable commodities by rail during the preceding decade, with special attention to the advantages secured by the use of overhead tank refrigerator cars. In this article, Mr. Townshend shows what the railways are doing with their improved refrigerator cars, and all operating and transportation people will no doubt be greatly interested in noting the excellent performance now being given, as exhibited by the figures in the tables contained in the article. As Mr. Townshend explained in his 1944 address, there is a certain temperature at which each perishable commodity is best preserved, and the efforts of those concerned with the railway refrigerator car service are directed to keeping each commodity transported at the proper temperature. As examples of the temperatures best suited to commodities in transit, the following are listed, the figures relating to degrees Fahrenheit:—Apples, 32; pears, 32; fresh meat, 34; bananas, 55; tomatoes, 45; potatoes, 40; export bacon, 30; frozen fish, 10. The problem facing the railway refrigerator car people may well be appreciated when it is considered that these temperatures, or temperatures approximating them, must be maintained within the refrigerator cars despite great variation in exterior temperatures, from a low of 45 or 50 degrees below zero in the winter to 100 degrees above zero in the summer. Many readers will be surprised to learn that the overhead tank refrigerator cars were only in the idea stage until about 1937, when a few cars were built experimentally. Excellent results were secured with them, and important advantages, as compared with the end bunker cars, were observed. The construction of larger numbers of the overhead tank cars soon followed.

The efficiency with which perishable products are now transported by rail has been made possible only



The Latest Type Overhead Tank Refrigerator Car on the Canadian National.

through the co-operation of a number of railway departments; the mechanical department, with its shops, has provided the cars and their interior fittings, and has co-operated with the car service and transportation people in making possible a refrigeration service which is far superior to that afforded shippers and consignees not so many years ago. The figures which Mr. Townshend presents in this article provide fine examples of the manner in which perishable products are being given complete protection as well as prompt movement.

Attention of readers is directed particularly to Mr. Townshend's remarks in regard to the possibility of using mechanical refrigeration equipment in railway cars. The experience, evidently, is that this constitutes a refinement which is uneconomical; the cost makes the rate prohibitive. Also, as truck rates, on the whole, must be competitive with railway rates, one may assume that the use of mechanical refrigeration in highway transport, while suitable for movements of a special nature, will not come into very general use. However, with the splendid service now being given by the overhead tank refrigerator cars on the railways, the use of mechanical refrigeration in railway refrigerator cars would seem

to be wholly unnecessary, and as time goes on, and further improvement in railway refrigeration service is secured, this will no doubt be even more the case than it is today.)

**REFRIGERATION** in transit continues to be a subject of intense interest. The production, harvesting and preparation of perishable foods has made rapid strides during the past decade, and it is therefore essential that continuous improvement be made in methods of delivering the food to consumers without in any way impairing its high quality—however great the distance it has to be transported or however extreme the range of temperature.

In many cases, after perishable products are prepared and packed, they are placed in storage at point of shipment and again go into storage after arrival at destination. In these storages their preservation presents no serious problem. The storages are mechanically refrigerated, ample power is available and temperature can be kept at the desired level.

However, on a moving vehicle it is not so easy to maintain proper temperatures. The question has often been asked why refrigerator cars should not be equipped with mechanical refrigeration, such as cold storages, with con-

as possible to have refrigerator cars equipped with mechanical refrigeration, but it is hardly practicable. As far back as 1928 there were several refrigerator cars in the United States equipped with mechanical cooling systems, but in each case they have been abandoned on account of the high cost of installation and exceedingly expensive maintenance. Such systems could only be continued by increasing rates beyond what the traffic could bear.

Mechanical refrigeration is more practicable on the motor truck, where it is under constant supervision, but I doubt if it will be found economically possible on any large scale, bearing in mind that the truck must compete with railway rates.

In view of the above situation, the Canadian National Railways have endeavored to make substantial improvements in affording protective service by improving the construction of the refrigerator car and making better utilization of facilities available. The aim has been to avoid any moving parts on a refrigerator car. This has led to the development of a car with ice overhead and heat beneath and both controlled by inside temperature indicators as described in my article in Canadian Transportation for April, 1944. In this review I propose to show the results of improving our equipment, and with this end in view the following service and temperature records are shown:

**Table A** relates to a shipment of export bacon from Edmonton, Alta., to New York, which required no icing in transit.

**Table B** records a shipment of frozen fish from Halifax to Chicago which was billed to re-ice if top inside temperature rose above 10 degrees.

If the car had not been equipped with inside temperature indicators it would have been unsafe to bill it other than to re-ice at all regular icing stations, as it would be impossible to estimate what the weather would be. Had the car not been billed to re-ice in accordance with inside temperature, it would have been iced six times in transit with consequent expense to shippers and delays to train.

**Table C** relates to a shipment of fresh beef moving under the protection of the underslung heater. If fresh beef freezes in transit, its value is reduced by about two cents per pound, or around \$500 per carload. Prior to the development of the underslung heater, it was impossible to heat meat in transit to prevent it from freezing, as the portable heaters placed at the ends of the cars caused the top air temperatures to rise so high the meat would spoil.

**Table D** relates to a shipment of frozen fish from Halifax to Detroit, Mich., which required no re-icing after leaving shipping point, with consequent savings in icing expense, switching and delay.

