

Milwaukee Road's Super Dome Cars

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Color illustrations courtesy Pullman-Standard Car Manufacturing Company

Milwaukee Gets First Full-Length Dome-Lounge Cars

Ten new cars, built by Pullman-Standard, embody original features of design, including a 68-seat dome section

The first of ten new dome-lounge cars, currently being delivered to the Milwaukee by the Pullman-Standard Car Manufacturing Company, are more than living up to advance billing as reported in *Railway Age* March 24. It is noteworthy how closely the cars follow in all major particulars the details laid down by engineers and de-

signers about a year ago and culminating in pace-setting cars which contain many distinctive features, several of them now being tried for the first time in American railroad service.

The ten "Super-Dome" cars, providing strictly non-revenue lounge space of exceptional appeal, will be used

in regular service beginning January 1, 1953. One will be assigned to each of the six "Olympian Hiawatha" train sets in daily Chicago-Tacoma-Seattle service and one to each of the four daytime "Hiawatha" trains in Chicago-Twin Cities service. All of the cars will be placed next to diners; they will not displace the "Sky Top" lounge car for first-class passengers carried at the rear of each of these trains.

The determination of the Milwaukee management to provide a new attention-innelling and passenger-pleasing feature in "Hiawatha" trains is exemplified in the "Super-Dome" car. Three main objectives in the road's large investment are to build railway prestige in general, to get these particular cars talked about from coast to coast, and to provide a service which cannot be approached by any competitive transportation media.

The new "Super-Dome" car was designed by engineers and design specialists of the Pullman-Standard passenger-car engineering division, working in conjunction with officers of the railroad and representatives of companies supplying many special materials and devices used. The air-conditioned full-length dome section accommodates 68 passengers in rubber-cushioned seats generously spaced 3 ft. 5 in. on centers and made non-revolving, as the car is reversed at the end of each run. Beneath the dome is a dining and lounge section, seating 28, where beverages and light snacks are served from an all-electric stainless-steel kitchen.

Loudspeakers carry radio programs and announcements over the train public-address system. RCA equipment is utilized including a plate-type radio antenna which is placed on the depressed portion of the forward roof as there is not sufficient clearance for a conventional antenna above the roof center line.

Part of the lower level space over the trucks is used for air-conditioning equipment, air compressors, diesel Enginator units, and fuel and water tanks. The housing of this equipment is designed so the various units can be serviced regardless of weather conditions and whether or not the train is moving. This equipment renders each dome car mechanically independent of the rest of the train as to power for lighting and air conditioning.

Since this car is a new type of construction necessitating placement of a considerable amount of equipment above the floor line and with provision for a large number of passengers on the upper level, an investigation has been made of its stability on curves. Desirable roll characteristics are reported at maximum operating speeds and with ample margin of safety for over-speeds.



Lower lounge section showing color photo mural picture window on partition in the background.

The extremely wide spacing of truck bolster springs and relatively high location of the lateral bolster restraint tend to give an unusually steady ride.

