Knife-noses

The story of the McKeen car — nate E. H. Harriman decided to

IN the early days of the 20th century the standard steam passenger train did not have competition from buses, autos, and jets, but it did have to contend with constantly rising costs and the interurban railways which were springing up everywhere.

With a thought to reducing passenger-train operating costs, Edward H. Harriman, Chairman of the Board of the Union Pacific Railroad, summoned to his elaborate New York office UP Superintendent of Motive Power and Machinery William R. McKeen and told him to work out a practical rail car powered by an internal combustion engine.

The idea of a rail car was not new in 1904 because ever since the railroads had begun, the desire for a self-propelled car which could carry passengers had been in the minds of railway designers. The propulsion problem, however, always stymied their efforts. Steam, compressed air, storage-battery-driven motors, and internal combustion engines had been tried, but all had proved unsuccessful owing mainly to the lack of a good transmission.

Two alternatives in transmission were possible: a mechanical drive or an electrical drive. The former was in use in automobiles, while the latter, for the most part, was applied to straight electrical railway locomotives.

McKeen returned to Omaha and put a group of his best designers and mechanical engineers on the job of producing an experimental car. In 1904 such an undertaking was a real job because virtually no railroad man, including McKeen, really knew a muffler from a spark plug — particularly in the motive power department of a line using 2000 steam locomotives!

Whenever additional help was needed men were taken off routine UP jobs and assigned to the project. It was well known by other top officials that Harriman had personally given McKeen the high sign, and no thinking person would dare question

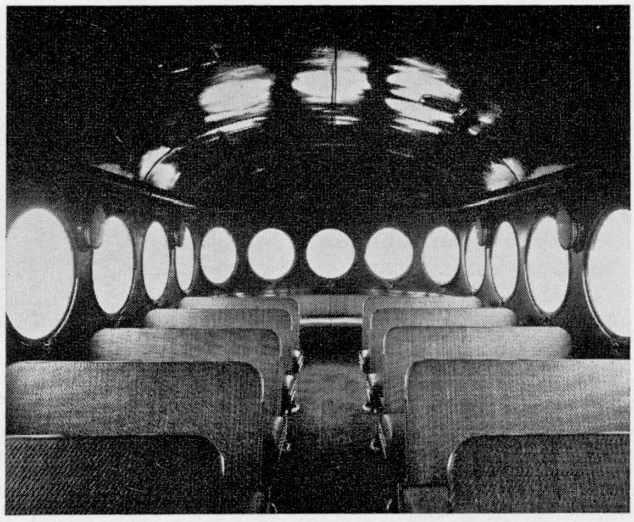
ORIGINAL McKeen car of 1905 featured what developed to be wrong-way streamlining, and an automatic streetcar-type rear door.

WILLIAM W. KRATVILLE

photography / AUTHOR'S COLLECTION

and portholes

or what happened when rail mag- cut local passenger-train expenses



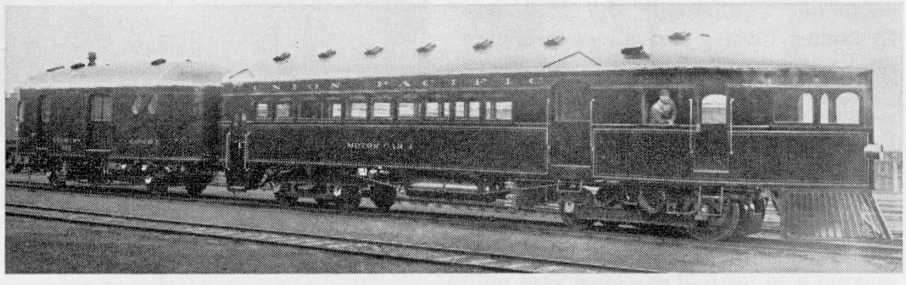
PORTHOLES and indirect lighting in interior of the M-8.

even the craziest procedure McKeen might devise.

McKeen tackled the assignment with gusto. He believed the car had to be a new design from the rail up rather than just a collection of former ideas. His first step was to personally draw the preliminary body design as he doodled at his desk.

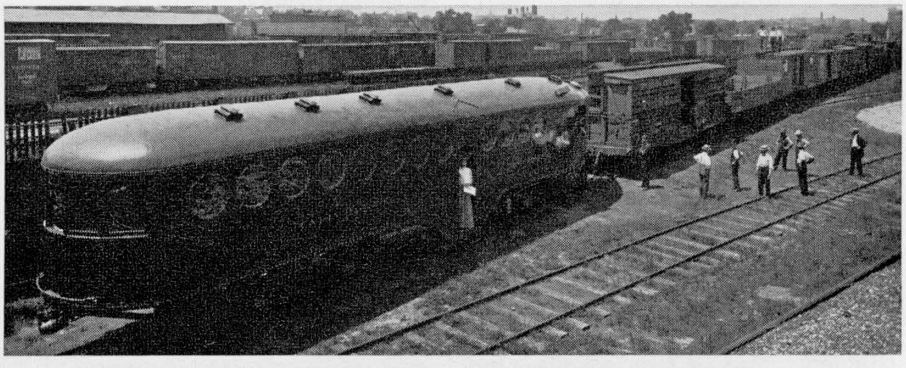
McKeen was famous for solving his own problems with his own ideas. Once he got an idea he carried it out, good or bad. McKeen's air-flow design was revolutionary in railroading. The prow of his car was torpedo-shaped and the rear was rounded. His thought was that the car would "knife through the air currents rather than butting through like a conventional-design car."

