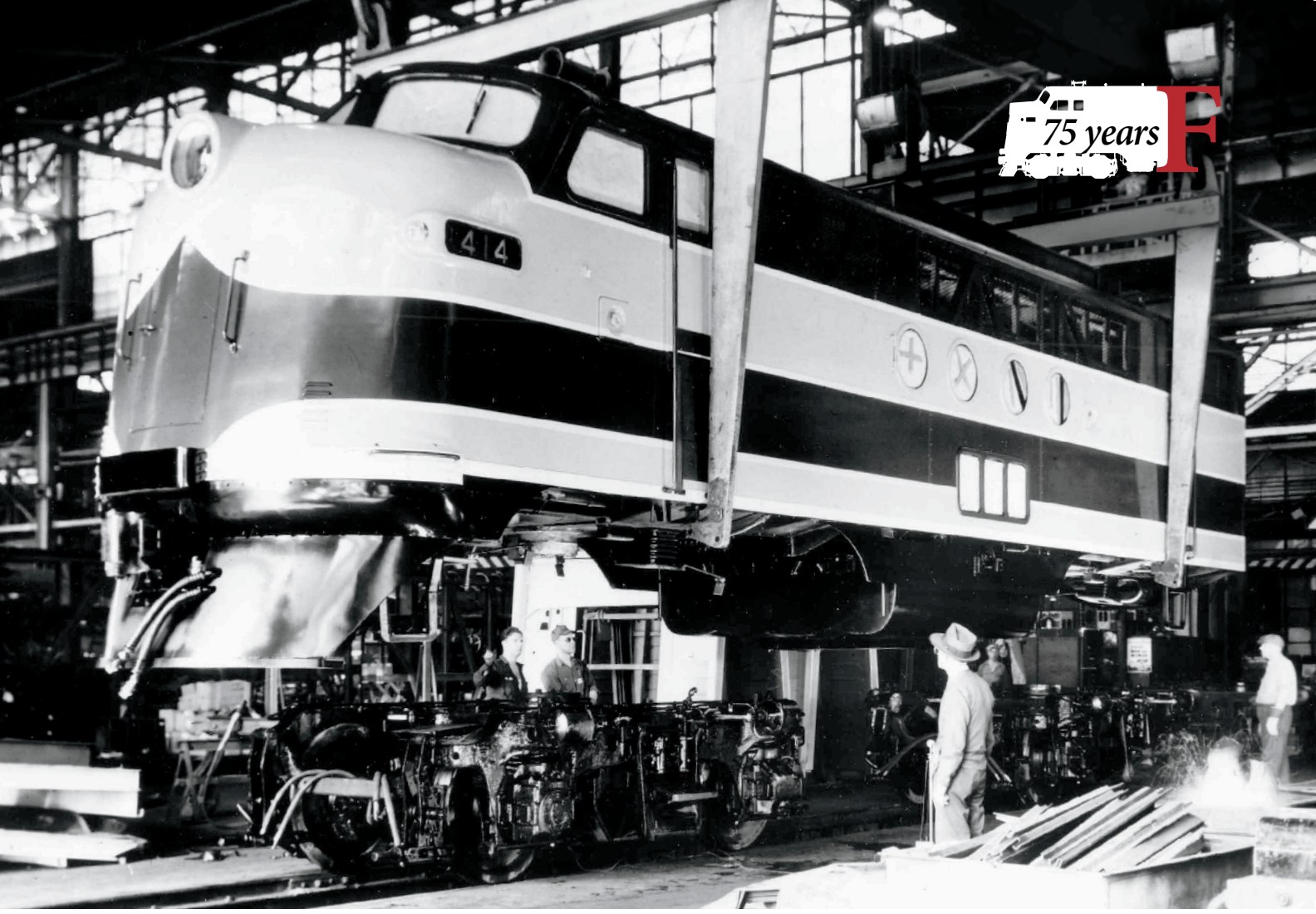


75 years F

Great Northern 414 is "trucked" in June 1944, after EMD had re-engineered the FT to save time in the La Grange plant's main assembly area.