**Table E** provides the record of another shipment of fresh meat moving

Station	Time	Date	Liquidometer Top	Bottom	Outside Temp.	Position Arr'd	Draft Control Dept.
Edmonton	9:00 p.m.	Dec. 17	7	24	-30A	12	2000
Saskatoon	5:20 p.m.	Dec. 18	36	28	0A		
Winnipeg	11:00 p.m.	Dec. 18	9	25	4A		
Ston Lookout	2:00 p.m.	Dec. 19	26	35	10A		
Armstrong	9:00 p.m.	Dec. 19	22	34	10A		
Hornepayne	8:10 p.m.	Dec. 19	24	34	10A		
Capeal	1:00 a.m.	Dec. 20	31	34	10A		
New Toronto	4:15 p.m.	Dec. 21	21	35	10A		
Scam Bridge		Dec. 21	21	35	10A		
Navy		Dec. 21	22	35	10A		
Packeron		Dec. 21	22	35	10A		
Jessey City	7:30 a.m.	Dec. 24	36	36	10A		

Car initially iced by shipper — over-all bailed "Do not re-ice unless delayed."

This car was bailed "Do not re-ice unless top inside temperature rises above 10 degrees, then use 10% crushed ice and 20% salt," but it will be noted no icing in transit was necessary.

**Table B—Icing and Temperature Record Covering C.N. 29517, Overhead Ice Car with 41,000 lb. Frozen Fish from Halifax, N.S., to Chicago, December 27.**

Station	Time	Date	Liquidometer Top	Bottom	Outside Temp.	Ice and Salt supplied (lb.)
Halifax	11:10 a.m.	Dec. 26	7	21	10A	1600 1200
Halifax	8:20 p.m.	Dec. 27	3	4		
Halifax	2:20 p.m.	Dec. 27	10	4	10A	Loading started
Halifax	4:00 p.m.	Dec. 27	10	4	10A	Loading completed
Rockingham	9:45 p.m.	Dec. 27	Zero	Zero	10A	
Truro	2:00 a.m.	Dec. 28	Zero	Zero	10A	
Moncton	10:45 a.m.	Dec. 29	28	Zero	10A	
Edmonton	4:40 a.m.	Dec. 29	58	28	5A	
Monk	1:00 p.m.	Dec. 29	618	58	5A	
Jofre	6:30 p.m.	Dec. 29	618	58	5A	
Montreal	4:20 a.m.	Dec. 30	618	58	10A	
Toronto	10:50 p.m.	Dec. 31	48	28	10A	
Port Huron	12:25 a.m.	1/1	18	18	10A	
Port Huron	2:30 p.m.	1/1	48	Zero	10A	
Bottle Creek	7:00 p.m.	1/1	48	Zero	10A	
Eldon	12:20 a.m.	1/2	18	Zero	10A	
Chicago	2:30 a.m.	1/2	Zero	Zero	10A	

This car was bailed "Do not re-ice unless top inside temperature rises above 10 degrees, then use 10% crushed ice and 20% salt," but it will be noted no icing in transit was necessary.

**Table C—Temperature Record Covering C.N. Underslung Heater Car 29516 with Fresh Beef from St. Boniface, Man., to Quebec, Dec. 27.**

Station	Time	Date	Liquidometer Top	Bottom	Outside Temp.	Heater Arr't	Position Arr'd	Draft Control Dept.
Transcona	11:30 p.m.	12/27	36	29	14A	Burnng	4	
Transcona	12:45 a.m.	12/28	36	31	14A	Burnng	4	
Reddin	2:00 a.m.	12/28	38	38	14A	Extinguished	4	
Ston Lookout	2:00 p.m.	12/28	38	38	14A	Out	25	
Armstrong	9:25 a.m.	12/28	38	34	14A	Out	38	
Hornepayne	11:40 a.m.	12/29	38	32	14A	Out	48	
Capeal	1:15 a.m.	12/30	35	32	14A	Out	54	
Montreal	9:40 a.m.	12/30	34	34	12A	Out	64	
Quebec	11:30 a.m.	12/31	32	32	12A	Lighted	64	
Quebec	12:30 a.m.	1/1	36	34	16A	Burnng	74	
Quebec	8:00 a.m.	1/1	34	32	16A	Burnng	74	
Quebec	9:00 a.m.	1/1	34	32	16A	Extinguished	74	
Quebec	9:00 p.m.	1/1	32	31	12A	Lighted	74	
Quebec	2:00 a.m.	1/2	35	32	10A	Burnng	74	
Quebec	5:00 p.m.	1/2	32	31	10A	Burnng	74	
Quebec	5:00 p.m.	1/2	32	31	10A	Burnng	74	
Quebec	5:00 p.m.	1/2	32	31	10A	Burnng	74	

Shipper's instructions accompanying this car were "Keep bottom inside temperature 12 above zero." Shipment returned at first-class condition.

**Table D—Icing and Temperature Record Covering C.N. 29515 with 26,675 lb. Frozen Fish from Halifax, N.S., to Detroit, Jan. 12.**

Station	Time	Date	Liquidometer Top	Bottom	Outside Temp.	Heater Arr't	Position Arr'd	Draft Control Dept.
Halifax	10:20 a.m.	1/11	12	18	24A	Burnng	6320	975
Halifax	8:15 a.m.	1/12	2	4	24A			
Halifax	10:15 a.m.	1/12	10	5	20A			
Halifax	10:45 a.m.	1/12	0	2	22A			
Rockingham	9:30 p.m.	1/12	0	2	22A			
Truro	1:10 a.m.	1/13	0	0	24A			
Moncton	9:30 a.m.	1/13	1	1	24A			
Edmonton	1:25 a.m.	1/14	0	0	27A			
Monk	10:30 a.m.	1/14	0	0	28A			
Jofre	4:35 p.m.	1/14	0	0	27A			
Montreal	7:20 p.m.	1/15	1	2	28A			
Toronto	1:20 a.m.	1/16	4	4	14A			
Windsor	5:00 p.m.	1/16	4	4	10A			
Detroit	2:05 a.m.	1/18	2	2	12A			

Shipper's instructions accompanying this car called for re-icing in transit only if top inside temperature rose above 10 degrees.