Science later proved McKeen's the-

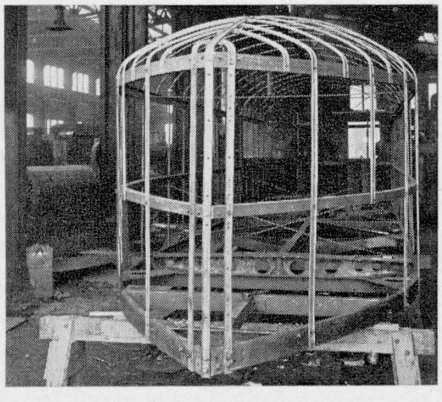


M-4 OF 1906 hauled a vest-pocket trailer for carriage of mail, express, and baggage.

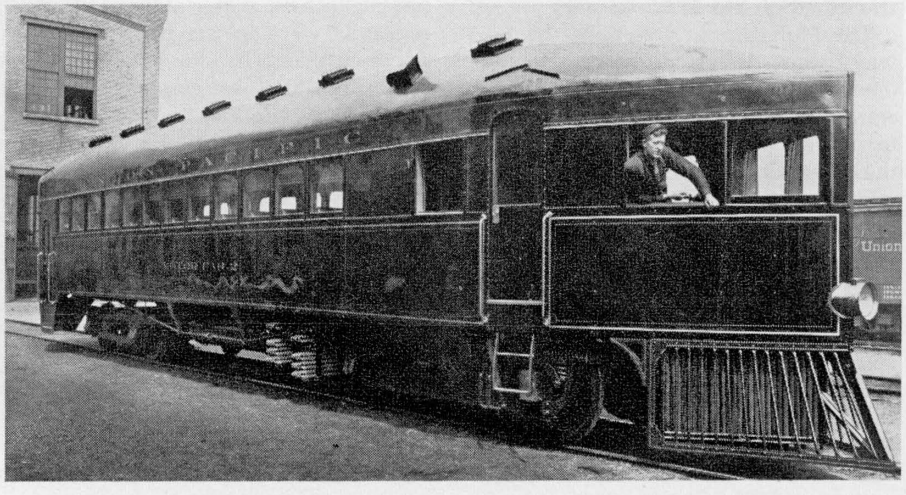
To begin with . . .



MC KEEN (far right) watches his M-10 lug 10 freight cars in test at Omaha in 1908.



↗M-2 under construction at Omaha and→ as she looked when completed in 1905.



ory was in reverse. In fact, the first streamliner, built by Pullman for the Union Pacific some 30 years later, employed the round nose and tapered tail.

The body design made the side of the car assist the floor beams in strengthening the entire car, thus creating a composite girder design. All doors and windows were subordinated to the strength requirements of the body. This design, particularly in those models which followed the M-1, was called the best ever built in the United States and was supposedly "impossible to telescope or crush." Photos show that in a head-on collision of two cars running a total of 80 miles an hour only the fronts were smashed and there was no derailing or damage to the motors.

The M-1 was lower than standard passenger equipment; the M-2 was 15 inches lower; and all cars beginning with the M-7 were 2 feet lower than standard.

The M-1 was assembled in the north end of the erecting shop at Omaha. The body was built in the car shop and the strange-looking forgings, unlike any steam locomotive part, came from the blacksmith's. A rope barricade was thrown around the area, and only a privileged few were allowed inside it. The popular pastime during lunch periods in the winter of 1904-1905 was gawking at the proceedings inside the roped-off area. Many bets were placed as to just what was being built.

Finally in January the motor arrived by box car. Gingerly it was lifted out by the overhead crane, even before the shop goat could back out of the shop. Official photos were taken before and after the motor was installed, and as was customary with the bold McKeen, press releases written in glowing terms were distributed. This flair for attention and publicity has led to many conflicting accounts in periodicals of the time concerning performance and sales standings of the McKeen cars.

The McKeen car was novel in more ways than design of body. Its door opened by foot treadle — as on streetcars — to reduce the need for a man to operate the door. A cylinder kept the door closed while the car was in motion, and air from the brake cylinder operated the trap.

The air system, too, was of new design. The fresh air was inducted at the front of the car and exhausted through Cottier ventilators on the roof. The complete air change cycle took only 4 minutes.

Manifold heaters were installed on the first cars, but later Baker heating units were applied to all McKeen equipment. The M-1 had ⅛-inch copper jackets for water storage. Radiating coils were in the passenger compartment, and in the summer water was circulated to condensers under the floor of the car.

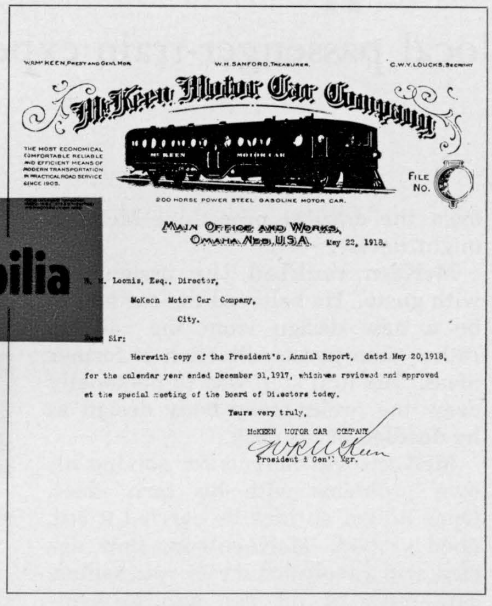
The interior lighting system was also unique. McKeen was ahead of his time in designing oval light containers with opalescent faces which gave bright but indirect lighting. One unit was installed between each window and most cars had about 20 lighting units. The first systems burned acetylene gas generated in Adlake generators and stored in tanks under the car. Several disastrous fires resulted from the use of gas, but no injuries were ever reported.

The little M-1 came from the shop sparkling in a rich maroon enamel body and jet black trucks. The lettering was silver lead, which soon was changed to gold. From this gaudy combination of colors came the moniker "Red Flash" for the McKeen cars.

Despite all of McKeen's innovations of body design, his lasting fame came from his introduction of the internal combustion engine to regular, practical railroad service. Gasoline engines had been tried on maintenance equipment before 1905, and the neighboring Burlington had an inspection car powered by a four-cylinder Fairbanks-Morse engine. The car was built in the Q's Havelock (Nebr.)

