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The Society, a non-profit corporation, meets the fourth Monday monthly except July, August, and December. Membership includes subscriptions to the San Joaquin Historian and the monthly newsletter, News and Notes. Additional copies may be purchased at the Museum.

The Society operates the San Joaquin County Historical Museum at Micke Grove Regional Park in partnership with San Joaquin County. The Society maintains an office at the Museum.

Manuscripts relating to the history of San Joaquin County or the Delta will always be considered. The editor reserves the right to shorten material based on local interest and space considerations. Inquiries should be made through the Museum office.

THE COVER PHOTOGRAPH

The Stockton-Copperopolis Railroad — a combination freight and passenger train — is pictured on Stockton’s Weber Avenue near San Joaquin Street. This issue focuses on a special kind of freight car significant to California’s railroad history — the refrigerator car, or “reefer.” This article is a condensed version of a 30 page manuscript on refrigerator cars. A copy of the original article is available at the San Joaquin County Historical Museum.

Courtesy of Horace A. Spencer
The Ice Car Cometh:

A History of the Railroad Refrigerator Car

by

Linda Danes-Wingett

While America’s railroads linked the nation and were instrumental in the development of cities and towns throughout the country, the railroad refrigerator car, or “reefer,” was destined to become an extremely important link between the farm and the marketplace. With the reefer and the dense rail network, transport of foodstuffs became national rather than regional in scope.

American consumers depended on this yellow-sided railroad car to supply fresh produce, meat, milk and other staples. The color of the reefer -- generally a bright yellow or sometimes a yellow orange -- provided a quick means of identification and quick handling. It was essential to feeding America, and it entered and disappeared from the American scene with little public notice.

History

Experimentation with railroad refrigerator cars began around 1842. In that year The American Railroad Journal reported on a new type of insulated freight car in use by Western Railroad of Massachusetts. It used ice in summer with four inches of powdered charcoal between inner and outer walls to protect cargo. Plans to convert “the whole country into a garden for our great cities” were not visionary for the 1840’s, yet follow-up or further experimentation with insulated railroad cars did not happen quickly. A great variety of specialty cars appeared shortly after the Civil War, with none more interesting than the refrigerator car. Before the refrigerator car was invented, it was impossible to ship foodstuffs long distances. Although crude attempts at refrigeration, using ice and sawdust in boxcars, had been tried in the 1840’s, it was not until 1867 that the first patent for a refrigerator car was issued. J.B. Sutherland was granted the first patent for a refrigerator car on November 26, 1867. Joel Tiffany, a Chicago lawyer, obtained another patent in 1877. Tiffany recommended using air ducts within walls for air circulation and fans to circulate air but could not devise a dependable way to power them. His design represents only one distinct plan of the time, but it was the earliest illustration of a complete refrigerator car.

Railroads were initially reluctant to purchase refrigerator cars. Transporting refrigerated produce was an uncertain venture, and refrigerator cars were expensive, costing twice as much as a standard box car. Box cars carried revenue-producing loads on return trips, while most refrigerator cars returned empty. Shippers considered them a poor bargain for regular cargo since their interiors were smaller because of their insulated walls. They also had a reputation for being damp and musty.
Beef packers made the first demands for refrigerator cars. However, railroads were heavily invested in cattle cars, stock yards, feed lots, and related facilities; and, therefore, they were slow to invest more money in refrigerator cars. When they did, the railroads demanded twice the rate for hauling processed beef than for hauling live cattle shipments.

Railroads already owned thousands of stock cars which were neither appropriate nor adaptable for transporting other products. Compared to stock cars and box cars, refrigerator cars were costly and complex: their double walls, insulation, tight fitting doors, ice bunkers, and drains drove the costs upward. In 1883, while a single box car cost approximately $800.00, a refrigerator car cost approximately $1,200.00.4

Beef packers initially dominated most of the refrigerator car business, controlling ice plants, setting icing fees, and developing methods to obtain rebates and mileage rates from customers. Eventually, refrigerated transport expanded to include vegetables.

Railroad refrigerator cars traveled the nation's railways for approximately 100 years. During most of this time the majority of the cars were privately owned. Railroads considered themselves a common carrier and treated anything that could not be transported in a box car or hopper car as a special product. Shippers of specialty items were encouraged to provide their own equipment, and railroads would move them in the normal interchange of service. The burden of investment was placed on the shipper instead of the railroads, which were generally capital poor.

Nevertheless, after 1901, the railroads began an aggressive acquisition of refrigerator cars. The railroads were motivated by three reasons: they had witnessed consumers' demands for refrigerated and fresh products, they were certain consumers' demands were not temporary, and they finally believed they could receive a fair return on capital invested in railroad refrigerator cars.

