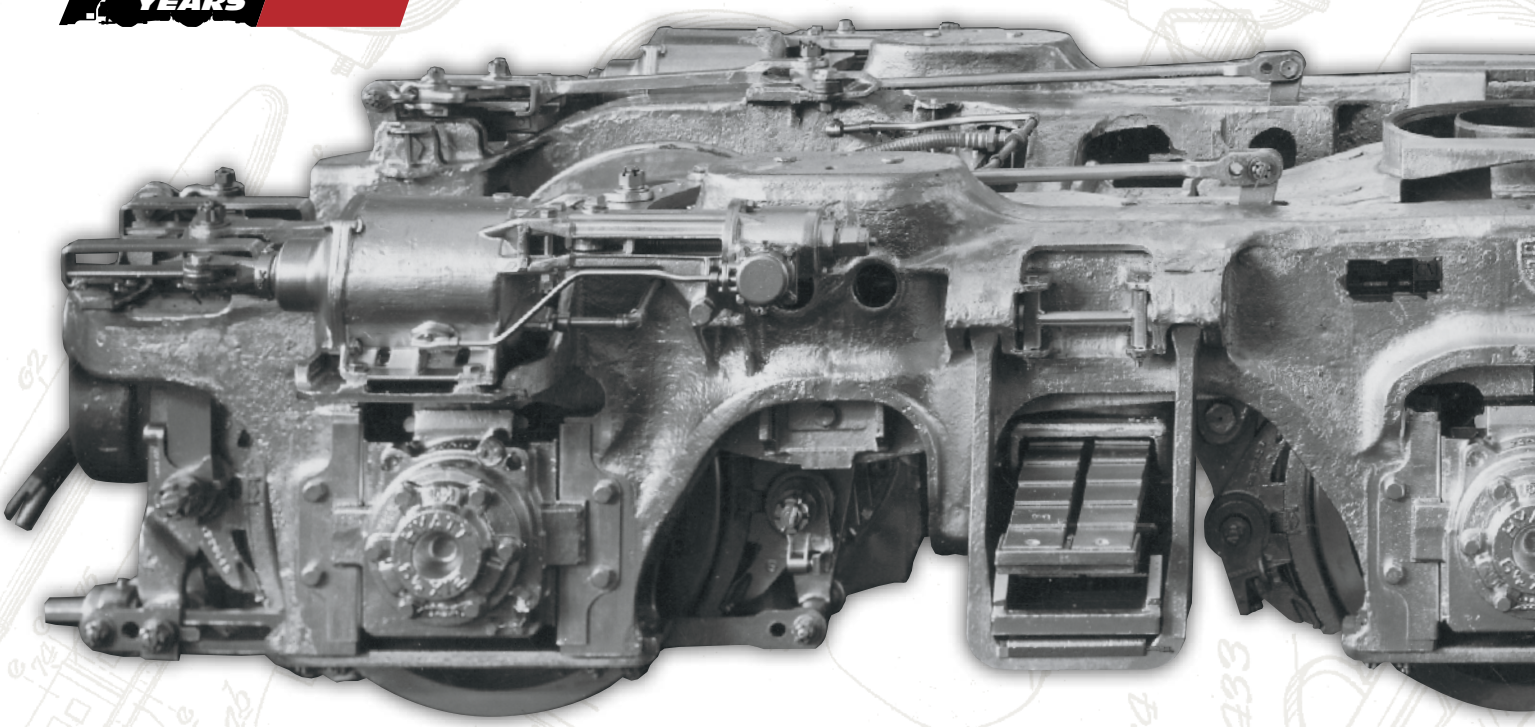
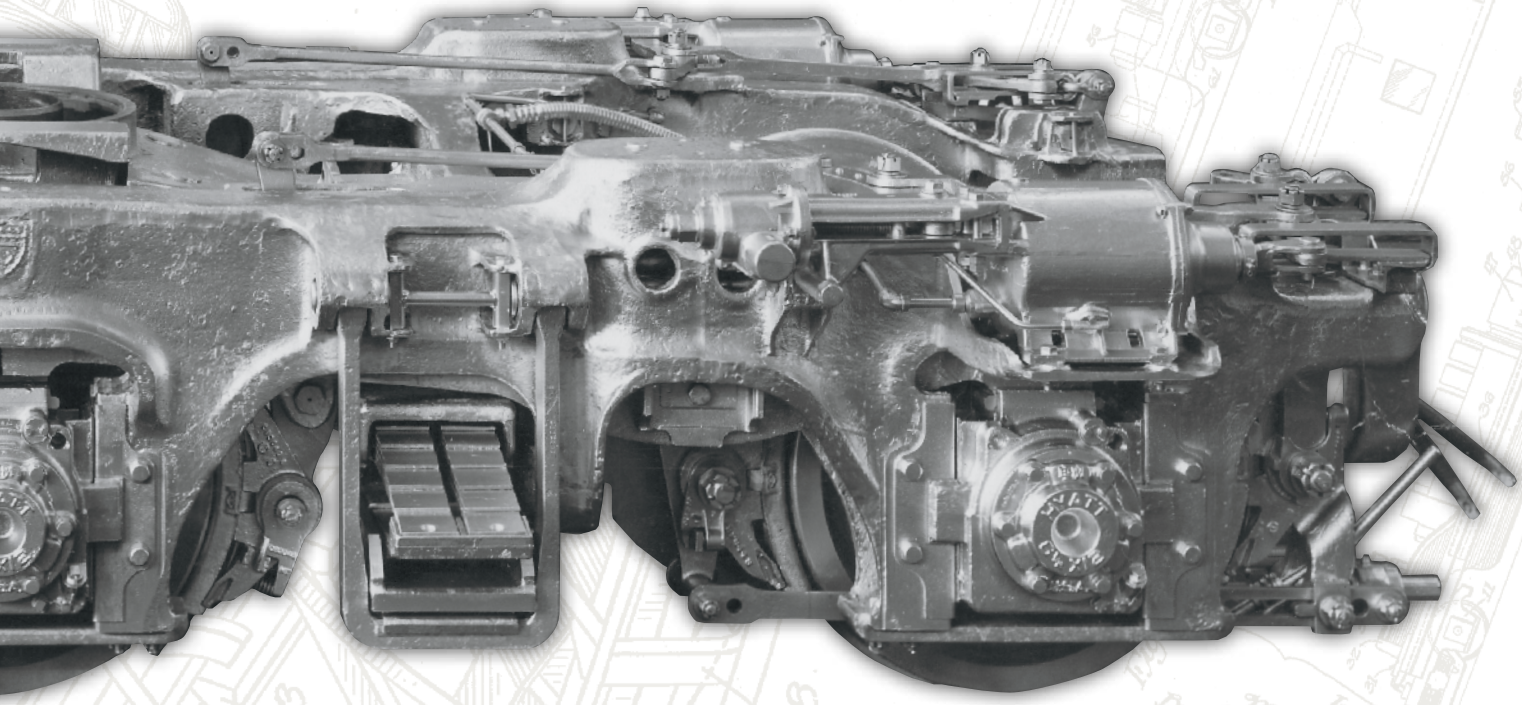