Re-engineering the FT

"The Diesel That Did It" was also the diesel that EMD learned from

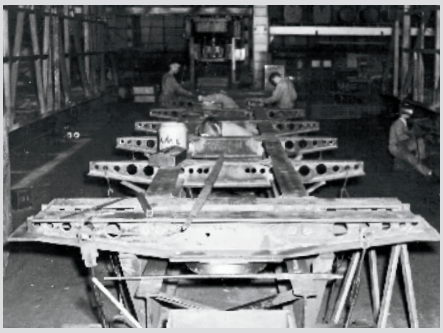
By Preston Cook • EMD photos from the author's collection

The introduction of the FT in 1939, and its production during World War II, helped propel Electro-Motive into the lead among U.S. diesel locomotive builders. EMD arrived at that advantageous position through an odd combination of circumstances. In contrast with some of the other locomotive builders, whose output was concentrated on locomotives and armaments, EMD became involved in projects that left it with a much larger facility and new plant machinery that allowed it to expand into new and lucrative markets in the postwar years.

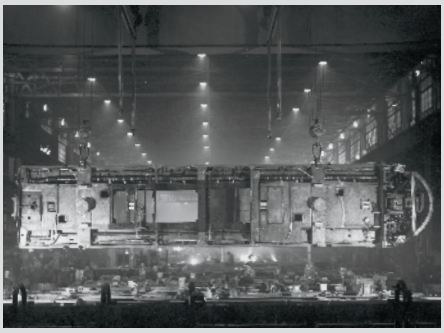
Electro-Motive was fortunate to be well-positioned for expansion of its facilities because of decisions made by GM management in 1935–36. Electro-Motive founder Hal Hamilton sought out and carefully researched the main plant site outside Chicago, and GM had the foresight in the early 1930s to buy the large tract of land, which then was a cornfield. Underneath was solid bedrock, making the site suitable for heavy manufacturing and the requisite large machinery.

Plant One, as the facility adjacent to La Grange, Ill., came to be known, was originally envisioned as an assembly plant. When it opened in 1936 its locomotives were "stick-built," *i.e.,* fabricated from individual parts. This worked adequately for the first few years, while production levels were relatively low. But Electro-Motive's market share was growing fast. By 1938 EMC surpassed Alco-GE as the leader in diesel locomotive production, and the output of diesels by

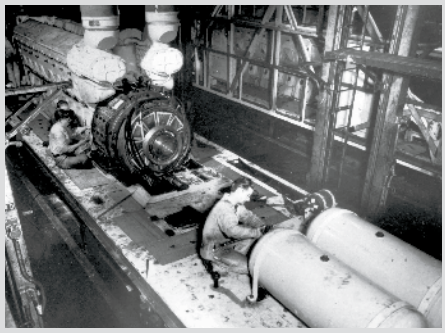
FT ASSEMBLY AT LA GRANGE



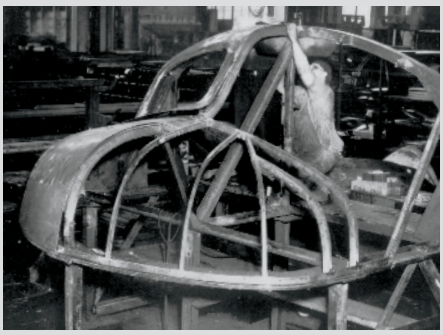
1 FT underframes were fabricated in one area, then moved for piping and cabling.



2 A piped and cabled underframe is lifted for positioning in the assembly area.



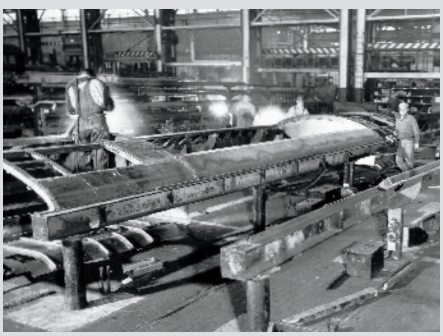
3 The underframe was supported on floor stands for fitting of major equipment.



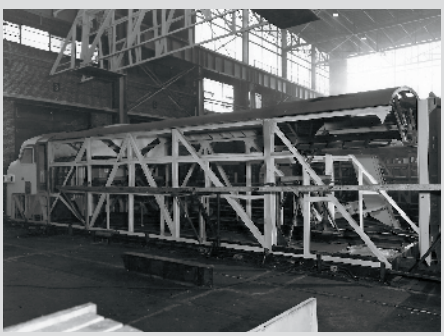
4 The cab was assembled in a jig fixture; compare to patent drawing on page 41.