As will be noted, no re-icing in transit was necessary.

**Table E—Temperature Record Covering C.N. Underslung Heater Car 29514 with Fresh Meat from Winnipeg to Montreal, January 19.**

Station	Time	Date	Liquidometer Top	Bottom	Outside Temp.	Heater Arr't	Position Arr'd	Draft Control Dept.
St. Boniface	3:00 p.m.	1/20	36	32	24	Burnng		
Transcona	1:00 a.m.	1/21	36	34	6A	Burnng	8	
Reddin	7:45 a.m.	1/21	34	39	10A	Burnng		
S. Lookout	1:30 p.m.	1/21	34	39	12A	Burnng		
Armstrong	8:40 p.m.	1/21	34	39	10A	Burnng		
Hornepayne	8:50 a.m.	1/22	34	39	10A	Burnng		
Capeal	3:00 a.m.	1/23	34	39	28	Burnng		
Brent	10:30 a.m.	1/23	32	32	15B	Burnng		
Ottawa	4:45 p.m.	1/23	32	32	6A	Burnng		
Montreal	9:10 p.m.	1/23	32	32	Zero	Burnng		

Shipper's instructions called for "Standard Heating" which in accordance with our Code of Rules requires bottom inside temperature kept at 32 degrees.

under heater protection with ideal temperatures.

Prince Rupert to Toronto in the month of May. It is interesting to note that while the end bunker car was re-iced six more times in transit at a greater cost of \$54.77, it still arrived at destination.

# Canadian Transportation

## Handling Perishable Traffic on C.N.R.

*In a recent address in Montreal, J. L. Townshend, General Supervisor, Perishable Traffic, Canadian National Rys., explained the necessity for precise temperature control in transporting many commodities by rail; dealt with the history of the refrigerator car; traced the development of the overhead ice tank car; dealt fully with heating equipment for use in cold weather; explained the use of the liquidometer in the regulation of car icing, and explained the function of salt used along with the ice.*

J. L. TOWNSHEND, General Supervisor, Perishable Traffic, C.N.R., who has been prominently identified with the important improvements effected in railway refrigerator car service during recent years, addressed a monthly meeting of the C.N.R. Staff Service Club of Montreal a short time ago on the handling of perishable traffic on the system. In introducing his subject, he pointed to the fact that in Canada, a country of great distances and extremes of temperature, the handling of perishable commodities forms one of the major railway problems. He explained that in the handling of non-perishable commodities such as coal, grain, feed, iron, steel, etc., all that is required is to load them into cars, and move them to destination; when the railways come to deal with perishable commodities, however, these must not only be transported, but must be protected against freezing or overheating.

Examples of Perishable Traffic.—The railways are called upon to handle many perishable products, and Mr. Townshend provided his hearers with many examples. The Okanagan Val-

handled from the Gaspe Coast and the Maritime Provinces to all provinces of Canada and to the United States, some shipments going to such distant points as Seattle, San Francisco and Los Angeles. The potato crop of New Brunswick and Prince Edward Island reaches huge proportions and is moved all over Eastern Canada and sometimes to Western Canada, and there is a large movement of Canadian certified seed potatoes to the Southern United States.

In normal times there is a heavy importation through Canadian Atlantic ports of bananas and tomatoes from the British West Indies, which are distributed to Canadian consuming centers. In addition, there are fresh Gaspe peas, fresh strawberries, fresh and frozen blueberries, eggs, butter, cheese, beer and other beverages and canned goods to be handled. Also, thousands of car-loads of fruits and vegetables from the United States, largely Florida and California, are brought into Canada each year.

Proper Temperature for Each Com-

Export Bacon Now Leading Item.—Mr. Townshend pointed out that at the present time the largest single perishable commodity handled by the Canadian railways is export bacon; in 1943, the two transcontinental railways handled something like 675,000,000 lb. of bacon from packing plants all over

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Examples of Perishable Traffic—The railways are called upon to handle many perishable products, and Mr. Townshend provided his hearers with many examples. The Okanagan Valley, in British Columbia, produces large quantities of high quality fruits and vegetables, which are marketed in British Columbia, the Prairie Provinces and Eastern Canada, and in normal times large quantities of Okanagan apples are shipped overseas; fish from Vancouver and Prince Rupert is shipped all over North America and also overseas. Meat packing plants at Vancouver, Edmonton, Calgary, Moose Jaw, Regina, Saskatoon, Prince Albert, Winnipeg, Toronto, Montreal and other points ship thousands of carloads of export bacon to the British market and fresh meat and packing house products to all points in Canada.

The Niagara Peninsula fruit crop, consisting of peaches, pears, plums, grapes and apples, moves to all points in Eastern Canada and as far west as Edmonton. Turnips move in large quantities from Southern Ontario to the Southern United States. Fish traffic is

handled from the Gaspé Coast and the Maritime Provinces to all provinces of Canada and to the United States, some shipments going to such distant points as Seattle, San Francisco and Los Angeles. The potato crop of New Brunswick and Prince Edward Island reaches huge proportions and is moved all over Eastern Canada and sometimes to Western Canada, and there is a large movement of Canadian certified seed potatoes to the Southern United States.