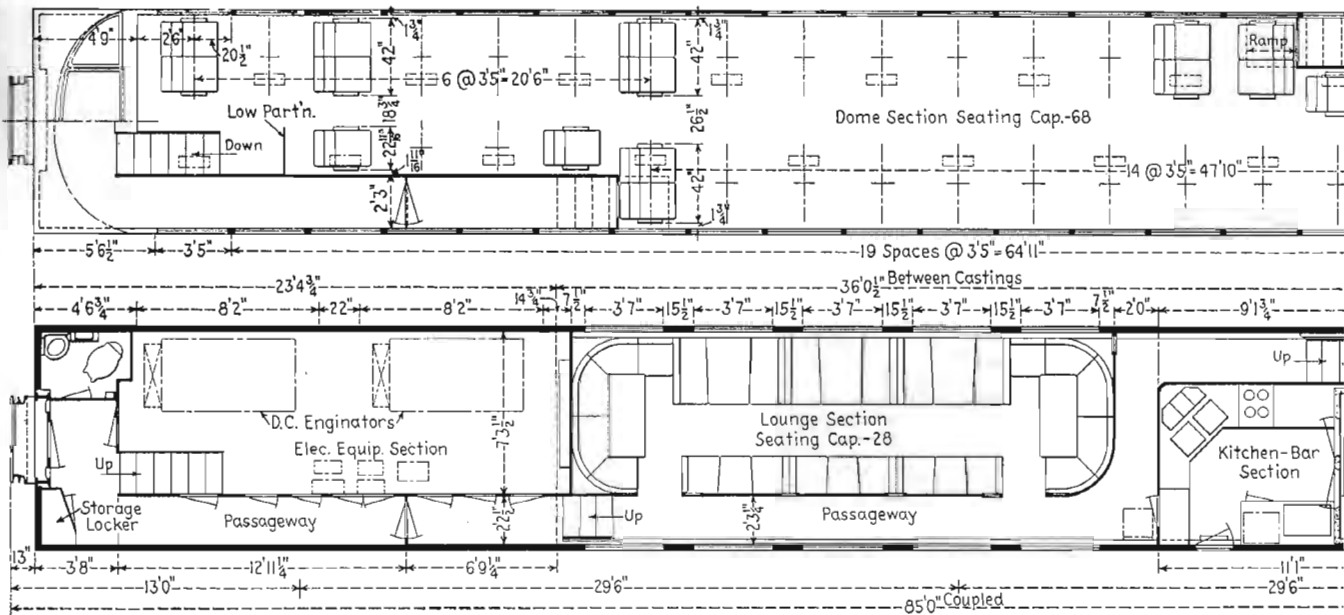
The new dome car is impressive looking and colorful. The eye-catching full-length dome, 15½ ft. high, harmonizes with the exterior color scheme which consists of traditional Milwaukee "harvest" orange and "royal" maroon with black underbody. The interior decorative treatment and lighting also merit special description. In the dome section, floor covering is rubber tile with appropriate inlaid design in the aisle, an authentic Indian motif being incorporated in the aisle strip. Stairways leading to the upper dome are covered with carpeting, featuring a broken-line pattern to match rubber flooring with which it comes in contact. Stairway railings are aluminited aluminum tubing with a modesty shield below the railing.

Copper-color dome-seat covering is supplied by Goodall in a pattern which also shows Indian influence and forms "M" for Milwaukee in a running design. Arm rests are covered with the same material and seat ends with Buffalo grain turquoise color, stain-proof Avtrim.

The dome ceiling is painted sky blue. The remainder of the dome section, including retainer frames for the curved glass windows and the dash at front and rear,



One of the Milwaukee "Super-Dome" cars with curved double-glazed high-visibility windows in the full-length dome.



Floor plan of new Milwaukee "Super-Dome" car—Dome level (above) and lounge level (below).

are painted sun tan. At either end of the car on the dash is an edge-lighted Lucite plaque, representing the running Indian, the Milwaukee trademark. Window cappings are laminated Formica with pearlescent finish.

Overhead lighting is Luminator incandescent type of a modern glass-block design in groups of three blocks to a fixture. The fixtures are in a staggered arrangement, avoiding a continuous effect. Some of the dome seats are equipped with aisle lights for visibility.

All dome seats, made by Heywood-Wakefield, are equipped with ash receptacles and adjustable foot rests. They are not only non-reversing but have fixed backs as it is not anticipated that many passengers will want to sleep in this car.

There are 21 rubber-mounted double-glazed curved sash, 3 ft. wide by 5 ft. high, in each car side. They are made by Adams & Westlake of ¼-in. Solex heat-resistant plate glass on the outside and ⅜-in. laminated Solex safety plate glass on the inside. In fact all glass, both utilitarian and decorative, in this car is safety glass as a precaution against personal injury.

Lower Level Arrangement

The lower-level lounge section with seating capacity of 28 is accessible from passageways laid out in staggered arrangement from either end of the car. The entire lounge room, including passageways leading to double-acting swing doors, is covered with Wilton-type carpeting, original in design and based on an Indian motif with green and antique gold coloring.

All furniture in this level is covered in Ashtabula top-grain leather in gold or green antique finish. Tables are covered with blisterproof realwood Formica. Table pedestals have a chrome satin finish and the bases of built-in furniture are made of stainless steel.

Walls of this entire area are painted surf green. The ceiling and the suspended ducts which house the air-conditioning and the continuous Luminator incandescent lighting are painted a sun tan. The Ajax venetian blinds and tapes are citron yellow, the operating part of the blinds having a satin finish.

Large pier panels in the room (eight in all) have

safety golden plate glass mirrors with wheelcut designs of a thunder bird. The vertical pylons which form part of the passageway are of stainless steel with safety glass panels in an appropriate Indian motif, wheelcut design. Horizontal safety-glass panels form part of the passageway partition and are also made of an imitation sandblast wheelcut design with appropriate Indian motif.