5 After the welded-up cab frame was plated, the welds were ground down.

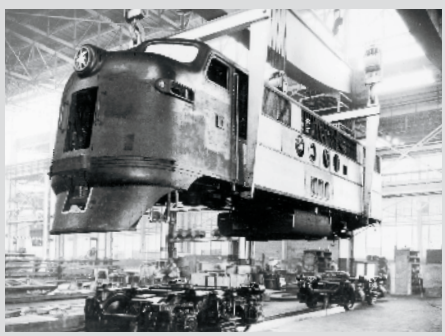
6 Work on the roof was begun inverted, with parts held in fixtures for welding.



7 The roof was then flipped over to install plating; note openings for equipment.



8 Side trusses were built separately, then mated with roof, cab, and rear bulkhead.



9 The carbody was welded to the underframe, then lowered onto the trucks.

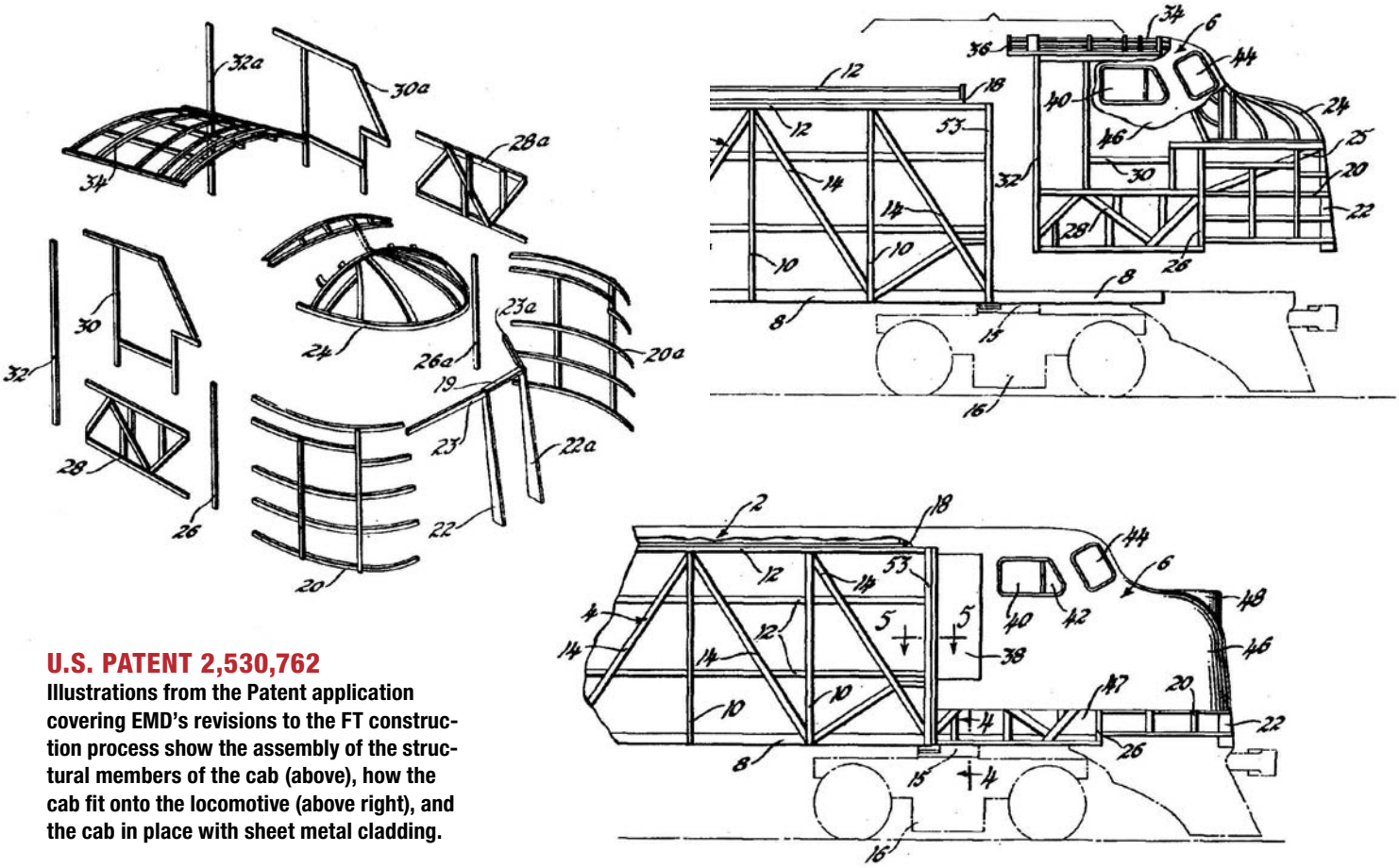
all builders was exceeding that of new steam locomotives. It had become clear that the diesel had a significant market potential, and GM made plans to produce its new 567 engine at La Grange, and to manufacture its own line of electrical rotating equipment.