MARTIN BLOMBERG

Streamliner designer

The man known for giving the E unit its wheels made major contributions to streamliner design that are now largely forgotten

By Carl R. Byron



The 14-foot 1-inch wheelbase of Blomberg's three-axle truck gave E units a smooth ride; its two-axle variant is still applied to new diesels.
Above and opposite, EMD

From spring 1934 until the beginning of World War II, new and generally diesel-powered streamlined trains were introduced with great abandon across America. Architectural and industrial designers of the Streamline and Moderne schools such as Paul Cret, Henry Dreyfuss, Otto Kuhler, Raymond Loewy, and Walter Teague basked in critical acclaim and financial reward throughout the pre-war period.

Yet there were other men who assisted in siring the streamliners. One of the earliest, most influential, and today virtually forgotten is Martin P. Blomberg.

Not *quite* forgotten, for one of his creations is among the most successful and enduring designs of the diesel age: the Blomberg truck. In its two-axle form, the Blomberg truck has supported more than 25,000 locomotives, from the first FT's of 1939 through today's MP40 commuter haulers. In its initial form it was a three-axle truck, designed for the first E units.

Because the weight of a fully loaded, twin-engine E unit was too great for four axles, designers specified six axles. Since it was feasible only to make electrical transition between two traction motors per engine and generator set, Blomberg designed the truck exclusively for two traction motors, resulting in an A1A configuration, with the traction motors on No. 1 and No. 3 axles. The frame and suspension features of the truck were an adaptation of steam locomotive tender truck design practice. Blomberg's significant deviations from steam tender truck features included the provision of traction motor nose support points on the truck frame, the use of a hollow bolster as a conduit for carrying traction motor cooling air without the need for individual boots between the motors and underframe, and the positioning of air brake cylinders with slack adjusters at the four corners of the truck frame, where they were readily accessible for maintenance.

FROM SWEDEN TO PULLMAN

Born in Sweden in 1888, Blomberg emigrated to Canada in 1912, then came to the U.S. four years later. In 1925 he joined the Pullman Car & Manufacturing Co. in South Chicago, Ill., as a mechanical engineer. He came with experience, having worked at National Steel Car Corp. in Hamilton, Ont. In his new position, Blomberg was responsible for carbody and truck design.

The year 1925 also was a pivotal one for Electro-Motive (EMC). After selling its first products, a handful of gas-electric cars, in 1924, the young company sold 25 of them in 1925. Lacking a manufacturing facility of its own, EMC relied on fellow Cleveland firm Winton Engine Co. for prime movers, General Electric Co. for electrical equipment, and St. Louis Car Co. for carbodies and assembly. Even more important, EMC ended 1925 with the commitment of ex-GE railcar jockey and seat-of-the-pants engineer Richard Dilworth to join the firm as chief engineer. There is no reason to believe Dilworth and Blomberg knew each other in 1925, but that would change—and so would railroad history in the process.

By 1928, Electro-Motive railcars had grown in length, power, and weight to the point that the carbodies and frames had to be more substantial—and there was little more substantial at the time than an 85-ton Pullman sleeper. Accordingly, EMC began subcontracting carbody design and construction to Pullman.