The glass mirrors are encased in extruded aluminum frames. Window cappings are processed Vicwood Formica in a blond wood effect to match the realwood prima vera Formica table tops. All heater pipe grills are stainless steel.

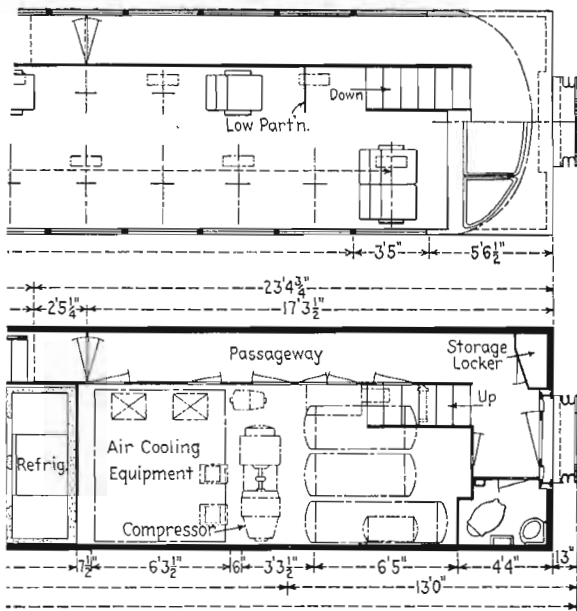
The partition at the rear end of the room is a lighted pictorial mural in full color, furnished and installed by Kaufman & Fabry, Chicago. This mural, with special Luminator lighting, has the appearance of a picture window frame without glass, the frame being painted the surf wall color.

At the forward end of the room is a stainless-steel kitchen-bar section with service opening, this section being of Pullman-Standard design and construction. The portion of wall adjacent to the opening is ornamented with a copper metal repousse in old form, again showing the running Indian Milwaukee trademark.

The new car is made of low-alloy high-tensile steel and embodies Pullman-Standard welded girder-type construction. The coupled length of the car is 85 ft. and dome roof height above rail 15½ ft., or 2 ft. more than conventional roof height. The car scale weight is 224,080 lb. including 14,400 lb. for the full passenger load and 9,080 lb. for lading such as fuel oil, water and crew.

By the judicious placement of heavy accessories, the car weight is almost equally divided, both crosswise of the car and fore and aft on the two trucks, a fact which greatly facilitates production of a smooth-riding truck design. These particular General Steel Castings trucks are six-wheel, all-coil spring, drop-equalizer type, equipped with Timken roller bearings, Unit-cylinder clasp brakes, Monroe vertical and Houde horizontal hydraulic shock absorbers, Budd Rolokron wheel-slide control and Westinghouse speed governor, among other devices. The combined weight of the two trucks is listed as 66,550 lb.

The car body is really constructed on three levels—



the normal entrance floor height 4 ft. 3 in. above rail, the depressed lounge-floor level 23 in. above rail, and the dome section floor level, 8 ft. 8 in. above rail. To carry static and dynamic load stresses satisfactorily through a structure of this kind presented many interesting structural problems. Each girder-type side is a structural section terminating at the side plate. Most important structural members are continuous the entire length of the car, including side plates, window headers, belt rails and side sills except portions at the lounge floor. In the usual construction, part of the roof also constitutes an effective section. Deflection had to be held to a minimum to protect the car-length expanse of glass in the dome.

Stresses in each side plate are of a low order to satisfy column action because the usual restraining effect of the roof sheet is not present in these cars and also because at the corners where the passageways are located the dome floor is not connected with the side frame.

Extra strength is provided in the carlines between windows to tie the sides together. At the center of the car above the dome aisle is a longitudinal panel of roof sheet about 2 ft. 4 in. wide, extending between box-section purlines, which gives necessary rigidity to the roof structure.

A feature of the underframe is the steel platform underframe casting at each end, made by the General Steel Castings Corporation, which is used to distribute buffing and other loads to side sills of generous section which extend around the depressed center portion of the car.

Each of these underframe end castings is 24 ft. 13/4 in. long, weighs 8,850 lb., and is in all probability the largest casting of its type ever thus used under a passenger car. The casting includes in a single integral structure the platform, buffer beam, coupler carrier, buffing-device pocket, draft-gear pocket, center sill, double body bolster (required with six-wheel trucks), integral center plate and body side bearings, and cross beam with integral side-sill and side-girder connection pads. The cross beam is designed to transmit both static and buffing loads from center sill to car sides and vice versa, as there is no center sill through the depressed center portion of the car.