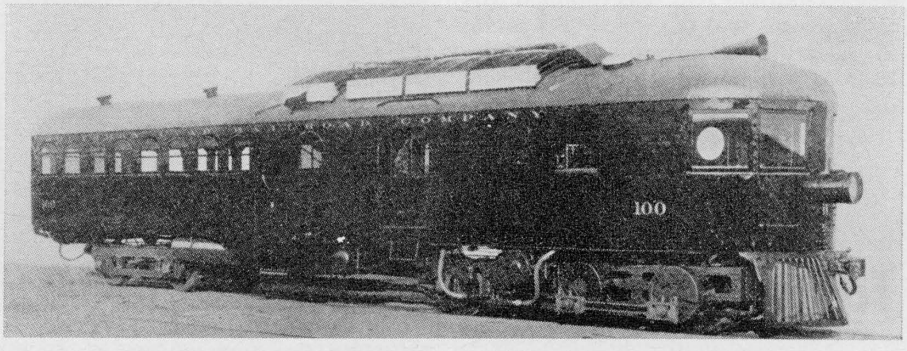
INVENTOR of the McKeen car rides the rear footboard of an 0-4-0 industrial switcher of 1909 which proved a drug on the market.

McKeen memorabilia



PIONEER PUBLICIST McKeen did not hesitate to exploit even letterheads for promotion of his knife-nose cars.

BIGGEST car built by McKeen labored on 4.92 per cent grade of Southern Utah, weighed 45 tons.



right in the middle of the red-light district. As the diminutive car struggled daily up the grade, the local females would gesture and poke fun at the crew, tempting them. "We never broke down though," recalls Beard.

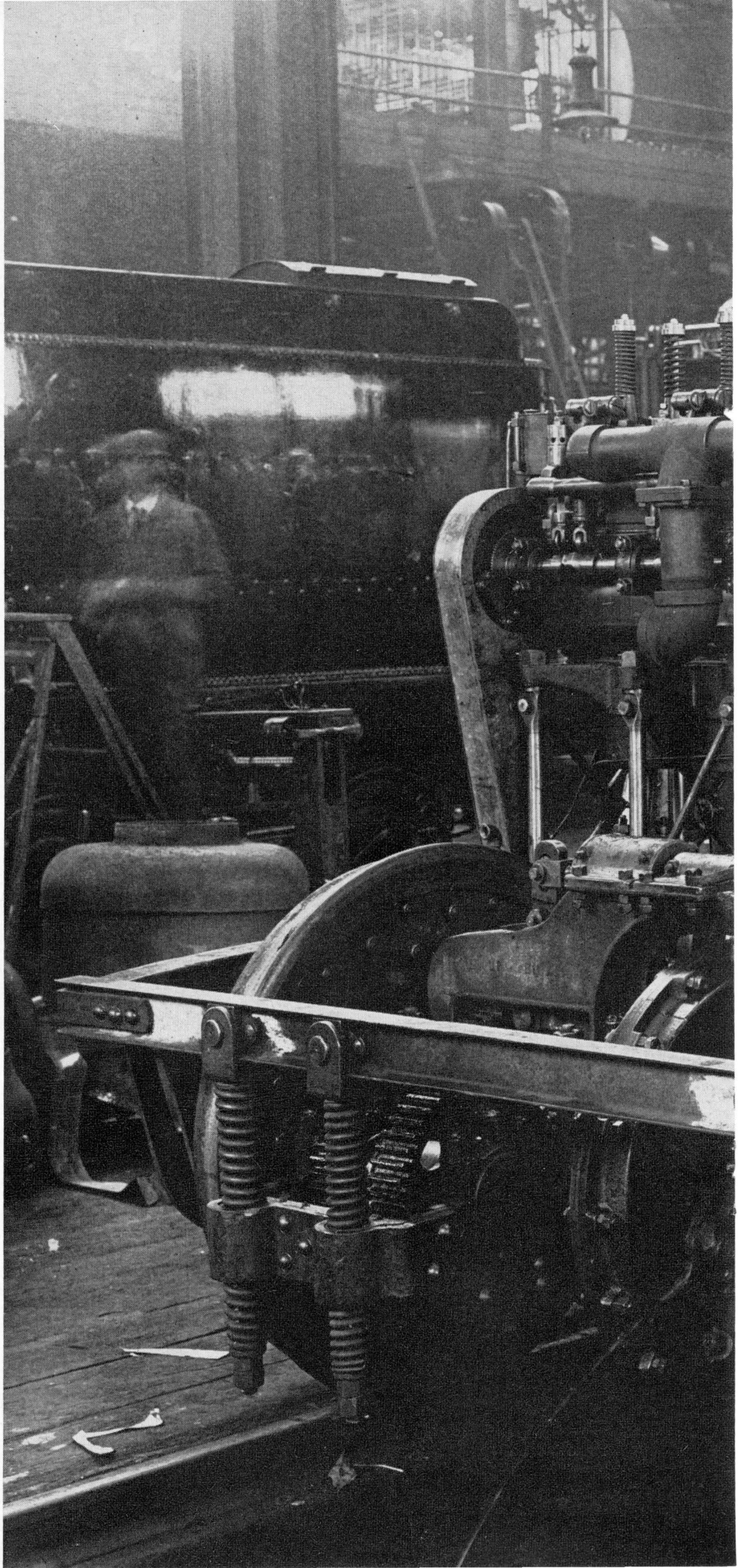
On August 21 the car returned to the cornfields and established the first internal combustion regular passenger service in the nation between Kearney and Callaway, Nebr. The first publicity trip was arranged by the road's advertising agent, Alfred Darlow, and the press and members of the Omaha Chamber of Commerce were guests. The trip was without trouble, and comments were made about the "dependability of the motor." But the trip was just a cover-up for the million and one tricks the engine had up its sleeve for the daily runs.