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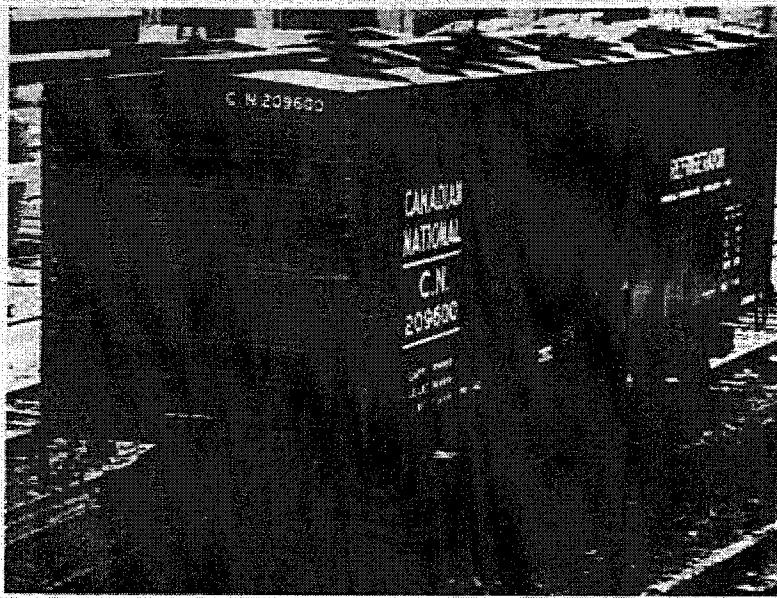
modity—There is a temperature at which each perishable commodity is best preserved, and all energies of those concerned with the railway refrigerator car service are bent on keeping each commodity transported at the proper temperature. Mr. Townshend listed the temperatures best suited to certain commodities, as follows:—Apples, 32 degrees; pears, 32; fresh meat, 34; bananas, 45; tomatoes, 45; potatoes, 40; export bacon, 40; frozen fish, 10. The effort is to keep the commodities within the refrigerator cars at the specified temperatures, even though temperatures outside the cars may vary from 100 degrees above zero during the summer to 45 or 50 degrees below zero in the winter.

Export Bacon Now Leading Item—Mr. Townshend pointed out that at the present time the largest single perishable commodity handled by the Canadian railways is export bacon; in 1943, the two transcontinental railways handled something like 675,000,000 lb. of bacon from packing plants all over



C.N.R. Overhead Tank Refrigerator Car with New Grey Paint and Emblem.

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Overhead Tank Refrigerator Car with Eight Roof Hatches Slightly Opened.

Canada to Saint John and Halifax for export. While this commodity is referred to as "bacon", Mr. Townshend explained, it is really sides of hogs, known as Wiltshires, and includes the backs, hams and shoulders, only the head and feet of the hogs being removed. In regard to this export traffic, he said:—"The hogs are dressed and cured and packed in bales, four sides to a bale, and then wrapped first in white cotton and then in burlap, and securely tied; each bale weighing about 250 lb. The curing continues while in transit, and this is why a proper temperature is so important. If the bacon gets too cold, curing is arrested, and if it gets too warm it becomes slimy, and not only is there loss but the fair name of Canadian bacon suffers."

"Prior to the war, Canada furnished the United Kingdom with only a small proportion of its bacon requirements,

the balance being imported from such countries as Denmark, Poland, Sweden, etc. At the present time, however, we are supplying Great Britain with almost its total requirements, and it is hoped we may retain this market after the war, and this is why it is essential that the quality be kept up. One of the most important factors in maintaining quality is the providing of proper in-transit temperatures."

**History of the Refrigerator Car**—By way of reviewing the development of the railway refrigerator car, the speaker said:—"As far back as 1857, the Pennsylvania Railroad remodelled thirty box cars, equipped them with sawdust insulation and installed ice boxes in the doorways and used the cars for the shipment of meat. At the same time the Pennsylvania were experimenting with its sawdust insulated cars, other experiments were in progress in Detroit which finally resulted in the

issuance on November 27, 1867, of the first patent on a refrigerator car to J. B. Sutherland.

"Other developments were an improved car patented by D. W. Davis in 1868, the Tiffany car designed for dairy products in 1872 and the original ten cars built by Mr. Swift of the Swift Company in 1875, the Hutchins refrigerator car used by the California Fruit Transportation Company, and finally the entry by Armour & Company, who previously had specialized in refrigerator equipment for dressed beef, into the fruit transportation field.

"So far as I can learn, the first refrigerator cars built by what now comprises the Canadian National Railways were those built by the Grand Trunk Railway about 1895. It is only in very recent years that some of these cars were scrapped. While there were improvements in construction and insulation, there were practically no changes in design between 1895 and 1930.

"Those early cars had ice bunkers placed across cars at the ends, extending from floor to roof, and all cars built since have had bunkers in the same position until Canadian roads brought out the overhead ice car in 1929. Ice was originally placed at the ends of the cars because it was more convenient to construct cars in that way, and it was felt as long as they were getting ice into the cars, where it could cool the lading, they were accomplishing something. However, it took more than forty years to get the ice in the proper position."