The combination of all these different and vital car

High Spots of the "Super-Domes"

- First full dome-car in service.
- Largest total seating capacity, 96.
- Average cost \$320,000 per car.
- Weights 224,000 lb. fully loaded.
- Boasts a 50-kw. diesel power plant.
- Has 20-ton total air-cooling capacity.
- Largest underframe end castings used.
- No equipment carried under the car.
- Dome windows largest curved units.
- With Solex glass, no curtains in dome.
- Most colorful decorative treatment.
- R.C.A. plate-type radio antenna.
- Solar discs aid automatic heat control.
- New design easy-riding six-wheel trucks.

parts in a single carefully designed unit structure contributes strength and rigidity to the car body at each end. The integral construction permits provision of cored openings wherever desired for pipes and electric conduit necessarily placed underneath the car.

The car body weighs 134,050 lb. and its center of gravity compares favorably with that of the average car, which is advantageous from an operating standpoint. The center of gravity of the car weight on rail is 57 in., or not more than 1 in. higher than in most conventional cars.

Few passenger cars, if any, in regular rail service have had self-contained power plant of either the capacity or flexibility provided in the Milwaukee "Super-Dome" car. To take care of the maximum electric lighting, cooking and air-cooling load, two Waukesha diesel Enginator units of 25-kw. rated output each at 40 volts d.c. are mounted longitudinally in an equipment compartment at normal floor height over one of the trucks. They may be adjusted in the car or easily pulled out through side doors on tubular tracks when more detailed attention is necessary.

Each of the two Waukesha diesel engines, rated at 60 hp., is of the six-cylinder liquid-cooled type with

Principal Dimensions and Weights of Milwaukee Dome Cars

Length over platform, coupled, ft.	85
Length between truck centers, ft.	59
Width over side sills, ft.	10
Width, inside between posts, ft.-in.	9-6
Height, rail to top of roof (dome), ft.-in.	15-6
Height, rail to top of roof (conventional), ft.-in.	13-6
Height, rail to top of floor, ft.-in.	4-3
Height, rail to top of low floor, in.	23
Height, rail to top of dome floor, ft.-in.	8-8
Truck wheel base, ft.	11
Wheel diameter, in.	36 1/2
Journal size, in.	6 1/2 by 12

Scale weights, lb.:	
Car body	134,050
Trucks (two)	66,550
Lading	9,080
Passengers	14,400
Ready to run	224,080
Lading weight details, lb.:	
Fuel oil	2,250
AC Condenser water	1,586
Air-pressure water	2,829
Lockers and refrigerators	2,065
Crew	350
Total	9,080
Passengers weight details, lb.:	
68 seats in dome	10,200
28 seats in lounge	4,200
Total	14,400



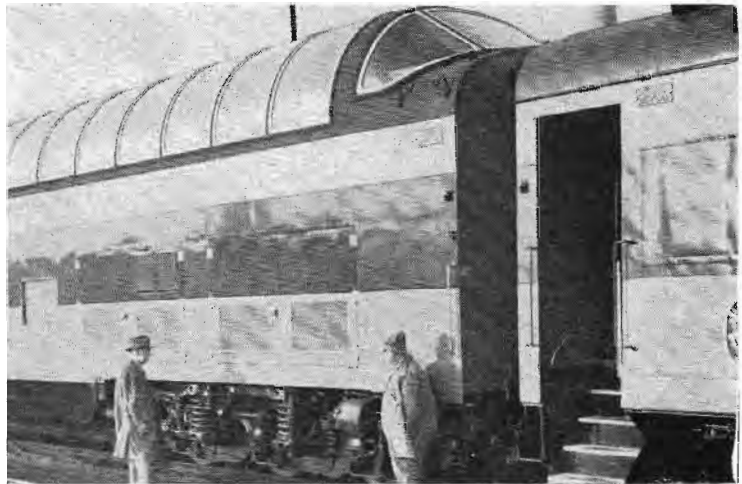
The Heywood-Wakefield seats in the full-length dome section are rubber cushioned and non-revolving.