Sometime during 1928 or '29, Martin Blomberg almost certainly was assigned design work on an EMC railcar body. Blomberg also worked on truck design at Pullman, but not on EMC gas-electric power trucks, which were basically

EMC made its first sale, Chicago Great Western gas-electric car M-300 (top), in 1924. Two-unit Santa Fe M-190 of 1932, the ultimate doodlebug, pioneered truck-mounted brake cylinders.

Two photos, Classic Trains coll.

beefed up interurban designs.

In 1930, as the Great Depression bore down on America, the Santa Fe Railway began searching for an internal combustion–powered railcar big enough to haul six or seven cars, yet inexpensive enough that break-even operation could be managed on a few fares. The road turned to EMC—and EMC turned to Pullman-Standard (as the carbuilder was known after its 1930 merger with Standard Steel Car Co.). If EMC Chief Engineer Dilworth and Pullman Assistant Chief Engineer Blomberg had not previously met, they most certainly did on this project.

The Santa Fe project produced in 1932 North America's longest, heaviest, and most powerful "doodlebug," motor-baggage car No. M-190. Unlike its predecessors, the M-190 was not a single carbody on two trucks, but an articulated, three-truck design. Two power trucks supported the engine section and the front of the baggage section, with a third, non-powered truck at the rear. The resulting "super doodlebug" stretched 90 feet and was powered by a 900 h.p., V-12 Winton Model 194 distillate engine.

The M-190 not only introduced articulation, but a new air brake layout as well. Because the space between the trucks of the 22-foot-long power section was occupied by the unit's fuel tank, there was no room for the customary single master brake cylinder. Instead, two small brake cylinders were mounted on each power truck, each cylinder powering two brake shoes. Novel at the time, this arrangement became standard for diesel locomotives.

It appears lost to the ages as to who first actually proposed both the M-190's articulation and brake designs: Dilworth, Blomberg, or Santa Fe Chief Mechanical Engineer Charles T. Ripley. Dilworth is understandably credited with both ideas in the GM-sanctioned *The Dilworth Story* (McGraw-Hill, 1954), but one thing is certain: Neither concept was applied without the approval of the Santa Fe mechanical department.

The lessons learned from Santa Fe M-190 were fresh in the minds of EMC and Pullman engineers in late 1932 when Union Pacific's new chairman, W. Averill Harriman, came calling. UP passenger loads—like everybody else's—continued to drop precipitously, and the road was seeking a new concept to draw people back to its rails. Harriman and UP President Ralph Gray believed that streamlining, Moderne interior design, high speed, and internal combustion power presented the only viable solution. Their insistence overcame Pullman's reluctance to consider streamlined articulated "motor trains."

On May 24, 1933, Pullman inked a contract with the UP for a three-car, internal combustion–powered motor train. In contrast to the M-190 and virtually everything else on American rails, the new train was to be of very lightweight construction, based on a "tubular" structural system, and clad in an aluminum skin. Designated UP No. M-10000, it would be America's first streamliner.

Work began immediately. The design team consisted of Blomberg; Everett E. Adams, UP vice-president for engineering and mechanical standards; William H. Mussey, Pullman-Standard research engineer; and William B. Stout, P-S consultant and president of Stout Engineering Laboratories in Dearborn, Mich.

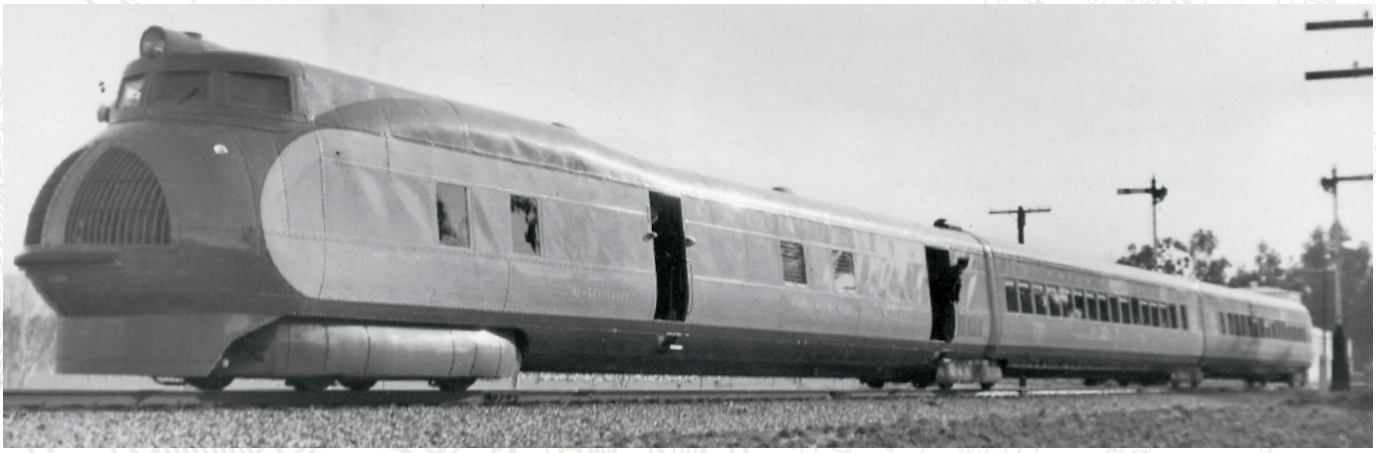
EMC was subcontracted to design and install the propulsion and control package, which consisted principally of a Winton Model 191 V-12, 600 h.p. distillate engine and a GE direct current generator feeding two truck-mounted traction motors. UP apparently planned—or at least initially hoped—to power the train with a Winton diesel engine, as the M-10000 patent application references a "12-cylinder 600 HP diesel engine," but a suitable one was not yet available.