Despite even these benefits, the attitude of the railroad industry toward refrigerated transportation was guarded. On one hand, it was attractive because it produced good revenue, with long hauls of 2,500 miles vs. one-tenth that for other merchandise shipments. However, seasonal food production meant expensive cars sat idle until the next harvest season.

The problem of idle cars was eliminated in two ways: a national refrigerator car pool was established by the United States Railroad Administration during World War I when it operated the major carriers. After the war this car pool was continued by the railroad industry. Under this plan cars were distributed from place to place as different crops matured, ensuring their maximum use.

It was vital that distribution of perishable foodstuffs be orderly. This required that all service, machinery, and equipment move to the proper location, in sufficient quantities, when the product ripened. At one of the great perishable "blocks" in California, where trains were assembled for eastern dispatch, there would be a five-month lull in activity. Then, in advance of the harvest, refrigerator cars flowed in, waited for the product to ripen, and the rush began.5
Trains loaded with fresh foods for America's consuming markets rolled eastward from vineyards, orchards, fields, and gardens in the western states, and the movement and distribution was indeed well organized. Cars were available when and where they were needed. Routing was exact, with produce sent to areas needing it, not to areas already glutted. In this way America's railroads and the railroads' refrigerator cars were a vital part of national health and well-being.  

At one time over 180,000 railroad refrigerator cars were involved in transport of America's produce. Money invested for the cars and fleet support — icing stations, repair shops, warehouses, and employees — amounted to hundreds of millions of dollars.

By 1900, the railroad refrigerator car industry was in good condition. The shiny yellow refrigerator car -- decorated with colorful signs, lettering, and slogans -- was the most glamorous freight car in America. It had grown in size and measured 35 feet long, carrying 30 tons of goods.

However, by 1930, the number of railroad refrigerator cars in service peaked; thereafter, though the volume of reefer traffic grew, there was a decline in the size of the fleet. This was due to larger refrigerator cars and faster schedules, which meant growers were able to be more efficient and more productive.

Throughout its history, the railroad industry experienced monopolies, takeovers, abuses and overcharging, antitrust action by the Federal government, and regulation by the Interstate Commerce Commission. During times of growth and change, ownership and control of refrigerator cars moved back and forth between private and railroad-controlled domination. By 1965, 85% of all the private refrigerator cars were railroad controlled. By that time, however, highway refrigerator trucks were competing with railroads and undercutting rail operations.

Between 1922 and 1960, the number of railroad-owned refrigerator cars dropped from 63,000 to 25,000. Railroads were experiencing competition for transportation of goods. By the early 1950's, trucks were carrying major portions of America's eggs, poultry, milk, fruits, and vegetables. By 1960's, work on the nation's Interstate Highway System was sufficiently complete to link America by highways. At the same time, Detroit was producing larger transport vehicles designed for heavier long-haul truck shipments on inter-state highways.

EXPANSION TO CALIFORNIA

Some of the nation's best crops were located in the Midwest, South and West, far from the concentrations of consumers in the Northeast. When the two were united by the completion of the transcontinental railroad in 1869, Americans enjoyed an opportunity to provide and to consume fresh foodstuffs on a year around basis. Almost no other nation had this option.

In his 1942 book *This Fascinating Railroad Business*, Robert Selph Henry observes the intricacies of transporting perishable goods:

On a main line eastward from California, the movement of perishables may average as high as 800 cars a day during the season, with peaks of 1,200 cars a day -- all to be lifted across the Sierra Nevada, and across the ranges of the Rockies, as well as across the deserts and the plains. At the peak of the season, more than 700 cars of perishables will leave a concentration point at the western foot of the Sierra in a period of four hours each day with a train starting up the mountain every twenty minutes.

As trains roll eastward, the shippers are busy selling the cars of fruit or vegetables they carry, wiring ahead to various diversion points instructions for the diversion and reconsignment of each car as it is sold.

As each train pulls into the icing stations along the way, it becomes a center of attention and activity. One force of men works on top of the train, filling the ice bunkers of the refrigerator cars according to shippers' instructions. Another force works beside or beneath the train, inspecting cars for mechanical...
defects, adjusting brakes, making minor repairs where needed. Another force works alongside the train, checking each car against the diversion and reconsignment orders held at that point, and carding the cars to be cut out and sent to the hold track for diversion.

By the time re-icing is completed, all minor mechanical adjustments have been made, bad-order cars and cars ordered diverted to other markets have been switched out, the cars remaining in the train have been rechecked against their waybills, the train has been coupled up and its air tested, the new crew have taken over and received their orders from the dispatcher -- and the train is ready to roll on..."11

California, specializing in growing wheat, developed more slowly than other areas as a supplier of agriculture produce until about 1900. The low production cost of growing wheat offset the cost of shipping it to distant markets.