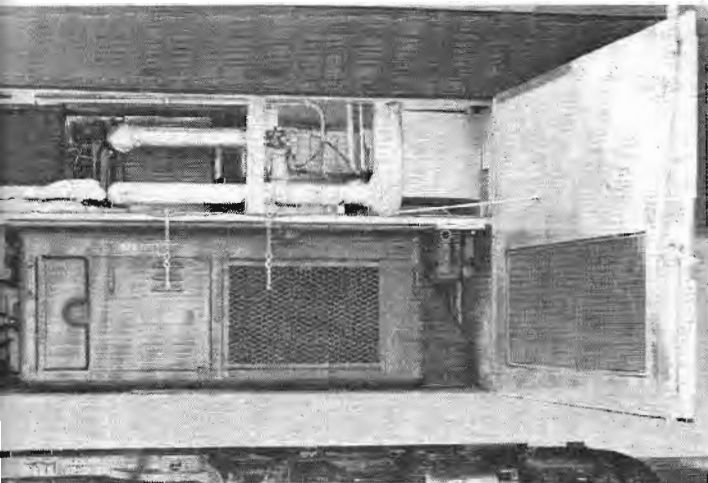
Details of dome-section entrance to one of the stairways, with Milwaukee running Indian trademark on the dash.



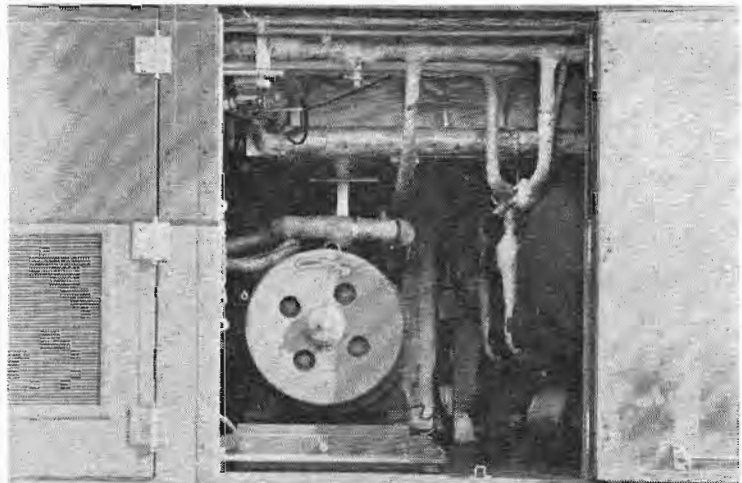
Decoration and equipment in the roomy lounge section which occupies the depressed center part of the car.



The General Steel Castings six-wheel truck, equipment compartment doors and exterior of dome sash at end.



One of two Waukesha 25-kw. Enginotor units which can be pulled out of the equipment compartment.



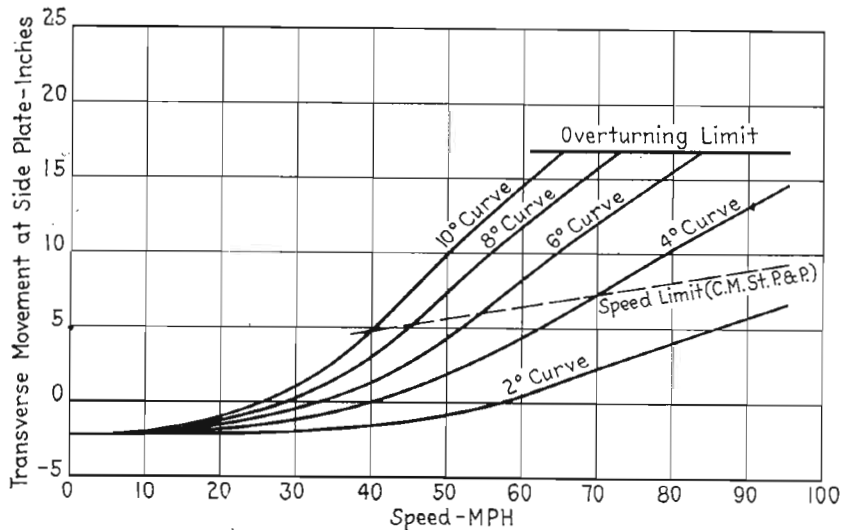
One equipment door closed and one open to show the Trane 20-ton compressor and connections.

direct fluid-drive connection to a fully enclosed electric generator. The generator regulators are set at 38 volts and the lamp regulators at 31 volts. Five Exide six-volt automotive-type batteries with 120-amp. capacity at 20 min. rating are floated across the line and supply power for engine starting.