No sooner had the car started its regular chores than it began acting up. The valve box gaskets blew out, motor stanchions snapped in two, the cooling and heating system clogged easily, and the clutch slipped incessantly. Not to be outdone, the carburetor needed constant adjusting. The Morse chain would easily slip off or break, the intake valves would stick or the pipes clog, the gearshift would foul — and the bearings always ran hot.

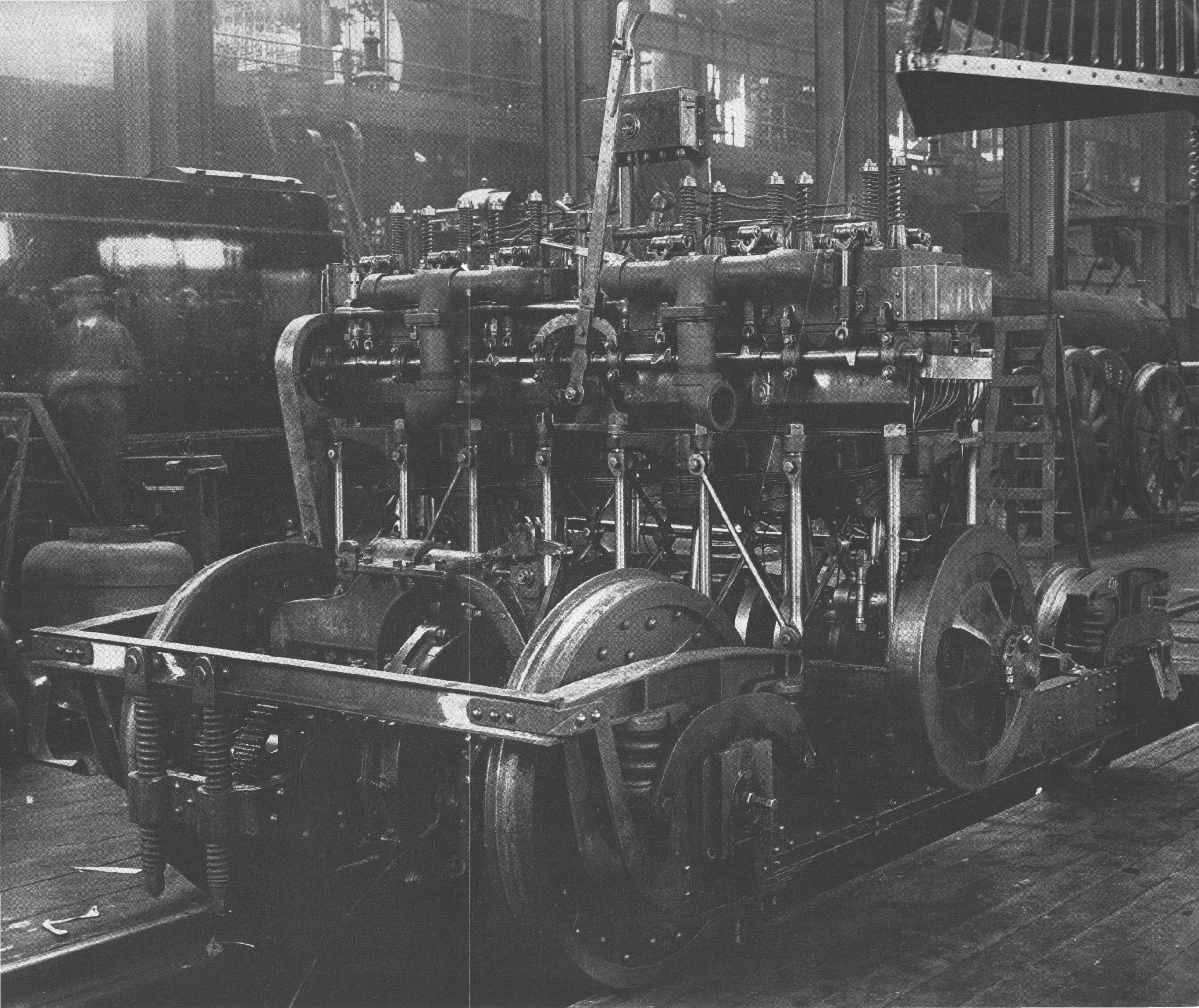
A steam locomotive engineer on a swift Atlantic or Pacific might roll along merrily without soiling his overalls, but the motorman on the first McKeen cars always looked as if he had just crawled through a load of machine shop oil and scrapings by the end of a run. Therefore the crews shied away from signing up for running the cars until they were better perfected. There was also some antagonism concerning the fact that the cars employed only a motorman and a conductor instead of a full crew.

The car's lubrication system was not what it should have been either, and the babbitt on the connecting rod bearing was continually burning out. To make repairs, the motorman would have to slip into the cramped area under the car between the motor and gas tank and prod through a sticky mass of smashed grasshoppers and oil drippings. In the winter he had to tunnel his way through the snow.

In the extreme cold the car was hard to start. If it failed to start before the air supply was exhausted, the car was cranked by hand. If this failed, a locomotive was brought in to shove the car around the yard until it started with the clutch in.



RARE VIEW in Omaha Shops of the guts of a McKeen power truck with 200 h.p. engine. The power plant was reversed by means of a lever on the sliding cam shaft!



McKeen memories

I THE ERA of the McKeen cars produced a good number of light moments — and occasionally dark ones too.

¶One evening at Lodi, Nebr., a drunk, bellowing out his sentiments of the UP management, crawled under a McKeen trailer and violently fought efforts to drag him out. Three men battled it out until he was finally removed.

¶Twice the sharp prows of the cars knifed through roundhouse walls when overzealous hostlers didn't get their charges stopped in time.