**Theory, Development and Advantages of Overhead Car**—Mr. Townshend stated:—"As is well known, cold air is heavier than warm air and falls to the floor of the car. It is a scientific fact that heat always flows to the cold and the principle of the end bunker car is that the warm air from the lading moves to the ice over the top of the bulkhead at the end of the car, and as it becomes cooled by contact with the ice it falls to the bottom of the bunker and passes out over car floor, and then, as it becomes warmed by contact with the lading and as it passes up through

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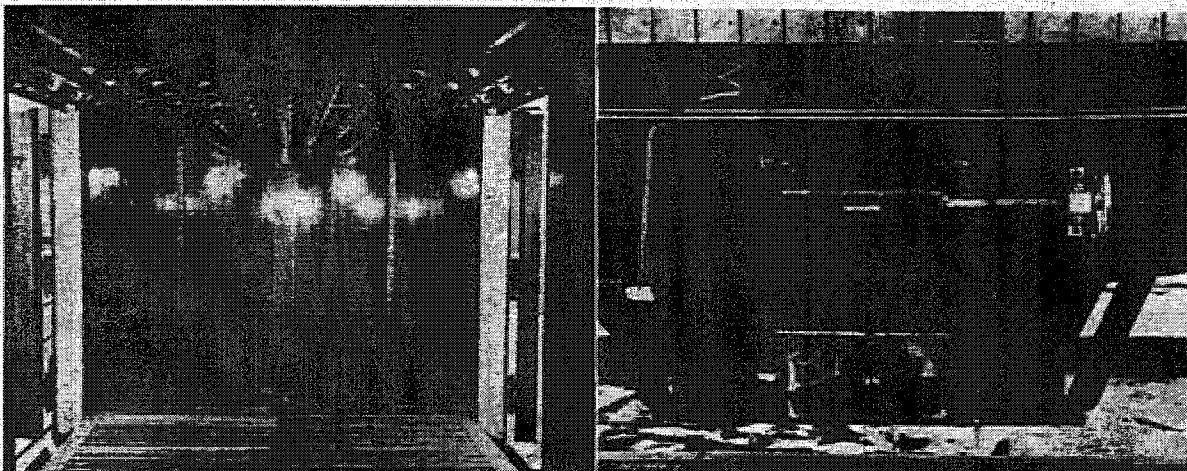
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Left, Interior View of an Overhead Tank Refrigerator Car, Showing the Smooth Finish, and the Beef Balls. Right, an Overhanging Charcoal Heater with Fueling Door and Draft and Fire Inspection Doors Open.

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the load, it carries more heat to the ice, but circulation is very, very slow, so that there are wide differences in temperature between the top and bottom of the car. As a general rule, the air temperature in an end bunker car is about 20 degrees higher at top doorway than at the bottom of the bunkers. This can have a very detrimental effect on some commodities.

"With a view to overcoming this condition, we worked for years on the idea of placing the ice overhead, and in 1937 the co-operation of the Mechanical Department was secured in the building of two experimental cars with overhead refrigeration. These worked well, and one hundred cars of this type were built in 1939 and 1940, and at present we have five hundred in service or on order. Obviously, since cold air falls, for efficient cooling the ice must be above the load. We have run many tests with these overhead cars and find we can provide just as efficient protection for the top layer as for the bottom layer. The end bunker car cannot be loaded too heavily, due to the inability to properly refrigerate the upper part of the load, but the overhead car can have every square inch of its loading space utilized, and since the railway can make no profit hauling air, this is a very important factor. While the Meat Board at Ottawa has found it necessary to limit the load of export bacon in end bunker cars to 50,000 lb. during the summer, the overhead car has handled more than 60,000 lb. and some loads have been above 80,000 lb. The extra revenue received on these heavier loads offsets the extra cost of the car.

"Several years ago it was learned that it was impossible to handle ship-

heads with a varying distance between bottom of same and top of floor racks; they of course should extend right down to top of floor racks. There were bulk-heads with an opening cut in them to allow heat to enter cars, when it would be impossible for heat to enter on account of the lading, and when it was known that heat was bound to rise in any event. There were cars with the space beneath floor racks closed off at ends of cars by a splash board to keep the water beneath the bunkers. This has been corrected by doing away with splash boards and equipping cars with

galvanized galvanized iron shell standing 23 inches high. It has a firepot at the bottom and a fuel magazine, or hopper, at the top, and a throat between the magazine and firepot, through which the fuel feeds down as required. On the first heaters of this type there were air inlet holes around the bottom, and air outlet holes between top of firepot and bottom of magazine, and the heater was equipped with a cutoff slide placed between the magazine and firepot. When it was desired to extinguish the heater, the cutoff slide was pushed in, to prevent any more fuel feeding into the firepot. After several years in service, it was found this heater was not satisfactory, as when the cutoff slide was pushed in it became red hot and ignited the fuel in the magazine, and if the top cover did not fit tightly, the heater would still continue to burn until all the fuel in the magazine was exhausted. It therefore became the practice, when it was desired to extinguish heaters, to dump them, with consequent waste of fuel and danger of fire.

"We then approached the heater manufacturers, pointing out our difficulties, and they co-operated in building a heater with what is known as a side damper. This side damper has four openings when in open position. The air enters the heater through the two bottom openings, is deflected by a baffle to the space beneath the firepot and passes up through the firepot and out through the two upper holes in the damper. When the damper is closed, all air supply is shut off and the heater must become extinguished. The draft holes referred to above were eliminated when side draft was applied.

"These heaters were placed in ice-



J. L. Townshend,  
General Supervisor, Perishable Traffic, C.N.R.  
depressed drip pans. It was customary

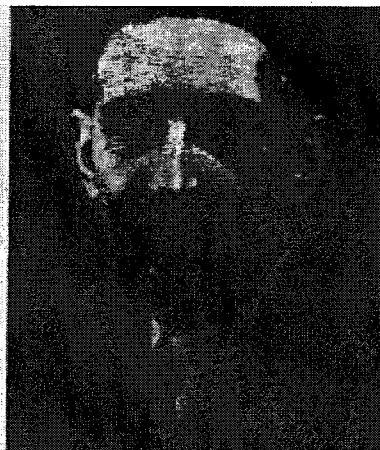
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"Several years ago it was learned that it was impossible to handle shipments of frozen goods in end bunker cars during the warm weather without defrosting taking place. However, with the overhead car we have handled capacity loads of over 90,000 lb. during the warmest weather with no defrosting whatever."