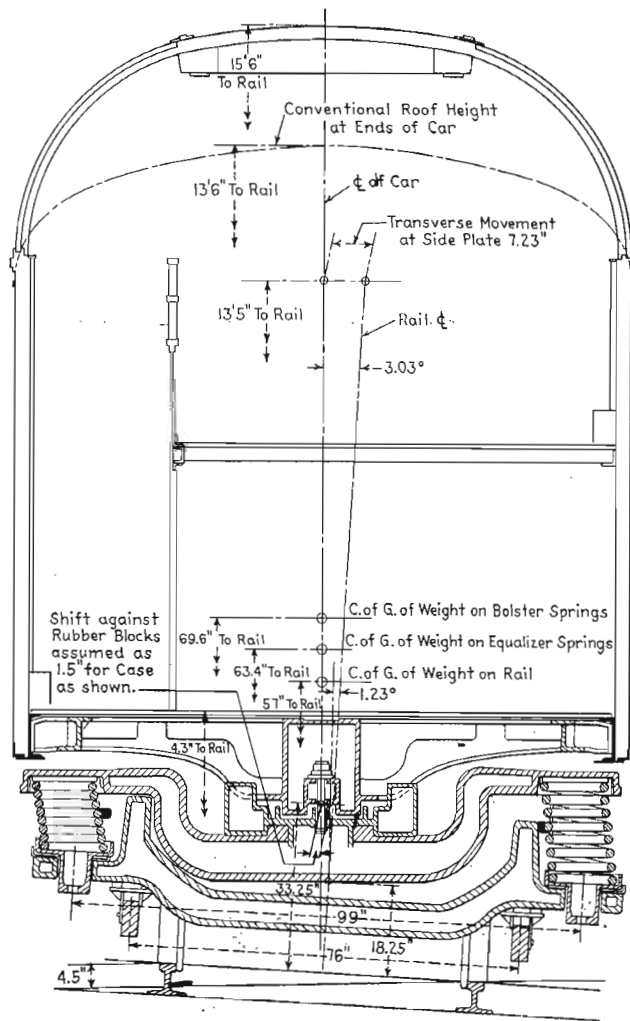
Control panels for the two power units contain fuel gages, high- and low-heat protective switches, automatic load disconnect switch in case of engine failure and other necessary controls, including interlocks to give a visual indication of power-unit failure and reduce the air-conditioning load requirement. Two diesel fuel tanks of 150-gal. capacity each are installed.

The engine exhaust pipes are 2½-in. stainless steel, carefully insulated. Tubular-type mounting tracks with extension and roller-bearing shear-rubber-cushioned trolleys are arranged to support the Enginotor units. By careful attention to details, the Enginotor units and all other power equipment in the car are effectively insulated against vibration and noise transmission to the passenger compartments.

The Milwaukee "Super Dome" car is cooled by a Trane air-conditioning system with double the capacity of most present-day passenger-car installations. Each of the new dome cars has refrigeration equipment capable of producing 20 tons of ice a day, which compares with



Body roll of full-length dome car, calculated for curves with 4½-in. super-elevation.



Body-roll diagram for full-length dome car. Condition shown is for 70 m.p.h. on 4-deg. curve with 4½-in. super-elevation and full passenger load.

7 to 8 tons of cooling capacity for standard sleepers and coaches.

Despite high cooling capacity, the new "Hiawatha" air-conditioning system is said to be economical in consumption of power, diesel fuel, and water due to two

important developments by the Trane Company in railway refrigeration. The first of these is the eight-cylinder, 20-ton compressor, heart of the cooling system. The compressor automatically steps down its operation and power consumption, by releasing pressure from pairs of cylinders, whenever cooling requirements drop. This system of unloading is largely responsible for the savings in diesel fuel consumption. It also reduces wear and tear on both the compressor and the diesel-electric power plant by minimizing intermittent starting and stopping.

A second feature is the Trane combination dry-wet condenser, which cools and condenses the hot, gaseous refrigerant from the compressor, and thus dissipates heat from the car to the outside air. Under moderately warm conditions, the condenser operates dry, much the same as the condenser on a household refrigerator.

During 90-deg. summer-weather, the condenser coils are sprayed automatically with water, which intensifies the cooling as it evaporates. Because the new condensers operate "dry" about 90 per cent of the time, they are said to use a fraction of the water consumed by fully flooded condensers, this water saving being highly important on hot, dry western runs.