¶Around 1918 various mail-catching tests were made on the Lane Cutoff out of Omaha. They were called off when a fatal accident occurred.

¶McKeen scored a first in public relations on July 30, 1910, when he induced UP officials to open wide the gates of the Omaha Shops, including the McKeen works, to the citizens of the twin cities of Omaha and Council Bluffs. The doors were open that muggy Sunday from 9 a.m. to 9 p.m. Guides were assigned to answer questions, and a band concert was the highlight of the day. A steady stream of people flocked to the shops and the management glowed with pride. The shop workers, however, had another slant on the affair and resentfully complained about the "social refinement" they were forced to bear.

¶The crowning moment of branchline tomfoolery came on a Nebraska line. A conductor had become adept at helping pretty ladies aboard. One day he helped too much and the damsel delivered a brisk clout to the head of the conductor with her parasol! I

One bright motorman at Callaway decided to try "horsepower" in the form of a brace of mules to lug the car around the wye and head it downgrade to start. But the car rolled away on the grade, bumping one mule hard aft. Thus ended the scheme.

When valve box gaskets failed they let water into the cylinders, causing the water pump to fail and the motor to overheat, which prematurely exploded the gas, which in turn caused the motor to ring out an anvil chorus.

It was on the Callaway run that the cars (and the following gas-electric cars) acquired the nickname of "bug." As the M-1 rolled into the Kearney yard on the first trip a switchman glanced at the car and exclaimed, "Look at that potato bug." In more dignified circles the term "McKeens" was used to refer to the cars.

The M-1 created as much attention in its day as did the streamliners of later years. Indeed, the cars were a novelty and indicated that great things were in store for railroading. The Omaha *Illustrated Bee* even predicted that the gas motor "would supplant the locomotive." McKeen boasted that the "future use of the cars will be enormous."

BUT BEFORE the M-1's wheels were getting hot McKeen was off to bigger and better cars. The M-2, dubbed the "battleship" by crews, was a double-truck, 55-foot, 55,000-pound hulk of steel. The heavier weight was due to the fact that certain parts were unavailable and substitutions had been made. The new body weighed half as much as standard equipment but was 25 per cent stronger. The car, which seated 57 persons, came out of the Omaha Shops in September 1905.

Mechanically, the M-2 was superior to the first car in that it had an air-operated clutch for its 100 h.p. engine which saved the motorman the risk of having his arm broken by flying levers. This accident could occur with the old hand-operated clutch.

In early fall a 3-inch pipe was run from the exhaust pipe to under the seats for heating. The invention lasted only a few miles before back pressure created by the pipe stopped the engine and the heater had to be disconnected.

The car made a round trip to Valley from Omaha at regular passenger-train speed on April 4, 1906, and it ran up the stiff eastbound Elkhorn grade "excellently."

On April 14 and 15, running as Second 1 (the *Overland Limited*) the car gained on the first section between Waterloo and Fremont, Nebr., but constantly lost time beyond because of meets and a heavy head wind. The trip to Grand Island was made at an average of 43.8 mph, and the return at 36.3 mph — including a delay for a hot bearing. Speed reached a maximum of 53 mph between two stations and an average of 42 mph for 20 miles. Not a bad record for a marine engine which attained only 25 mph in a yacht!

The trailing truck was designed by McKeen himself, and it embodied the best features of streetcar, locomotive, and Pullman trucks. The springs were the most important item developed. They were elliptical and were designed to avoid "teetering." They did their job so well that many Harriman Lines passenger cars were equipped with similar trucks. Their weakness was hot bearings, and many delays were attributed to this failure.

No notable changes were made in cars M-3 through M-6. All these models resembled the M-2, and they were assigned to various locations for tests. The M-3 left Omaha in November 1905 to work between Houston and Galveston, Tex., on the Southern Pacific. The M-4 was tried briefly on the Alton out of Bloomington, Ill., then worked the Kearney branch of UP. Later it was sent to Oregon Railroad & Navigation at Portland. The M-5 went to Los Angeles & Salt Lake in January 1908 to work out of Los Angeles on LA&SL and on the Southern Pacific, and tests were even made on the Pacific Electric. The M-6 ran round Omaha for a time, then was assigned to the Leavenworth-Lawrence (Kans.) run on the St. Joseph & Grand Island. M-6 replaced a four-car steam train after the addition of a small 4-wheel trailer which carried the baggage and express.

Operating statistics showed that this group of McKeen cars operated at 40 mph at minimum cost "hour after hour." Repairs were tabbed at 3 to 5 cents per mile, and the cars were dependable enough to remain away from shoppings six to nine months. McKeen claimed that all the cars were faster and had "better hill power and endurance than anticipated."

The M-7 was the first center-door car and was built in 1906. To obtain the strongest body possible, McKeen installed round windows 22 inches in diameter which resembled those of a ship but were 2 inches wider. The depressed entrance enabled passengers to entrain without using the traditional porter's step. Car length was increased to 70 feet to provide space for baggage or mail in cars without trailers.

The frame was built up from I beams. The body bolsters were cast malleable iron. Three- and 4-inch channel steel 2 inches thick made up the upper frame; side sheeting was

⅛-inch steel. Fuel tanks were of 120-gallon capacity located beside the rear frame bolster and protected by a side shelf so that there was little chance of puncture. The tanks were built to withstand 500 psi, but operating pressure was only 3 pounds and if it reached 5 pounds the fuel escaped into another tank which had only the filler hole.

The round windows eliminated most of the dust problem. In good weather the windows were opened upward and clamp-locked. But they had one bad feature: occasionally they would loosen and come banging down on the head of some unsuspecting passenger.

Because the motor on McKeen cars was mounted transversely on the front truck which in turn was mounted in an opening in the floor so the whole truck and motor could swivel, noise was louder than on later gas-electric cars which had no floor opening. Also, the exhaust pipe ran under the car to the rear. Later this was run up the rear of the car so that it would exhaust above the trailer cars; still later it was run straight above the motor to the roof.