**Improvements in End Bunker Cars—** The speaker pointed out that vast strides had been made in improving the end bunker type of refrigerator car prior to the development of the overhead car. In this connection, he stated:—"While protection to perishable freight is afforded by supplying ice in warm weather and heat in cold weather, the first essential is good cars, and I am sure you will all agree that even before the advent of the overhead ice car, which we consider the last word in a refrigerator car at the present time, great strides had been made in improving our refrigerator equipment. In the old days there were some curious notions in regard to refrigeration and heating. The first refrigerator cars were not equipped with false floors so no matter how much ice or heat was supplied there was no air circulation and loads could not be protected. Finally floor racks were added, along with insulated bulkheads, waterproof floors, etc.

"An inspection of some of the refrigerator cars only recently dismantled would show such curious things as only one-half inch of insulation, where we now use four and five inches, and bulk-



J. L. Townshend,  
General Supervisor, Perishable Traffic, C.N.R.

depressed drip pans. It was customary to fasten side ladders and other fixtures to cars by running bolts right through car walls. Since metal is a perfect conductor of heat, the effect of every bolt was almost the same as a hole through car walls. Means have been found of fastening these appliances without having bolts through the walls. These and other improvements have been readily made by the Mechanical Department at our suggestion, until, prior to the advent of the overhead car, we had the best end bunker refrigerator cars in service anywhere."

#### Protection by Heat in Refrigerator Cars

Turning to examination of that part of the refrigerator car service having to do with the protection of lading against frost, Mr. Townshend noted that the practice of moving perishables during the winter, under protection against freezing, was adopted about 1912. The furnishing of artificial heat to supplement the insulation of the car was first done by installing oil heaters in the car bunkers, but this was found unsatisfactory; the wicks were sometimes turned up too high, resulting in heavy soot damage; sometimes the wicks worked down and the heaters would become extinguished, and when moisture got into the feed pipes and froze, the heaters were prevented from functioning. To overcome these difficulties, he said, the charcoal heater was developed, and he dealt with this subject as follows:—

"This appliance consists of a corrugated

was pushed in became red hot and ignited the fuel in the magazine, and if the top cover did not fit tightly, the heater would still continue to burn until all the fuel in the magazine was exhausted. It therefore became the practice, when it was desired to extinguish heaters, to dump them, with consequent waste of fuel and danger of fire.

"We then approached the heater manufacturers, pointing out our difficulties, and they co-operated in building a heater with what is known as a side damper. This side damper has four openings when in open position. The air enters the heater through the two bottom openings, is deflected by a baffle to the space beneath the firepot and passes up through the firepot and out through the two upper holes in the damper. When the damper is closed, all air supply is shut off and the heater must become extinguished. The draft holes referred to above were eliminated when side draft was applied.

"These heaters were placed in ice-bunkers at ends of cars, and when the heaters were lighted the warm air rose and passed out over top of bulkheads and towards center of car. As it became cooled by contact with the cold car or the lading, it descended at space left in load at doorway, or through load if load was spaced, and returned to the heater beneath floor rack and bottom of bulkhead.

"The length of air travel was so great and circulation so slow that there were wide differences in temperature between top and bottom of car. If heaters were burning for any length of time, these differences might amount to as much as 40 degrees. There were many cases when shipments were not properly loaded of overheating damage and frost damage in the same car. Heaters were lighted or extinguished in accordance with the outside temperature. For instance, if the car contained apples, the instructions would be to light heaters when outside temperature fell to 15 degrees above zero or lower. This had been arrived at after several tests, but at best was merely a guess, for the reason that all cars were not of the same construction and did not contain the same amount of insulation. Also it was quite common for outside temperature to be well below freezing (32 degrees) for several days, but above 15 degrees, and heaters would never be lighted and apples would freeze. Conversely, temperature might keep just below 15 degrees, but never

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real cold, and heaters would be kept burning constantly with the result that there was overheating of the load, particularly at the top.

"In order to overcome these difficulties and to furnish protection based on the temperature inside the car, we began about fourteen years ago to see if some reliable means could not be developed whereby the inside temperature of the car could be secured without opening the doors. This had been tried many times before but without success. To begin with, we equipped a few cars with a distance reading thermometer, with a bulb placed at top and bottom of car at center and a dial on outside of car. There was a tiny tube running from the bulbs to Bourdon tubes in the case on the outside of the car. The bulb, tube and Bourdon tubes

advance made in the handling of perishable traffic since refrigerator cars were first introduced as it removed the guess-work.

"Instead of lighting heaters for apple shipments when the outside temperature is 15 degrees, we now light them when the bottom inside temperature is 34 degrees and extinguish when above that point. Apples will not actually freeze until temperature falls to 23 degrees, so if a car arrives at an inspection point with the bottom inside temperature, say, 35 degrees, the heaters are not lighted even though the outside temperature may be 20 below zero. At the next inspection point the inside temperature will be below 34 degrees and might be as low as 30 degrees, when heaters will be lighted, and so on.