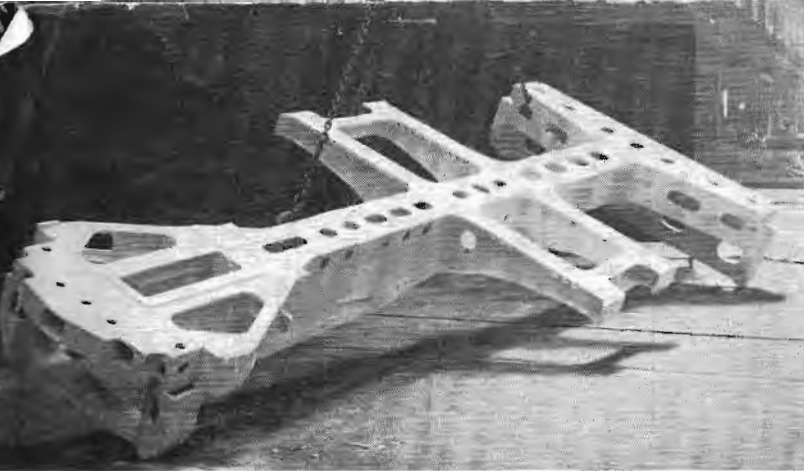
Three standard compact Trane railway air conditioners, which include steam heating coils, maintain controlled comfort conditions at all times. Two eight-ton units supply filtered, conditioned air to the Pyle-National Multi-vent ceiling outlets in the dome section through double-glass windshield ducts at each end. A smaller four-ton air conditioner supplies the 28-seat dining-lounge section on the lower level, offsetting the heat and humidity of the electric kitchen. The air conditioners also maintain a slight positive pressure throughout the cars, thus minimizing infiltration of dust and moisture.

An important departure in this dome car design is the location of all air-conditioning equipment as well as power plants in two compact compartments, above the trucks, at each end of the car. These equipment spaces are completely protected from the dust and moisture that complicate traditional under-car location. The equipment compartments are accessible from the outside or inside.

Effective Heating Equipment

No passenger train or car can operate many months in Milwaukee territory without effective heating equipment and much attention has been given to this detail in the new cars. The heating system utilizes narrow unit-fin radiation with solenoid valve, latest-type loop equipment, zone-control and individual circuits for each portion of the car on the various floor levels, as developed by the Vapor Heating Corporation. By turning one switch on the electric control panel the trainman puts the system into operation; then sensitive Vapor thermostats take over and operate the steam valves and the air-conditioning compressor automatically to keep the passengers comfortable as the outside temperature changes from subzero to over a hundred.

On mildly cool days the car is heated by the overhead system, fresh air being brought into the car and mixed with recirculated air as it passes through a thermostatically controlled steam-heated radiator in the duct



The car underframe includes at each end one of these Commonwealth one-piece cast steel platforms.



Vapor Solar Discs which aid in accurate automatic control of temperatures in the dome section.

Partial List of Materials and Equipment on 10 Milwaukee Full-Length Dome-Lounge Cars

Trucks; end underframe castings	General Steel Castings Corp., Granite City, Ill.
All-coil springs	Railway Steel Spring Div., American Locomotive Co., New York.
Wheels	Standard Steel Works Div., Baldwin-Lima-Hamilton Corp., Burnham, Pa.
Roller Bearings	Timken Roller Bearing Co., Canton, Ohio.
Shock absorbers:	
Vertical	Monroe Auto Equipment Co., Monroe, Mich.
Horizontal	Houdaille-Hershey Corp., Houde Engineering Div., Buffalo, N. Y.
Insulating pads, truck	Fabreka Products Co., Boston.
Wheel-slide control, Rolokron	United States Rubber Co., New York.
Brake pin collars and cotters	Budd Co., Philadelphia.
Center-plate liners	Elastic Stop-Nut Corp. of America, Union, N. J.
Air brakes—electro-pneumatic, and water-raising mechanism	Gatke Corp., Chicago
Brake shoes	Westinghouse Air Brake Co., Wilmerding, Pa.
Clasp brakes, Unit-cylinder	American Brake Shoe Co., New York.
Hand brakes	American Steel Foundries, Chicago.
Couplers, Tightlock	National Brake Co., New York.
	National Malleable & Steel Castings Co., Cleveland.
Draft gears and buffing device; bolster-locking center pins	W. H. Miner, Inc., Chicago
Upper buffer mechanism	Standard Railway Equipment Manufacturing Co., Hammond, Ind.
Structural steel, Cor-Ten	United States Steel Co., Pittsburgh.
Insulation, car-body	Gustin-Bacon Manufacturing Co., Kansas City.
	Johns-Manville, New York.
Window sash	Adams & Westlake Co., Elkhart, Ind.
Window capping	Formica Co., Cincinnati.
Diesel Enginotor units, two	
25-kw.	Waukesha Motor Co., Waukesha, Wis.
Fuel tanks for diesel engines	Chicago Boiler Co., Chicago.
Storage batteries, automotive type	Electric Storage Battery Co., Philadelphia.
Air cooling, 20-tons' capacity	Trane Co., LaCrosse, Wis.
Heating system, zone-control	Vapor Heating Corp., Chicago.
Air filters	Farr Co., Los Angeles.
Air distribution panels, electric trainlines and jumpers	Pyle-National Co., Chicago.
Radio and public-address system	RCA Victor Div., Radio Corp. of America, Camden, N. J.
Buffer refrigerators	Frigidaire Div., General Motors Corp., Dayton, Ohio.
Curved glass units, interior paint	Pittsburgh Plate Glass Co., Pittsburgh
Exterior paint	E. I. du Pont de Nemours & Co., Wilmington, Del.
Lighting fixtures	Luminator, Inc., Chicago.
Decorative glass panels	Cadillac Glass Co., Detroit.
Photo full-color murals	Kaufmann & Fabry, Chicago.
Rubber floor covering	Goodyear Tire & Rubber Co., Akron, Ohio.
Floor carpets	Olson Rug Co., Chicago.
Dome seats	Heywood-Wakefield Co., Gardner, Mass.
Lounge settees and furniture	Beck & Blatchford, Chicago.
Venetian blinds, lower lounge	Ajax-Consolidated Co., Chicago.
Seat covering	Goodall Fabrics, Inc., Sanford, Me.
Water tanks	Scalfe Co., Oakmont, Pa.
Washstands	Crane Co., Chicago.
Hoppers	Duner Co., Chicago.
End door operators	National Pneumatic Co., Boston.