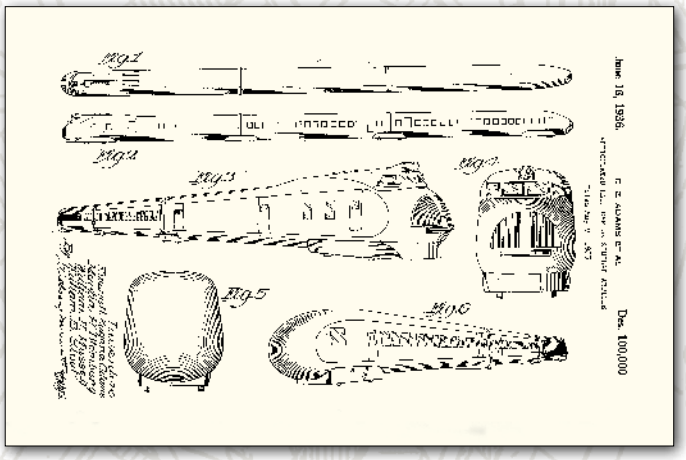
Less than a month later, on June 17, 1933, Burlington Route and the Edward G. Budd Co. of Philadelphia signed a similar contract for a three-car stainless steel streamlined diesel-powered train. Then, on June 30, UP placed a second order with Pullman, this time for an expanded version of the M-10000. This train, No. M-10001, would be a six-car, diesel-powered streamliner complete with dining, lounging, and sleeping facilities.

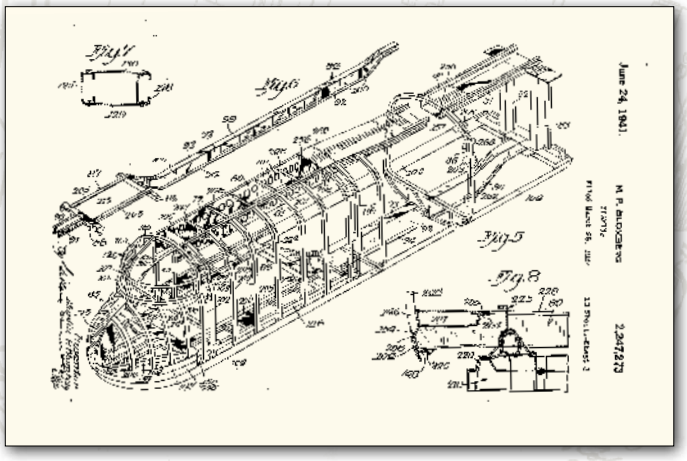
MORE STREAMLINERS

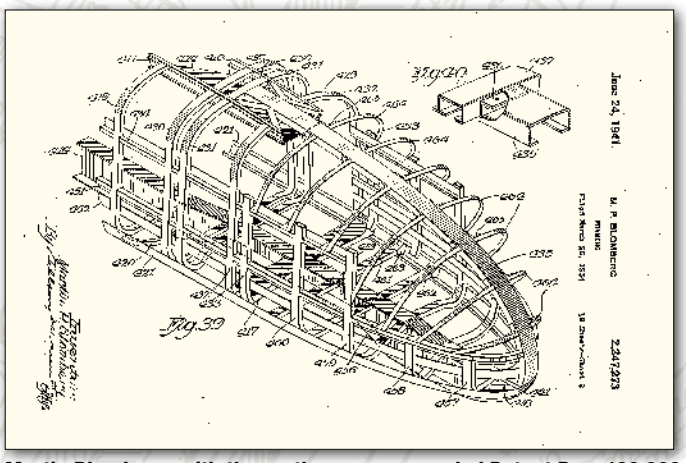
Pullman-Standard's South Chicago plant officially released the M-10000 for testing on February 11, 1934. A press preview followed the next day, and over the weekend of February 23–24 the train was on public exhibition at Chicago & North Western's Chicago Passenger Terminal. The "Little Zip," as the small but speedy train had been dubbed, was then off on an extended nationwide tour.

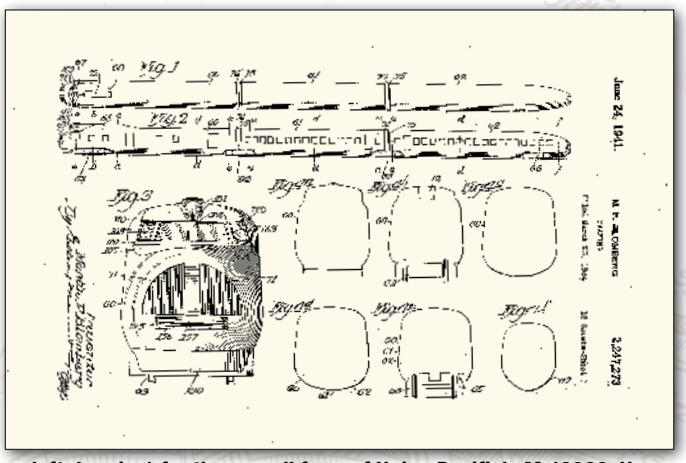
On March 26, 1934, the UP/P-S/Stout engineering team applied for a patent on the M-10000 and any subsequent "cars shaped with due regard to aero-dynamics at high speed." The same day, Martin Blomberg individually filed a patent application for the complete nose-to-tail structural design of the M-10000. Of particular note was the detachable combined











Martin Blomberg, with three others, was awarded Patent Des. 100,000 (top left drawing) for the overall form of Union Pacific's M-10000. He was the sole holder of Patent 2,247,273, covering the structural framing of the train, which was a template for other Pullman/EMC streamliners.