When the first FT set was built in 1939, the La Grange plant was in transition to a highly integrated manufacturing facility capable of producing most of the components of a diesel locomotive. Bringing production of a large portion of the product in-house freed Electro-Motive from outside influences and supplier complications, making it less dependent on companies that might have ties to a competitor. But at this point, the locomotives were still being stick-built, a time-consuming task that occupied part of the assembly floor for extended periods.

COLLATERAL BENEFITS

When the U.S. entered World War II, it was EMD's good fortune to be selected to supply several critical diesel engine products for the military rather than to assemble tanks or build munitions. The GM 184A "pancake" engine, a 16-cylinder radial prime mover that produced 1,200 h.p. in about the space of a kitchen refrigerator, was originally developed for dirigibles in the 1930s. The Navy needed several hundred of them for a fleet of submarine chasers, and Cleveland Diesel (the former Winton Engine Co. and, like EMD, a GM division) could not supply them because it was busy with other Navy orders. The work went to La Grange, and plant expansions were begun in 1942 to provide the additional space and machining capacity. EMD later was selected to assemble the engine skids for LCI (Landing Craft Infantry) vessels, further expanding the capacity at La Grange.

But it was the Navy's LST (Landing Ship Tank) program that ultimately positioned EMD for the postwar locomotive market. The Navy needed propulsion equipment for hundreds of planned LSTs, and it selected EMD to build a ma-



U.S. PATENT 2,530,762

Illustrations from the Patent application covering EMD's revisions to the FT construction process show the assembly of the structural members of the cab (above), how the cab fit onto the locomotive (above right), and the cab in place with sheet metal cladding.

rine version of the 567A engine. This program alone set EMD up with the capacity to build and test as many as 10 engines per working day.

These emergency programs required critical space that affected locomotive production, particularly during 1942–43. The War Production Board's selection of the FT as the priority diesel freight locomotive for wartime construction kept EMD in the industry lead for road freight units, but there were times during the war when the defense projects took priority over locomotive building.

DISPERSING THE WORK

The available space in the final assembly bay had to be used to best advantage, and some features of the FT design were not conducive to quick assembly. As a result, the EMD Engineering Department had several of its most talented designers tackle the problem of re-engineering the FT to make it faster to assemble. The efforts of Andrew Finigan, Frank Bruchtel, and Martin Blomberg resulted in the award of U.S. Patent 2,530,762.

In the words of the Patent description: "In prior practice it had been customary to build the entire locomotive carbody as a complete assembly or unit, and this unit included the nose or cab. According to the present invention, the underframe and main body part are constructed of a number of subassemblies into one unit."

The Engineering Team's design work established the techniques that would be employed in EMD locomotive construction from 1943 onward. Although the Patent primarily covers the cab construction, the designers broke the locomotive into a number of subassemblies that could be final-assembled in a significantly reduced time. F-unit cabs were subsequently built and equipped on a "cab line" and then moved to the assembly bay and installed on an underframe that had been built, piped, and cabled in another area of the plant. The process was subsequently refined so that the cab, side trusses, roof, and rear bulkhead were pre-assembled into a body assembly to be installed on the underframe.

This greatly improved Richard Dilworth's original FT design, making it more suitable for mass production, but the locomotive still had drawbacks that made it less than ideal for the postwar market. One of its biggest limitation was the complicated belt and gear box drive for the cooling fans, which took a lot of time to position and assemble. The system, with its mechanical clutches and manually operated radiator shutters, was also not readily adaptable for automatic operation that was made possible by advances in the technology of temperature regulation systems. The FT also required extensive internal piping work on the lubricating oil and cooling water systems.

Late in the war, as the emergency production programs wound down, the further limitations of the FT were addressed by Eugene Kettering and other EMD designers. Kettering, son of GM research boss Charles F. Kettering, had joined Winton Engine after its acquisition by GM and came to EMC in the late 1930s to work on the 567 engine program.

Despite its drawbacks, Dilworth's FT proved to be the centerpiece in EMD's successful efforts to dieselize North America's railroads. It was not only "The Diesel That Did It," as writer David P. Morgan called it in a 1960 TRAINS magazine article, it was also the diesel that EMD learned from. Through the efforts of many designers, and with the unanticipated assistance provided by wartime emergency programs, the company was able to enter the postwar locomotive market with reliable products that could be competitively mass-produced.