When the M-8 was built it resembled the other cars, but it soon became the darling of the McKeen household — because it had the first gas engine designed and built by the boss himself. The 200 h.p. engine closely resembled the marine engines but employed a McKeen carburetor which was more economical. The car consumed an average of ⅓ gallon of gasoline per mile on level track and had greatly improved flexibility in engine control and increased power at lower speeds.

The new drive was identical to that on other cars except that it had specially cast steel gears instead of bronze gears. The air brakes were the straight type operating from tanks of 100 to 150 psi capacity. The cars braked on all wheels.

The gear ratio of the McKeen drive was 4:1, and the gear was 96 per cent efficient. Because of rough usage, all parts were made with large wearing surfaces. Low or high speed was attained by throwing in the clutch and giving either of two gear combinations. The heavy tractive effort combination was designed for starting or high speed. The low tractive effort was used for running. All speed combinations were controlled by the throttle and spark. All the motorman had to do was "to look at the indicator to know which lever to move." The low speed gave full engine power at 10 to 15 mph and the high speed gave full power at 60 to 70 mph.

To reverse the car, air was admitted into three cylinders on one side of the motor block. After the valve cams changed for running in the opposite direction, the gas was fed in until all cylinders were obtaining fuel and the car jerked off in the other direction. While this process was being completed, the car rolled freely along.

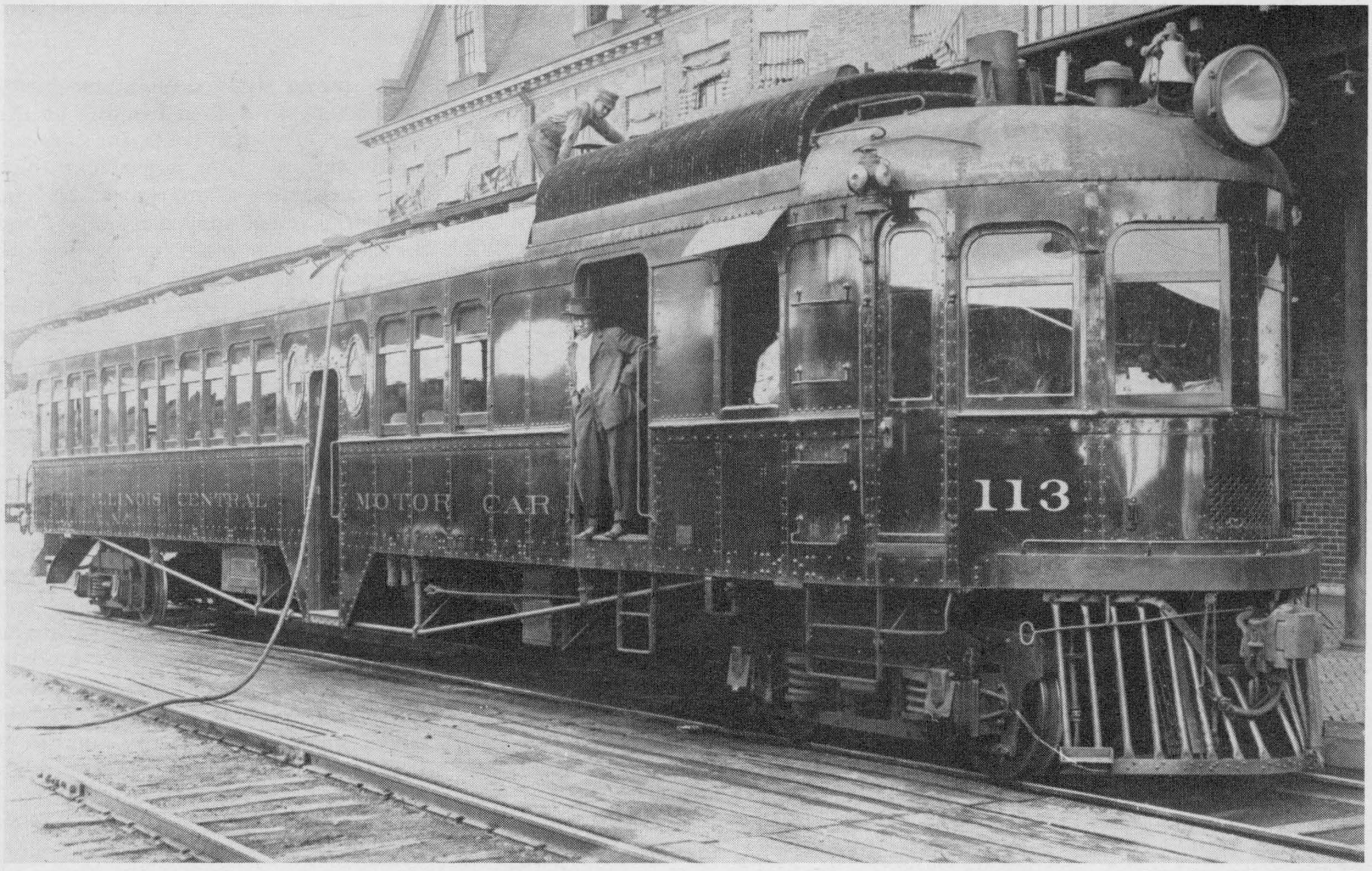
The big innovation on the M-8 was the motor, but newly designed rubber window gaskets eliminated some loose fitting present on the previous car.