California's great boom began with the opening of an "overland route" due west from Omaha, across the Great Salt Lake and the Sierras and into Oakland. Low railroad rates made shipping California agriculture products east both practical and possible.

California crops which glutted local markets became a great cash crop when delivered to New York. By 1920, California was a leading supplier of fresh and preserved fruits and vegetables for the rest of the country.12

Design

The most popular refrigerator car was little more than an insulated box car with "bunkers," or ice compartments, at both ends. The roof had hatches at the corners for checking and replenishing ice. When merchandise in the cars did not require refrigeration, the hatches were opened to permit air circulation.

In the early 1900s, refrigerator cars were built on steel frames while the bodies were constructed of wood. By 1911, 43.3% of new reefers ordered had steel underframes; and by 1913, 79.4%. Builders still employed wood for the car's body because of the high conductivity of metal which could result in temperature instability. In wood cars there were leaks and high maintenance costs. However, their costs were lower than that of metal cars because wood was readily available and the lumber was treated to prevent rot.13

By 1933, a few all-steel reefers were in service. Some cars had steel body frames and ends and wooden sides. In 1936, Pacific Fruit Express converted to steel-body refrigerator cars and ended construction of wood-sheathed cars. However, wood continued to be used for car interiors, floor racks, and subsidiary body frames. In 1936, Pullman produced a welded steel body refrigerator car; welding began replacing rivets and bolts on manufacturing assembly lines.

As steel was slowly replacing wood-bodied cars, some builders experimented with aluminum, stainless steel, and plywood. Their experimentation resulted in lighter weight and satisfactory refrigerator cars. Nevertheless, most builders resisted changing to aluminum and stainless steel, possibly because they were more costly, although they were more durable. Plywood construction was better received. It offered good insulation, and the worst defects of lumber were eliminated. Using large plywood sheets eliminated over 85% of the joints and 96% of the nails and screws required to build a
board-sided body. Thus, the plywood car was strong and more heat and air tight. Plywood refrigerator cars commenced service in 1935. Steel shortages occurring during World War II meant more plywood cars were built. By the war’s end, refrigerator cars with plywood bodies, often with steel-sheathed exteriors, were an established part of railroads’ transport of food.  

America’s railroad builders willingly adopted their own reforms to improve refrigerator cars: axle-driven, forced-air circulation fans came into use. The idea was first introduced in 1868, when American Artisan described a reefer with a wind-activated circulating fan mounted to the roof of the car near its center. In 1875 a more powerful axle-driven fan was tested. Finally in 1904, a refrigerator car with a friction driven blower was exhibited at the St. Louis World’s Fair.  

Less than forty years later, in September 1940, William Van Dorn of Pasadena, California, received two patents for axle-driven circulating fans. The device -- marketed by Preco of Los Angeles -- was a small pneumatic tire which rode against one of the railroad wheel cars for power. V-belts connected the powershaft to a countershaft above the main floor but below the elevated floor racks. A series of blowers were mounted on the countershaft which extended the width of the car, and both ends of the car were so equipped. This system completely exchanged air three times per minute. By 1945, nearly one-third of all new ice cars in the reefer fleet had this system as standard equipment.  

In the early 1950’s, an electrical drive replaced the direct mechanical drive. This allowed fans to be mounted near the ceiling. Electrical power came from a generator propelled by the axle-driven arrangement. When railroad cars were at a standstill, power was not generated, and the fans stopped functioning. When this occurred, an electric motor would be connected to the Preco fan to power its operation during pre-cooling or to maintain a stationary loaded car while in a terminal.  

After World War II, changes and improvements to the design of refrigerator cars included light-density insulation, steel wheels, and softer-riding cars. Doors were changed, with plug-type sliding doors replacing hinged doors. The newer doors slid on tracks similar to those used on ordinary box cars and could be pushed open flush with the car’s side. Early plug doors were six feet wide, but by the 1970’s they had expanded to ten feet, five inches wide.  

These structural reforms improved the ice car tremendously, but they could not save it. Post-war diet in the United States included a new item, frozen food, and the ice car could not satisfactorily transport frozen food. Mechanically-refrigerated cars were necessary to haul frozen food, and it was neither feasible nor economical to maintain, service, and repair facilities for both ice and mechanical refrigerator cars.  