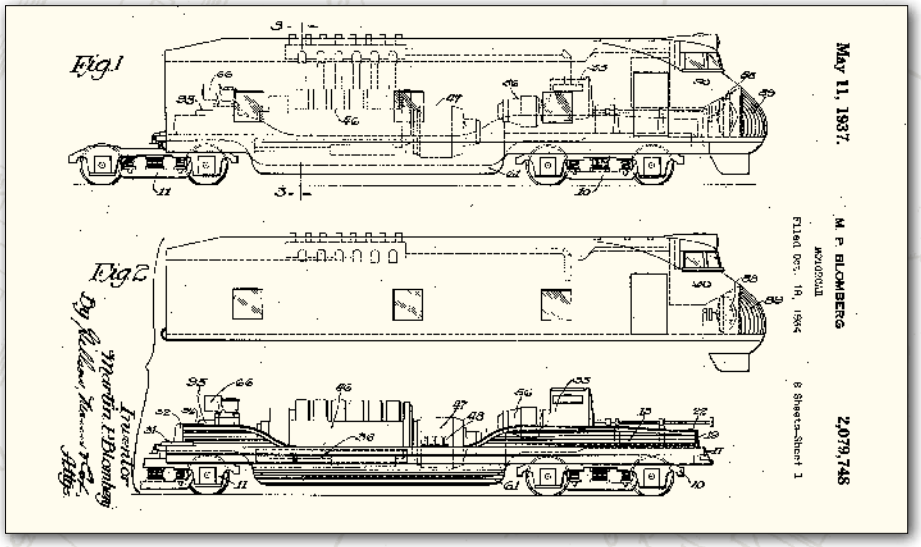
Photo, Rail Photo Service; patent drawings, U.S. Patent & Trademark Office

engine bed and power truck Blomberg designed into the M-10000 power car. Either the engine bed and front truck could be lowered out of the car into a pit for servicing, or the entire power car could be jacked up or lifted by a crane to allow access to the prime mover.

On May 9, 1935, Adams, Mussey, Blomberg, and Stout applied for a third patent, covering the "ornamental design of an articulated rail car or similar design." All three M-10000 patents were subsequently granted and assigned to Pullman-Standard.

The M-10000 began—or continued, if one counts Santa Fe M-190—the evolution of truck design by Martin Blomberg. The initial trucks used under the train had wide spring planks centered in the truck frame with coil springs above or beside each journal box. Also as on the M-190, truck-mounted air brake cylinders were used. All these elements remained in Blomberg's subsequent truck redesigns to improve Little Zip's ride, and would reach their ultimate refinement in his design for the Blomberg truck.

On May 12, 1934, the M-10000 arrived at the Union Pacific display at Chicago's Century of Progress Exposition. It briefly visited Pullman on May 23 to have a fourth car, sleeper *Oregon Trail*—the first car completed for the M-10001—added to its consist. Three days later, Burlington No. 9900, the stainless-steel, diesel-powered *Zephyr*, made its famous Denver–



Unlike his M-10000 design, Blomberg placed the engine of UP M-10001 in a cradle between the trucks, as shown in his Patent 2,079,748, awarded after he left Pullman for EMC. Left, U.S. Patent & Trademark Office; above, Union Pacific

Chicago nonstop run. When it arrived at the "Wings of the Century" pageant at 7:09 p.m., the second year of the Century of Progress Exhibition was officially open. Both the *Zephyr* and the M-10000 were wildly popular exhibits.

As visitors flocked to the fair, both Pullman-Standard and Budd were busy fabricating additional streamlined motor trains. In October 1934, Pullman completed the M-10001, and Blomberg's fingerprints were again all over this second, improved design. The M-10001 had its 900 h.p. Winton 201A diesel V-12 prime mover located in the carbody midway between the trucks—both sets powered this time—in a cradle formed by dropped side sills. Access to the prime mover was now by a removable roof hatch. The articulated joint between the power and baggage sections was a duplicate of the design pioneered on Santa Fe M-190.

Lest anyone doubt that the M-10001 was developed from the M-10000, Blomberg stated in his "Framing" patent application of October 18, 1934, that, "The scheme of design and operation is substantially the same as that disclosed in the [M-10000] application of Adams, Stout, Mussey & Blomberg, dated March 26, 1934."

The patent application claimed the motor train was to be powered by a "900 HP gas-electric set," which raises an intriguing possibility. As originally conceived, it appears the M-10001 was to be powered by a Winton Model 194 distillate engine rather than the 201A diesel initially installed. The only known railway installation of a Model 194 was in Santa Fe M-190; however, one source claims Winton constructed two Model 194's. Perhaps the second one was not a spare, but a hedge against the seemingly endless developmental problems that at the time threatened indefinite delays to the production of Winton 201A diesels.