The competition

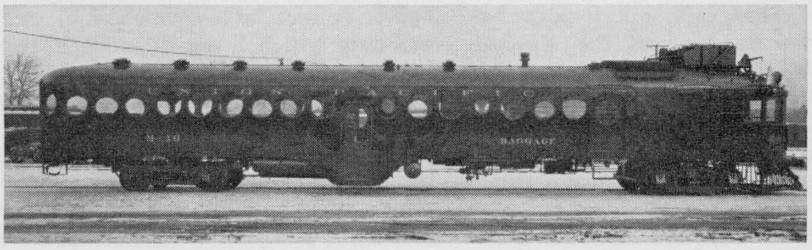
THROUGHOUT the years between 1905 and 1908 McKeen was more interested in perfecting than in producing. In late 1907 he discussed the idea of forming a separate company and even "humbly" proposed to head it. When plans were almost complete for forming the company, the M-7 was sent on a western trip, then to New York via the North Western and the Erie.

Harriman arranged a big reception by leading railroad and banking personalities and then held a swank banquet. The centerpiece on the table was

IC NO. 113 was typical of the GE cars which, more than any other make, spelled finis for McKeen's mechanical transmission car. GE turned out its first gas-electric for Delaware & Hudson in 1906. Nose of 113 smacked of McKeen styling, however.



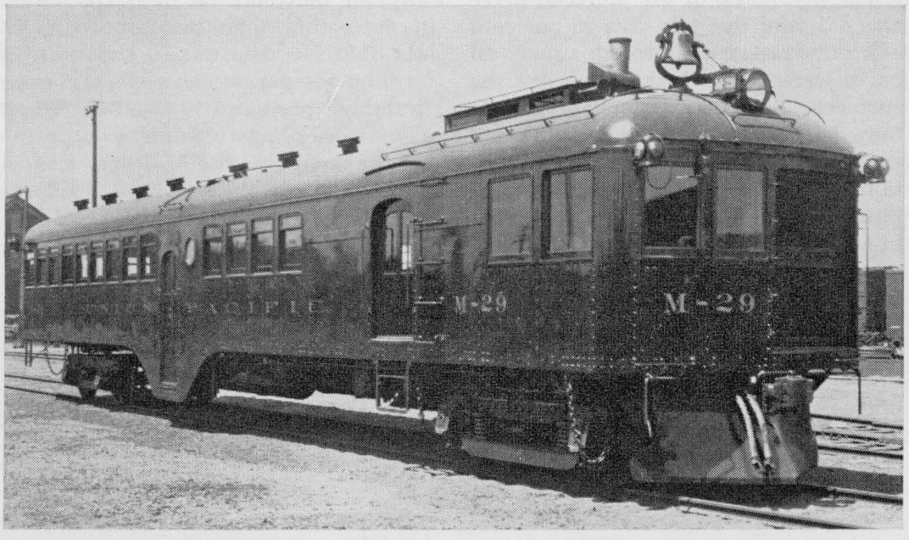
Collection of C. W. Witbeck.

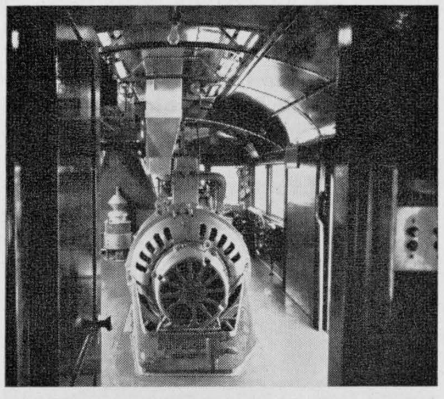


FRONT TRUCK was main external difference when M-16 was rebuilt in 1926.

LOUNGE END of McKeen in 1935—surely the plushiest branch-line ride in all of Union Pacific history.

Modified McKeens





←**REBUILT McKeen M-29** in July 1927 omitted knife-nose and portholes, incorporated 300 h.p. Hall-Scott gasoline engine↗ and, of course, electric transmission.

an electric-powered scale model of the M-7. This created so much attention that the only way Harriman could get the big shots to eat was to shut off the train. (The model is now in the Union Pacific Historical Museum at Omaha.) Throughout the crew's stay they were wined and dined and shown the town by Harriman. After the M-7's triumphant return to Omaha from the big city, it worked the Loup City (Nebr.) branch.

The tests of cars on various lines proved successful, and with Harriman's urging the Espee placed a large order. Added to the UP's own large order, this assured the success of the company. With a bundle of preliminary orders and great hopes, McKeen resigned his $10,000 a year job with UP and became president of the McKeen Motor Car Company on July 1, 1908. The certificate of incorporation was issued in Nebraska on August 3 with an authorized capital stock of 1 million dollars divided into shares of 100 dollars par value each.

Frank Jumper, from the UP, was appointed sales manager and about 50 employees were hired, mostly from the UP Omaha Shops. Generally, the new company offered higher wages and the future looked "very good."

The new company leased an old car shop building at the north end of the Omaha Shops. By arrangement UP made whatever parts McKeen couldn't furnish, except for electrical items which were purchased wherever possible in those early days of the gas engine.

In 1910 Victorian Railways of Australia ordered two cars of 5'3" gauge. Clarence Beard assembled the cars from regular bodies and parts in the Omaha plant. He rebuilt a truck frame to the wider gauge and mounted a standard 200 h.p. motor on it. Then the car was knocked down and the body was shipped in one crate, the motor in another. Beard went along as personal messenger.

The first narrow-gauge cars were built in 1912 and were sold to the Queensland Government Railways. These six cars were similar to the M-10 passenger type and also were converts from regular McKeen cars. They were shipped in many boxes each, again with Beard acting as the deliverer. Over handrails, the cars actually were 9 inches wider than their standard-gauge counterparts. In true English practice, they had buffers and the motorman's seat was on the left.

Among the roads which used McKeen cars on lease or purchased them were the North Western, Santa Fe, Erie, Southern Pacific, St. Joseph & Grand Island, Oregon Short Line, Los Angeles & Salt Lake, Texas & New Orleans, Silver Peak, and Norfolk & Southern. Also represented on the sales charts were the Hocking Valley, the Alton, Chicago Great Western, Illinois Central, and Virginia & Truckee. Foreign use extended to Canada, Cuba, Mexico, Spain, and Australia. All cars were standard gauge except the Australian models.