Long after most private and industrial refrigeration consumers had adopted mechanical refrigeration, the railroads abandoned their ice cars. Most refrigerator ice cars and ice stations were retired by 1972. Ice cars in good condition continued in use, however, hauling ventilated shipments. Today, thousands of railroad refrigerator cars remain in service, carrying loads normally assigned to insulated box cars, but few operate as refrigerator cars.  

By the time ice cars were retired to the scrap heap or converted to insulated box car transport, most railroad refrigerated transit had given way to unregulated highway carriers. Now that railroads are somewhat deregulated, they are reclaiming some of the food transportation business. Railroad food shipments are transported in refrigerated containers loaded piggyback aboard railroad flat cars.
Ice

Transportation of foodstuffs by railroad refrigerator ice cars was more than a fleet of shiny yellow cars: it involved an impressive number of related facilities to store, handle, and supply ice. Vast ponds, refrigeration plants, insulated warehouses, and ice docks were located every 250-300 miles along America's principal railroad tracks. In some instances, a service terminal was both an ice house and a loading dock, with ice transported in by special ice cars from a central supply depot.20

For most of the 19th century, refrigerator cars' enormous demand for ice was met by natural ice harvested from frozen ponds and lakes. During winter months ice was cut, gathered, and stored in insulated warehouses for use as required during the rest of the year.

In some instances, natural ice was not cut from a pond or lake. Instead ice was made by pumping water into a shallow, one-foot deep tank, and the frigid climate froze it.21

In 1834, Jacob Perkins was granted one of the first patents for a practical ice-making machine. Within the next fifty years ice makers were produced in the United States, France, and Germany.22

Progress was made in producing ice by artificial means, yet nearly everyone favored natural ice. They believed artificial ice to be unhealthy even though it was produced from purer water than that usually found in lakes and ponds. However, it could be produced as needed, and it did not need to be stored for long periods. The superstition about artificial ice was eventually overcome through publicity and education.
Although the use of artificial or manufactured ice became more common by the 1890’s, natural ice, under the right conditions, continued to be harvested until almost the end of the refrigerator ice car era. At its peak, railroad refrigerator cars consumed 13 million tons of ice per year.\textsuperscript{23}

The largest California ice plant belonged to Pacific Fruit Express (PFE) located in Roseville, California. Its mechanical units turned out 1,200 tons of ice a day for storage at a warehouse with a capacity of 52,000 tons. Roseville’s rail docks could service 254 cars simultaneously. Even with this capability, PFE relied on private suppliers to meet increased demands.\textsuperscript{24}

Ice was cheap and simple, which explains its long standing popularity with railroad men. An ice car for meat transport might require $300.00 worth of ice a year. This cost alone is not large, but when 100,000 cars are involved, it is enormous. As a result, shippers constantly searched for cost-cutting methods. One was to pre-cool both the foodstuff and the car before shipping. Pre-cooling began as early as the 1870’s. Though the economic benefit of pre-cooling was widely recognized, it was seldom practiced.

In 1909, \textit{Railway Age} magazine urged more pre-cooling. In 1910 Santa Fe Railway opened a large, reinforced concrete pre-cooling plant in San Bernardino, California. Thirty-two loaded cars were pushed into the plant, cold air was pumped into the railroad car’s hatches at one end, and the warm air was forced out the opposite end into ventilating ducts. It took four hours to pre-cool a car and its contents. The Santa Fe plant could process 150 cars a day. This process worked so well that pre-cooled cars required only one re-icing en route to the East.\textsuperscript{25}

Adding salt to ice did not necessarily conserve ice, but it improved the effectiveness of ice as a coolant. Ice alone could not hold air temperature to less than 35°F, even in a well-sealed enclosure. Adding salt to the ice caused it to melt faster and accelerated the absorption of heat. The most efficient mixture was 30% salt to 70% ice, resulting in a temperature of 6° below zero under ideal conditions. The optimal temperature was a few degrees below freezing. Ice and salt were often used for meat shipments. It was tried for frozen foods but was not successful.

A disastrous side effect of the salt-ice mix was the highly corrosive liquid discharged out the underside of refrigerator cars. The cars’ steel underframes, trucks, and wheels were liberally dosed with the rust-causing fluid. The problem was frequently discussed but never solved. Brine tanks to catch and hold the discharge were employed on cars using interchange service. But enough brine leaked out to cause heavy damages to railroad properties each year.\textsuperscript{26}

Ice blocks weighed from 200 to 400 pounds and were slippery and bulky. Placing five tons of ice into a refrigerator car through four small hatches, twelve feet above ground, was a challenge. Even the strongest ice man needed equipment to assist in loading. It is quite certain high-level loading docks came into being at the start of the refrigerator car era, and equally certain a mechanical method of conveying ice to the docks was rapidly introduced.