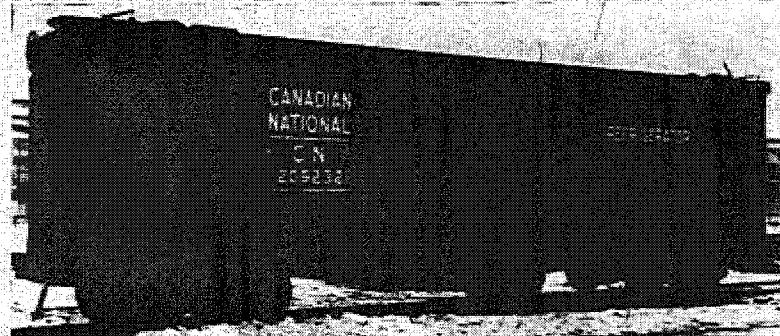
"However, much as manipulating

for removing ashes and too difficult to refuel. The next season we went back to the Mechanical Department with our suggested improvements and again plans were drawn up and another heater constructed in Point St. Charles Shops. This was a great improvement and overcame all the defects found the year before, except we had no reliable and practicable draft control. We then approached the manufacturers, who had so improved our portable heater, and let them go to work on it, and they produced the underslung heater, practically as we have it today, and with which we now have about 1,500 cars equipped. The heater is not yet mechanically perfect. Our Mechanical Department recently found some defects in it which are being eradicated. However, the heater has given us good service and has enabled us to perform any heating job which we have been called upon by shippers to perform, and, above all, we have eliminated the bugbear of overheating the top of the load. In most cases the variation in temperature between top and bottom of load does not amount to more than two degrees.

"The heaters are manipulated in accordance with the temperature inside the car. They are lighted for various commodities when the bottom inside temperatures reach the following points:—Tomatoes, 46 degrees; lemons, potatoes, pineapples, cocoanuts, wine, beer and other beverages, 40; fresh and cured meats, 32; apples and oranges, 33; all other commodities, 34.

"Then we have a set of instructions showing how the heater is to be operated. For instance, if car arrives at an inspection point with inside temperature four degrees or more too low, the draft control is to be increased four points and so on. It is amazing the interest that has been taken in the heater by the carmen and others at the various inspection points, and the good service they are giving. Of course, the carmen would much rather attend to this heater on the ground than to climb over the icy roofs in below zero weather, with a high wind blowing, to service the portable heaters."

Use of Liquidometer in Icing  
Locating the position of resealing points



A C.N.R. End Bunker Refrigerator Car.  
Note the underslung heater below the side doors, and the liquidometer inside temperature indicator dial on the side of the car.

were filled with a non-freezing liquid and when the car warmed up the liquid would expand and cause the Bourdon tubes to uncoil and actuate the pointer on the dial. The difficulty with this instrument was that when there was a difference in the temperature at the point where the bulb was located and the dial on the outside of the car, it would not register correct temperatures. This was because there was so much of the liquid in the Bourdon tubes that it had nearly as much effect on the dial as the liquid inside the car. When we learned of this defect, we tested many instruments and worked

heaters in accordance with the inside temperature improved the situation, we still could not give a satisfactory heater service due to heaters being located at the ends of the cars. We could prevent the freezing of the bottom of the load, and while we minimized the overheating at the top of the load, we could not prevent it. Also, we were being called upon to furnish heater protection to such commodities as chilled poultry, export bacon and fresh beef, which just could not stand any overheating.

"Therefore, at the request of the Federal Department of Agriculture, we co-operated with the National Research

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**A C.N.R. End Bunker Refrigerator Car.**

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were filled with a non-freezing liquid and when the car warmed up the liquid would expand and cause the Bourdon tubes to uncoil and actuate the pointer on the dial. The difficulty with this instrument was that when there was a difference in the temperature at the point where the bulb was located and the dial on the outside of the car, it would not register correct temperatures. This was because there was so much of the liquid in the Bourdon tubes that it had nearly as much effect on the dial as the liquid inside the car. When we learned of this defect, we tested many instruments and worked with several manufacturers until finally one concern agreed to build a distance reading thermometer especially designed for our purposes. This was the liquidometer, with which most of our cars are equipped and all will be equipped in another year or so. This instrument has two bellows set in the case on the outside of the car with the indicator between them and there is a tube leading back into the car from each bellow. One of these tubes stops just short of the bulb and the other is connected with the bulb. By this means the temperature between the bulb and the dial exerts the same pressure on the bellows in the case and the extra pressure from the bulb actually moves the pointer, so, irrespective of the outside temperature or the temperature between the dials and the bulb, the instrument records the exact temperature at the point where the bulb is located. I consider this the greatest

heaters in accordance with the inside temperature improved the situation, we still could not give a satisfactory heater service due to heaters being located at the ends of the cars. We could prevent the freezing of the bottom of the load, and while we minimized the overheating at the top of the load, we could not prevent it. Also, we were being called upon to furnish heater protection to such commodities as chilled poultry, export bacon and fresh beef, which just could not stand any overheating.

"Therefore, at the request of the Federal Department of Agriculture, we co-operated with the National Research Council in the development of the underslung charcoal heater. The Mechanical Department co-operated by placing a draughtsman at our disposal, and plans were drawn up for a heater. We closely followed the design of our portable charcoal heater, except that the heater was made larger and a copper coil was installed in the firepot, and from the top of this copper coil a two-inch pipe ran up into the car and completely around the car on the floor beneath the floor racks, and returned to the lower end of the coil. The first heater was built in Point St. Charles shops and installed on a car, after which several running tests were made, from which we found the liquid in the pipes would circulate properly and that an even temperature in cars could be maintained.

"Certain defects were found in the heater, however, such as firepot being too small, not equipped with shaker

potatoes, pineapples, coconuts, wine, beer and other beverages, 40; fresh and cured meats, 32; apples and oranges, 33; all other commodities, 34.

"Then we have a set of instructions showing how the heater is to be operated. For instance, if car arrives at an inspection point with inside temperature four degrees or more too low, the draft control is to be increased four points and so on. It is amazing the interest that has been taken in the heater by the Carmen and others at the various inspection points, and the good service they are giving. Of course, the Carmen would much rather attend to this heater on the ground than to climb over the icy roofs in below zero weather, with a high wind blowing, to service the portable heaters."