Norfolk & Southern had the only known Jim Crow car. The 70-foot model was delivered in the summer of 1909 and had a 10-person compartment for colored passengers. The mail compartment was probably one of the smallest ever designed — 7 feet long.

In an attempt to widen his line, McKeen delved into a heavy parts business which finally gave way to automotive parts supply houses. In 1909 he built and tested a weedburner and tried an experimental industrial 0-4-0 switcher, both of which were failures on the market.

Probably the proudest moment for McKeen during the company era came when a new railroad, the Minnesota & Northern, ordered every unit of power from him. Included were a wooden box-cab motor unit of 200 h.p. which resembled a caboose, and two 55-foot passenger cars. Practically the only source of income for the line was hauling supplies to a new Mississippi River dam near Minneapolis.

The biggest McKeen car ever built was the 100 for the Southern Utah Railway. This Mallet actually had two driving axles, connected by outside rods. The motor was a standard 300 h.p. engine connected by chain drive to 42-inch drivers, which were standard on McKeen cars. The other wheels were the regular 33-inch type. The truck had standard steam locomotive equalizers and the motor was designed to operate on low specific gravity fuels so that it could be started on gas and run on distillate. To use the latter fuel, a specially designed Duff carburetor on each cylinder was employed.

The 100 could start on the heaviest of grades with ease. The car was ordered to replace steam trains between Price and Hiawatha, Utah, 18 miles of sharp curves and 4.92 per cent grades. A notable feature of the biggest McKeen was the multiple braking equipment for the steep grades. Besides the automatic air brakes, two hand brakes were installed. One worked in conjunction with the air and the other was an independent brake. The 58-foot car tipped the scales at 91,000 pounds.

Around 1913 McKeen decided to build larger and more powerful cars to more effectively compete with standard trains. The preliminary move in this direction had been the use of the 31-foot trailers, but the new idea was to have bigger trailers and more power to pull them. A 300 h.p. standard motor was designed and built with six cylinders but with a 2-inch larger diameter.

The large trailers were 50 feet long with center doors and round windows front and rear. On some of these — and on the smaller cars too — McKeen installed a revolutionary item: the ball bearing. They were made by the Hyatt Company and were reported to be the first ball bearings in regular railroad use.

The new cars were mostly mail-baggage-express cars; only a few were passenger models. But even the new cars did not stem the tide of the GE gas-electric car and transmission. McKeen's orders were falling off.

As World War I boomed upon the scene, the demise of the McKeen mechanical transmission was evident to all except McKeen himself. His notable competitor, General Electric, was making the sales everywhere but on McKeen's doorstep.

Tests proved the McKeen cars were slower than electrical transmission cars for the first 50 feet but then would jerk away at greater speed than the other for the next 250 feet.

Besides having the obvious advantage of unlimited gearing combinations, the gas-electric's motor was mounted inside the car on the body and was not subjected to the shock from switch points and rail joints which the McKeen car motor received. And there was plenty of shock on a McKeen. One time a car was being towed behind a freight and the McKeen began bouncing all over the track. The conductor left the passengers to bounce for themselves and sought safety in the caboose.

By 1920 sales were nil and debt was mounting. The Union Pacific bought out McKeen's interest, paid the debts, and closed the doors on a great era.

But the day of usefulness was not over for the cars on the UP. Carl R. Gray took control of the road in the mid-'20's and sent Beard to Erie, Pa., to contract for a 180 h.p. Sterling engine and a General Electric truck which were shipped to Omaha and installed on the M-11.

Following the success of this car others were converted from time to time until most were gas-electric cars. Some had their front and rear ends squared off; some were coupled to regular trailers from other makes of gas-electrics then on the road; some had sheet metal pilots installed for looks and snowplowing. In 1935 the M-23 and M-24 and trailers even received a yellow and leaf brown color scheme to match the streamliners.

Two old decaying McKeen bodies in the Omaha Shops scrap pile were dusted off in 1927, and with new front and rear ends and 300 h.p. Hall-Scott engines from San Francisco became the M-29 and M-30. These were among the last cars cut up in the late 1950's.

If McKeen had been around the UP when it converted to gas-electrics his heart probably would have been broken, for he upheld in his most stubborn manner, regardless of tests or the opinions of other engineers, that his drive was the best. ■

McKeen the man

■ WILLIAM R. MC KEEN was a remarkable man in many ways. He was accustomed to money throughout his life and always held well-paying jobs. Although no accurate records remain of the McKeen Company, those close to him estimated that he made a fabulous sum from the McKeen cars and lost nothing when the firm went broke because UP paid the debts.

McKeen, the son of a wealthy Indiana banker, was graduated from Rose Polytechnic and the University of Berlin. He soon found himself in a good position in the railroad world, and by June 1902 he had been appointed to the top UP mechanical position.

The genius was a sporty dresser, and most photographs show him in a striped shirt and tie and dark suit. Always present was a big cigar protruding through the flaming red beard.

McKeen was strong-willed and boastful. Oblivious to the thoughts of anyone, he boldly posed his girl friend in many of the publicity photos of the cars. The walls of his Omaha office in the UP headquarters building were adorned with as many pretty girls and Egyptian dancers as locomotives.

Frequently, and violently, McKeen clashed with his employees, but he knew he needed their talents and retained them. After the company folded he retired from the railroad scene except for occasional visits to Omaha. He made his home on an estate in California and died there in October 1946.

Many have wondered through the years why McKeen, despite his brilliant railroad career, did not do many of the things he had the opportunity and knowledge to do. He passed up one of the greatest chances of all time when he turned down even a discussion of an idea brought to him by a Mr. Brill of New Jersey: fluid drive. If he had listened to other people all of the streamlined trains of today might well be built in Omaha. ■