\textbf{SAN JOAQUIN COUNTY}

Pacific Fruit Express (PFE), jointly owned by Santa Fe and Southern Pacific (later Union Pacific and Southern Pacific), served western growers for about 65 years. By 1970, it handled 25% of the nation’s perishable produce and was the largest refrigerated car line in the railroad industry.

Pacific Fruit Express’ “Central California District” was headquartered in Sacramento, and consisted of territory inland from Bakersfield northward and regions along the Southern Pacific in Nevada. District agents were located in Bakersfield, Fresno, and Stockton. Both
Stockton and Tracy both had ice transfer plants (ITP). In addition, Stockton boasted an ice manufacturing plant (IMP), and was a regular icing station.

Pacific Fruit Express contracted all services with Valley Ice Co., which had a roofed platform and double-track capability with a 42 car capacity. Most ice for transfer stations was shipped from Pacific Fruit Express' Modesto ice manufacturing plant.

Tracy's ice transfer plant was an emergency icing station where cars were iced for loading in surrounding territories during peak season to relieve Pacific Fruit Express' Modesto and Stockton plants. Tracy Ice Company provided the ice and performed the icing, using ice company escalator trucks.

Union Ice, located in Stockton, provided ice for railroad refrigerator cars. Union Ice no longer exists; its ice-making business was acquired by Arctic Ice, and the cold storage business was acquired by Reliance Cold Storage.

Don Faucett of Reliance Cold Storage said his father, Andrew, founded Reliance Cold Storage. Andrew Faucett learned about refrigeration through a mail-order correspondence course and received his certificate of completion in 1934 from Siebel Institute of Technology in Chicago.

From about 1934 until 1937, Andrew Faucett worked at Modern Ice and Refrigeration in San Jose. Then in 1937, he opened Centerville Independent Ice Company to manufacture ice. (Centerville is now known as Fremont.) Around 1954, Mr. Faucett opened Reliance Cold Storage in Stockton diagonally across from the Tillie Lewis Plant. Ms. Lewis sold him the land and wanted assurances of cold storage for ten years.

Today, Don Faucett operates Reliance Cold Storage at Fresno and Navy Drive in Stockton. Don said his father never worked icing cars but manufactured and supplied ice. He said, “shooting ice into the cars was labor intensive and hard work. But then, at that time everything was labor intensive.”

Mrs. Mary Leer, Gift Shop Manager at the San Joaquin County Museum, relates the labor intensive aspect of icing cars told to her by her husband, Emil Leer. As a young man of 18 or 19, Emil worked for Union Ice, icing railroad refrigerator cars during the summer of 1938 or 1939 prior to entering the military. He told her of a period of intense activity when he went four days without sleep because “the work had to be done.” Possibly he and the other ice men rested and dozed between icings, but they never left the work site or went to bed.

Each person who played a role -- the inventor, investor, designer, dispatcher, builder, producer, worker, or ice man -- is an important part of the history of those interesting, fascinating, and glamorous railroad refrigerator cars.

Decorated with colorful signs, lettering, and slogans -- the refrigerator car was the most glamorous freight car in America.

Photo courtesy of San Joaquin Historical Society Museum

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Notes


3 White, p. 278.

4 White, p. 271.


6 Henry, p. 318.


8 White, The Great Yellow Fleet, p. 145.

9 Stover, p. 214.

10 White, The Great Yellow Fleet, p. 11.


The Author

Iowa-native Linda Danes-Wingett, raised on a farm which had been in the family for over 100 years, attended rural Oak Springs School, the same one-room school her father and paternal grandmother attended. Upon graduating from Bloomfield High School in Iowa, she moved to California and began a 34-year secretarial career working for various levels of government. After retiring in 1991, she obtained her B.A. in history from CSU, Stanislaus, in 1993. The mother of two step-children, Linda is married to Mel Wingett, a San Joaquin County Historical Society & Museum Board of Trustees’ member.

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Hidden Treasure, that's what you will find in the Museum Gift Shop. Our gift shop volunteers and staff are constantly looking for books and collectibles that reinforce the exhibits and programs of your museum and address parts of our county history that are not yet a part of our museum's offerings. Even though our purchasing volume is not as great as major stores, our non-profit museum store status often enables us to secure merchandise that is original and unique and not available elsewhere. Some of the Society's own publications or the work of our volunteers make a unique gift for someone special. You will find the Museum Gift Shop even easier to visit now that the museum has expanded its hours to Wednesday through Sunday from 1:00 to 4:45 p.m. Don’t forget that the profits of our volunteer-operated gift shop directly support the museum and its educational programming.