In late October 1934, after its record-breaking cross-country speed run [see Fast Trains, 2009], UP M-10001 returned to Pullman for a major redesign and upgrade that included the addition of a seventh car and stretching of the power car 12 feet to house a new V-16 1,200 h.p. Winton 201A diesel. The original V-12 900 h.p. engine, generator, and control equipment were soon reused in the booster unit for the under-construction nine-car M-10002 set.

During the M-10001 upgrade in mid-1935, Illinois Central ordered from Pullman a diesel-powered five-car articulated streamliner. The train would be named the *Green Diamond* and work in Chicago–St. Louis service. That this train was similar to the UP streamliners was hardly a surprise, as W. Averill Harriman sat on the IC board to represent the UP's substantial IC stock holdings.

The expanded and more powerful seven-car M-10001 entered UP service as the *City of Portland* on June 6, 1935. Less than two months later, Martin Blomberg resigned from Pullman-Standard and on September 1, 1935, joined Electro-Motive's engineering staff under Dick Dilworth. The first EMC office staffers were just moving from Cleveland to a site in the Chicago suburbs near La Grange, Ill., where construction of the new assembly plant was in progress.

LEGACY AT PULLMAN

Blomberg's influence lingered at Pullman after his departure. Several of his design parameters were incorporated in

The beginnings of E-unit styling can be seen in IC's *Green Diamond* (above, at Kankakee, Ill., in 1941) and UP's *City of Denver* (Denver, in '49), both built by P-S and powered by EMC.
Above, Dan Peterson; right, Irv August

IC's *Green Diamond*, as well as the larger, separable locomotives for UP's *City of San Francisco* and *City of Denver* trains.

The *Green Diamond*—the last fully articulated streamliner—upon close examination reveals the incremental intermediate design steps between Blomberg's M-10001 and M-10002 and their later UP siblings. The *Green Diamond* power car was but a modest revision of the M-10001 design. The cab remained high behind the nose, but was restyled from a turret to a streamlined contour, resembling a mid-1930s automobile passenger compartment. The bulbous nose continued to use a parabolic arch surrounding the air intake, but was now covered with twin chrome-plated grilles, again similar to contemporary automotive practice. Side-panel vertical framing still consisted of thin U-, L-, or I-shaped members, but the sidewalls were now vertical as opposed to inward-sloping as on the early UP trains and supported a separate and distinct roof.

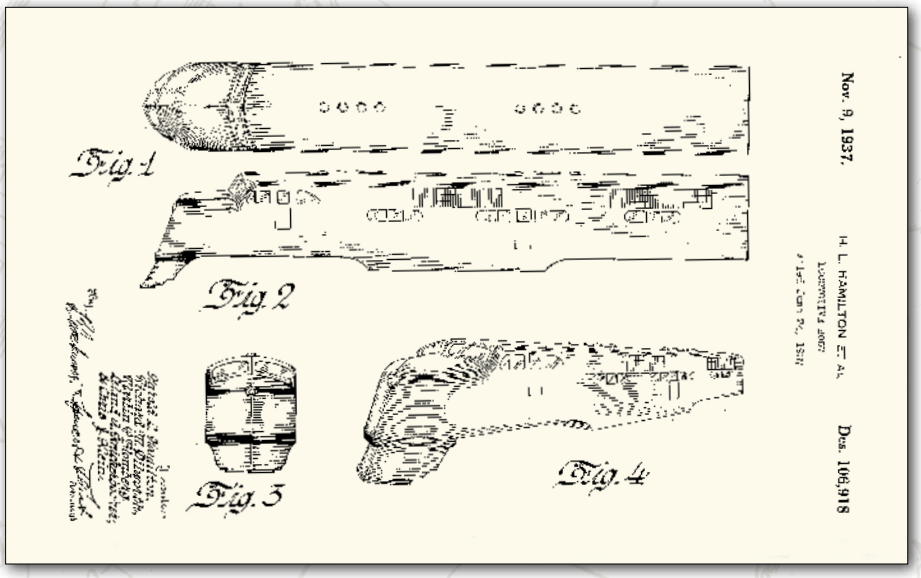
Yet there were far more similarities than differences between the two power cars. Each nose contained the locomotive's cooling air intake. Each placed its 100 h.p. Winton Model 233 auxiliary engine set (or sets) between the cab and the Winton 201A prime mover. Cab entrance remained indirect, through side carbody doors and up two interior steps. The same drop-center underframe was used, and the power cars were of similar length (59 feet for IC's *Green Diamond*, 60 feet for UP M-10001). Like its UP cousins, the skin of the IC train was of riveted aluminum.

EMC G.M. Hal Hamilton (left) and Chief Engineer Dick Dilworth.
EMD

When M-10002, the power for the *City of Los Angeles*, was released by Pullman in July 1936, the locomotive was nearly identical to power car M-10001, with the exception that the auxiliary engine and prime mover had traded places, and 8 feet had been added to the carbody to extend it over the rear truck which, in previous applications had been articulated with the second car of the integral train set.