leading to the overhead air duct in the dome and lounge section which distributes the heat evenly.

When it is cold, heat is also supplied by the floor unit-fin radiators. Heated air also moves up inside the wall and out openings in the window ledge, which adds materially to the comfort of passengers on the outside seats, keeping their sides and elbows warm.

One interesting feature of the heating system is the use of two Solar Discs mounted outside on the car roof at the rear end. This device lowers the temperature setting of the thermostats in the dome to offset heat from the sun. When a cloud blocks out the sun the Solar Discs

immediately react so that more heat or less cooling can be provided to keep the car comfortable.

The fuel and water supply tanks and the equipment compartments also have thermostatically controlled heating systems. Hand-operated steam valves control steam supply to steam pipes around the fuel and water-filling inlets. Steam also heats water for the kitchen and wash rooms, controlled by a flow-limit valve in one of the Vapor safety steam regulators.

How the Trucks Function

The six-wheel trucks with 6½-in. by 12-in. axles required to support the weight of the "Super-Dome" car are a special General Steel Castings design, shown by test to give exceptional ease of riding under all speed and normal track conditions and in spite of carrying the main passenger load at an unusually high level. The all-coil-spring truck is equipped with rubber bumpers, Miner bolster-locking center pin, Gatke center-plate liners, Fabreka insulating pads under the equalizer ends and brake pins fitted with Pol-pin collars and cotters, supplied by the Elastic Stop Nut Company. Rubber pads to dampen vibration and noise are also applied at the constant-contact friction-type side bearings, bolster coil springs, bolster bumpers and anchor rods.

This truck differs from conventional six-wheel trucks in a number of ways, especially elimination of swing hangers and spring plank, with lateral movement transmitted through the bolster springs; provision of integral cross and center bolsters positioned above the truck frame and hence readily removable for easy truck inspection or repairs. Practically all truck parts such as springs, shock absorbers, anchor rods and rubber bumpers are located outside the truck frame. Even the side bearings are brought outside and spaced 8 ft. 3 in., as compared with 7 ft. 7 in. on standard passenger cars using six-wheel trucks to give added stability.

Truck springs are of the coil type, the four relatively stiff 9-in. diameter equalizer springs with 14⅜ in. free height and 2⅜ in. static deflection cushioning road shocks which would otherwise be transmitted to the main truck frame. To give a still softer and more flexible ride to the car body and contents, four 13⅝-in. diameter coil springs with 26-5/16 in. free height and 8-13/16 in. static deflection are installed between the main truck frame and the body bolster. The total vertical travel, limited by positive stops and cushioned by the Monroe shock absorbers, is 4 in., 1 in. above normal position and 3 in. below. The maximum lateral bolster movement is 2¼ in. each way from the center, cushioned for the first inch by the Houde absorbers and for the next 1¼ in. by the hydraulic device in combination with gradually increasing resistance of the rubber bumpers until a positive stop is reached.