**Use of Liquidometer in Icing**

Leaving the subject of preservation of perishables by heating in refrigerator cars, Mr. Townshend turned to the use of the liquidometer in regulating the icing of cars. He explained that cars are bailed to re-ice only if the top inside temperature is above a certain point, and that a great many icing stations, at which cars would ordinarily be iced, are passed up, saving the expense for ice and also saving a great deal of switching. He said:—"The liquidometer is particularly useful in the icing of the overhead cars. These cars are equipped with tanks which retain a large part of the meltage from the ice. When, say, 15% salt is used along with the ice, a brine forms in the tanks at a temperature of about 15 degrees. If cars are iced frequently, this cold brine is forced out and wasted and is replaced by ice at 32 degrees and salt at perhaps 70 or 80 degrees and new brine has to be made. Consequently there is a great waste of refrigeration.

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"Therefore, if cars are iced only when the top inside temperature is above a certain point, full advantage is taken of the heat absorbing capacity of the cold brine, and it is not forced out of the tanks until it has absorbed all the heat possible. In a test between two overhead cars with bacon from Edmonton, Alta., to Halifax, one iced when top inside temperature fell below 30 degrees and the other iced at all regular icing stations, the car billed to be iced in accordance with the inside temperature cost only \$51.23 to refrigerate and was only iced five times, while the other car cost \$95.40 to refrigerate and was iced eleven times. Both cars delivered bacon at seaboard at the same temperature. As the ice in the overhead car is good to the last pound, such frequent icing is not so necessary as with the end bunker car, and eventually we will be able to eliminate at least 50% of our icing stations."

The Use of Salt—Mr. Townshend pointed out that ice, by itself, melts at any temperature higher than 32 degrees; that it will not melt at any temperature lower than 32 degrees, and that heat in a refrigerator car can be absorbed only by the melting of ice. Continuing, he stated:—"There is always a difference in temperature between the refrigerant in the ice container and the air in the body of the car so that when ice alone is used the car body is always above 32 degrees. Therefore, if a temperature near 32 degrees, or lower temperature, is required, it is necessary to compel the ice to melt and continue absorbing heat at temperatures lower than 32 degrees.

"This is done by the addition of common salt in varying percentages, de-

to be iced and with how much ice and salt, or what heater protection is to be given, or if it is to be ventilated. These instructions are shown on the bill of lading, which is the contract made between the shipper and the railway for the transportation of the shipment.

"The agent at shipping point copies these instructions to the waybill which accompanies the car in possession of the conductor. These waybills are taken into the yard office at each terminal and the work to be done is ascertained by checking through them. To speed up the work, advance notices are sent by wire from one terminal to another, so that the forces can have everything in readiness to do a quick job, but these advance notices are checked against waybills before departure of train to make sure there are no failures.

"Icing stations are spaced about 24 hours apart, which is the safe icing lapse for an end bunker car. Heaters and ventilators, however, are serviced at each inspection point, which are about eight hours running time apart.

"The above outlines the arrange-

ments for handling perishable traffic and particularly the developments of the past few years—developments of which I think we may well be proud.

"The Canadian National Railways is in the very forefront in the handling of perishable traffic on this continent, as will be attested to by anyone familiar with the situation, and this proud position has not been reached without a great deal of co-operation by the various departments of the railway, including the men in the field, and of course none have helped more than the Mechanical Department and the shops who have 'given us the tools'.

"No one knows what the future holds for us, but it is my opinion that a glorious period lies ahead—perhaps we will be even more glorious in peace than in war. There will be great improvements in transportation and there will be great developments in the preparation and distribution of perishable food-stuffs, and the Canadian National Railways are going to find themselves well equipped to go forward hand in hand with progress."

## Financial Results of U.S. Railways

*Earnings were not as good in January this year as in the month last year, the net income of all Class 1 roads, after charges, having decreased from \$62,979,830 to an estimated \$45,400,000.*

REPORTS filed by the U.S. Class 1 railways, with the Bureau of Railway Economics of the Association of American Railroads, show that their net railway operating income (the amount

In the 12 months ended Jan. 31, this year, the U.S. Class 1 roads earned a return of 4.96% on property investment, compared with one of 5.72% in the 12 months ended Jan. 31, 1943.

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car so that when ice alone is used the car body is always above 32 degrees. Therefore, if a temperature near 32 degrees, or lower temperature, is required, it is necessary to compel the ice to melt and continue absorbing heat at temperatures lower than 32 degrees.

"This is done by the addition of common salt in varying percentages, depending on the temperature desired. When salt is supplied, the melting point of the ice is lowered, and the freezing point of the solution from the melted ice and dissolved salt is lowered. When 10% salt, 10 lb. salt to 100 lb. ice, is used, the melting point becomes 21 degrees, and other percentages are as follows:—12% salt, 19 degrees; 15%, 15 degrees; 20%, 9 degrees; 25%, 1.8 degrees; 30%, 6 below zero.

"This 6 below zero is the lowest temperature which can be secured with ordinary salt. However, should lower temperatures be required, they can be secured by the use of calcium chloride, which will produce temperatures as low as 54 below zero.

"It will be seen, therefore, that when cars are under refrigeration the temperature is regulated to a certain extent by the amount of salt used. When cars are equipped with liquidometers, if it is found one percentage of salt is not providing low enough temperature, the amount of salt can be increased."

#### Conclusion

In concluding, Mr. Townshend stated:—"The handling of a shipment of perishable freight begins when the shipper orders a car. It is up to the railway to supply a good clean car, suitable for the shipment. Then it is up to the shipper to load the car in the approved manner and to give the railway instructions as to how it is to be handled, such as when and where it is

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