The need for more horsepower meant multiple prime movers, requiring more space than a single carbody could house and more traction motors than could be mounted in a single truck. UP M-10002 was the first streamliner to have what would come to be known as an A-B set of locomotives—a cab-equipped leading unit with a trailing booster unit. However, M-10002's two power units were joined by a bridge casting tying the Nos. 2 and 3 trucks together, technically rendering it a single B-B+B-B locomotive consisting of two conjoined carbodies, each of which contained a prime mover.

When designing the locomotives for subsequent UP streamliners, Pullman engineers continued to use the M-10000 and *Green Diamond* for inspiration. The cab was moved further back from the nose, and entry to it now came directly via a side door, while a separate side door gave engine-room access. The headlight was lowered and faired directly into the nose above and between the twin large chrome-plated air intake grilles. The carbodies were of riveted Cor-Ten steel rather than aluminum. The overall design, component layout, thin sidewall box framing, and riveted construction were



Blomberg was among the five men to whom the landmark patent for the EA carbody design was awarded. In 1940, an EA-EB set led B&O's *Royal Blue* out of Jersey City. Left, U.S. Patent & Trademark Office; above, H. F. Harvey

all derived from the M-10000 and Blomberg's initial design concepts.

City of Denver locomotives M-10005 and M-10006 were virtually identical to M-10004, which powered the *City of San Francisco*, and M-10003, a spare set for replacement or emergency service. All were conjoined A-B sets with the span bolster concept introduced on M-10002.

With the *City of Denver* sets, cars of full-sized cross section and dimension became the order of the day, although semi-articulation of car combinations continued for several more years.

Blomberg left a substantial legacy at Pullman. UP M-10002, the *City of Los Angeles*, like M-10000 and '01, had power- and passenger-car designs based on his patented tubular framing and cross section. The same was true for M-10004, the *City of San Francisco*. The passenger cars of Pullman's first four streamliners varied little except in number, length, window placement, and interior layout.

The era of dedicated, highly customized motive power and trainsets was short-lived. Blomberg's contributions to the aerodynamically designed articulated streamliner were now destined to fade into history and the files of the pre-digital era U.S. Patent & Trademark Office.

OVER TO ELECTRO-MOTIVE

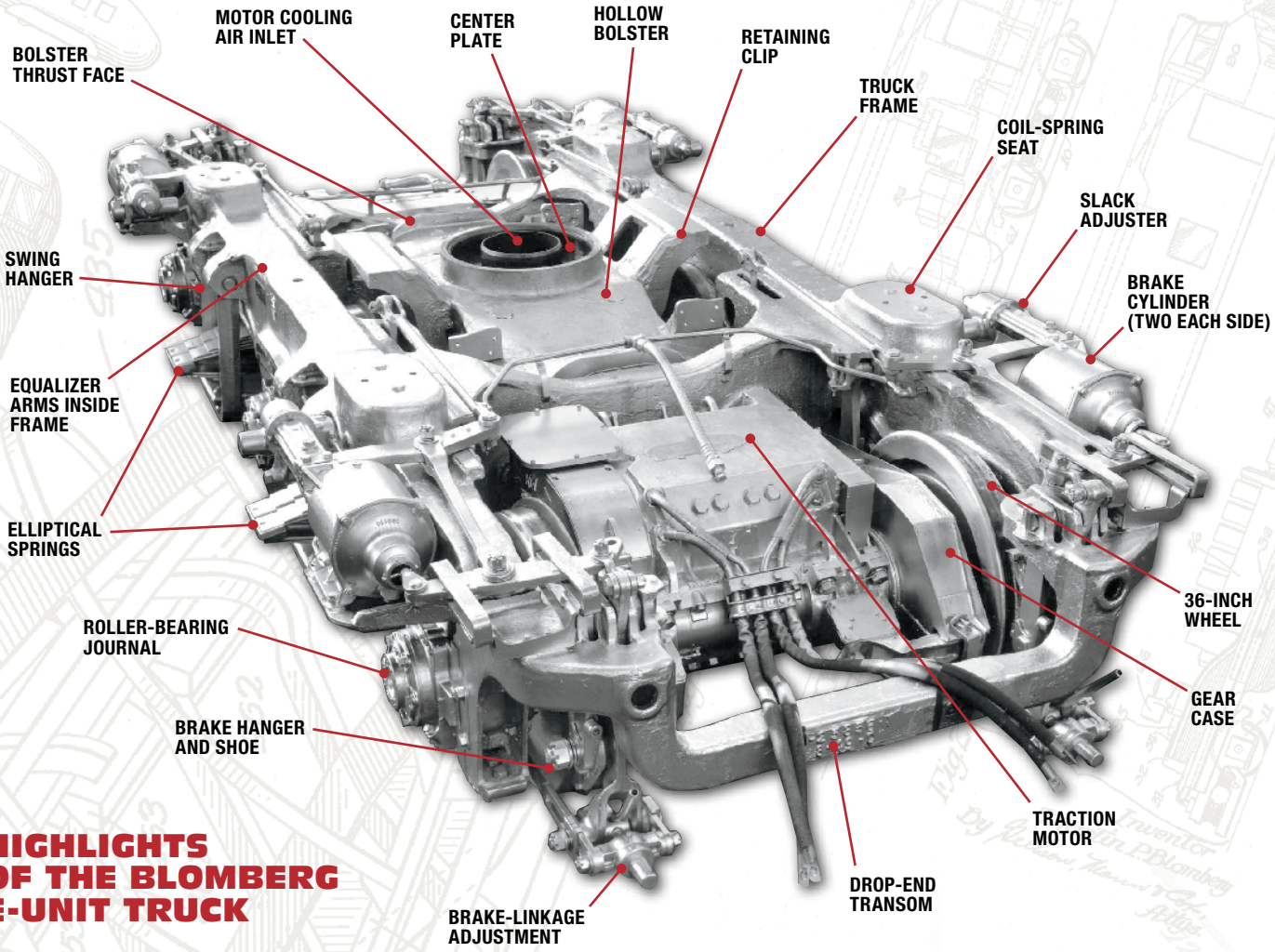
Blomberg likely left Pullman-Standard because management decided to end streamliner power car/locomotive construction. P-S knew passenger cars far better than locomotives, and cars were much simpler and more profitable than the integral power car/locomotive designs for each new streamliner. And car orders were soaring in 1935–36. Given the likely minimal profitability on the power car component of the UP streamliners, compounded by various technical problems the early power cars and locomotives presented—tracking at high speed with B-B trucks and wear/maintenance issues on the Winton diesel engines are two issues that come to mind—Pullman was likely only too glad to leave the locomotive market to EMC and Winton. Electro-Motive was where the challenge was, and Blomberg headed there.

He had just arrived at La Grange when EMC received a $366,648.88 purchase order from the Burlington Route for two 1,800 h.p. locomotives to power a pair of new Budd-built articulated trainsets for Chicago–Minneapolis *Twin Zephyr* service. An order for two 3,000 h.p. A-B locomotives to power two new *Denver Zephyr* sets followed in December. Blomberg barely had time to hang up his jacket and loosen his tie before lubricating his slide rule and going to work down the hall from Dick Dilworth.

Also in that fall of 1935, Dilworth's box-cab passenger locomotives—EMC 511 and 512, B&O 50, and Santa Fe 1 and 1A—were just hitting the road. Although the box-cabs had their deficiencies, they proved the suitability for high-speed passenger service of a locomotive with twin prime movers in a single carbody.

But the streamliners cried out for more stylish power, and on April 19, 1937, they got it. To clicking p.r. cameras, EMC rolled out its first E units, B&O EA-EB set 51 and 51A, for final testing and delivery. A formal dedication ceremony took

More on our website Read more about Martin Blomberg in an article about him in the October 1994 issue of TRAINS magazine at www.ClassicTrainsMag.com



HIGHLIGHTS OF THE BLOMBERG E-UNIT TRUCK

place on April 25 at Washington Union Station prior to the units' departure for Chicago with the *Capitol Limited*.

The E-unit's rakish carbody design was the work of a GM-EMC team that included Blomberg. Two months after the Washington ceremony, the design was submitted to the U.S. Patent Office. Signatures on the application were: EMC founder and General Manager (and now GM Vice President) Harold Hamilton, EMC Chief Engineer Richard Dilworth, EMC Staff Engineer Martin Blomberg, and Leland Knickerbocker and Chris Klein of GM's styling section in Detroit.

Blomberg had substantial input on the overall E-unit design. The E's cab and windshield placement is strikingly reminiscent of that pioneered on the IC *Green Diamond*, followed by the UP M-10003–M-10006 locomotives, whose design began during Blomberg's tenure at Pullman. Granted, the cab was no longer raised above the carbody, but melded instead into the roofline. The use of sidewall panel/batten strip construction, porthole windows, and the small triangular window behind the cab side door are otherwise remarkably similar.

A modified Pratt truss design was developed to carry the live load within the E-unit carbody, since both engine/generator sets were no longer centered over the truck bolsters as they had been in Dilworth's box-cabs. EMC had first used a simple Pratt truss in fall 1936 on CB&Q's *Twin Zephyr* and *Denver Zephyr* locomotives, a design likely created in collaboration with Budd.

And of course Blomberg designed the truck for the E unit, the truck that bears his name. In 1939 he modified the three-axle/two-motor design for the E unit into a two-axle/two-motor design for the FT freight locomotive. The FT persuaded a large portion of the railroad industry to switch from steam to diesel motive power. The locomotives that accomplished this monumental change over the ensuing two decades mostly rode on Blomberg trucks, which are still employed on new power today. It is an amazing record of engineering excellence.

Martin Blomberg retired from EMD in 1949, the midpoint of the steam-to-diesel transition, and died in 1966 at his home in Florida. He is the *only* design or mechanical engineer with the patents to prove his influence on early streamliner design at both Pullman-Standard and Electro-Motive. His skills, talent, and patents are intertwined with the earliest carbody designs at both firms, as well as the vast majority of diesel-electric power cars and locomotives produced by Electro-Motive during the streamline era of 1934–64—an era that would have been vastly different without him. His well-known truck designs were but a part of his overall engineering influence upon the development of the North American streamlined diesel-electric locomotive and the passenger trains they led.

Union Pacific E9A No. 914, the final E unit to be built, was delivered in January 1964, two years before Martin Blomberg's death.

J. R. Quinn photo, Louis A. Marre coll.