

poor nations is not one of them. Although some poor nations “have shown alarming stagnation,” Wright says, “the economic output of the average poor nation has grown in recent decades.”

While the *gap* between the richest and poorest nations has increased, globalization is not to blame, he says. The most stubbornly poor nations, as in sub-Saharan Africa, seem “underglobalized.” Those nations “most thoroughly plugged into the global market system,” as in East and Southeast Asia, have grown the fastest. They haven’t left their poorer citizens behind, either, says Wright, citing a recent study by World Bank economists, who

“found that, as national income grew, the fraction of the economic pie going to the bottom fifth of the income scale didn’t shrink.”

Still, Wright concedes, rapid modernization may be having a disorienting effect in developing nations, perhaps “neutraliz[ing] much of



The same globalization that made protesters in Seattle mad may make poor people in developing nations happier.

the happiness brought by growing income.” That, he says, might be an additional argument for worthwhile policies—e.g., environmental and labor provisions in trade agreements—that have the side effect of slowing globalization down a little.

ECONOMICS, LABOR & BUSINESS

The Diesel Revolution

A Survey of Recent Articles

Future historians of our time may find it odd that, as Maury Klein, a professor of history at the University of Rhode Island, notes, scholars in recent decades have expended more effort assaying the social significance of TV’s *Brady Bunch* than they have illuminating the great impact that the diesel locomotive had on railroading and American life. Klein and his colleagues try to rectify that imbalance in this special issue of *Railroad History* devoted to “the machine that saved the railroads.”

Rudolf Diesel (1858–1913), the Parisian-born German engineer who gave the machine his name, never built more than a few crude prototypes. “The consensus is that his science was ahead of his engineering: he had to cope with poor metal and crude manufacturing that did not keep pace with his ideas,” writes Mark Reutter, editor of

Railroad History, which is published by the Railway & Locomotive Historical Society, with editorial offices at the University of Illinois. But Diesel’s ideas—first advanced in an 1893 manifesto, *Theory and Construction of a Railroad Heat Engine*—eventually proved revolutionary. With the steam engine then at the height of its influence, he pointed out how extremely inefficient it was, losing most of its fuel’s heat energy up the stack. He developed a theory of internal combustion, in which the fuel would be mixed and ignited in the same vessel that moved the piston—resulting in a much more efficient engine. His test engines attracted international attention in 1898; St. Louis beer baron Adolphus Busch paid him about \$240,000 for exclusive U.S. and Canadian rights.

But to provide high thermal efficiency,

the diesel engine “had to be machined to a precision comparable to the work done by diamond cutters,” Reutter notes. Though a workable engine was displayed at the 1904 St. Louis World’s Fair, and Southern Pacific built and tested a diesel locomotive the following year, it would be decades before the diesel locomotive truly “arrived,” in the form of the sleek, high-speed *Zephyr*, introduced by the Chicago, Burlington & Quincy Railroad in late 1934. (See “The Lost Promise of the American Railroad” by Reutter, in *WQ*, Winter 1994, pp. 10-35.)

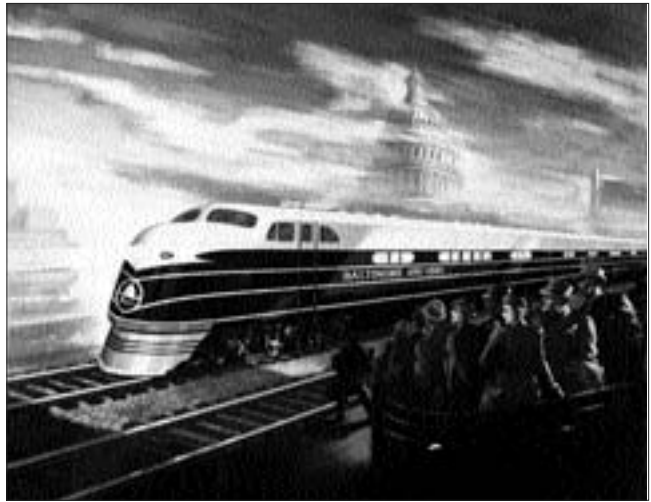
Ralph Budd, Burlington president, had seen a prototype of General Motors’ model 201A diesel engine and gambled that it would work. It did, and the streamlined *Zephyr* wowed the public. Other railroads quickly embraced the diesel streamliner. The streamline style—smooth, sinuous, and suggestive of speed—soon spread to all sorts of things, from autos to radios, from gas stations to bus stations, observes Jeffrey L. Meikle, a professor of American studies and art history at the University of Texas at Austin.

The streamliners helped to reverse a decline in the passenger railroads that had begun before the Great Depression. “From the peak year of travel in 1920 through 1929,” Reutter notes, “the railroads had lost one-third of their passengers.” From 1934 to 1938, however, ridership increased by an average of 34 million passengers a year.

The diesels aided the bottom line. “The new equipment, while more expensive to purchase,” Reutter says, “was cheaper to operate once fuel and water savings, reduced maintenance charges, higher loadings, and better equipment utilization were figured in.” Labor costs remained almost the same, however. “After 1936, all diesel streamliners were required to have firemen in the cabs even though there were no longer any fires for the firemen to tend.”

Progress had some drawbacks, particularly for the veteran railroad men of the steam

engine era. True, their work had not been glamorous, contrary to romantic myth, says the late Robert Aldag, a mechanical engineer long involved with locomotives. “It was hard, it was dirty, it was repetitive. And yet a visitor to a steam locomotive cab might pick up a sense of achievement, a feeling that the crew knew they were good at their jobs and that they, more than any others, made the trains run.” Their relationship with the steam locomotive was more personal than with the diesel, observes historian Klein. “Every steam locomotive had its own char-



Embracing the diesel, the Baltimore & Ohio Railroad assigned its first streamliner to the Capitol Limited line in 1937.

acter and eccentricities; it had to be serviced regularly, and parts had to be made especially for it. Engineers and crews grew attached to ‘their’ machine and personalized it.” The more standardized diesel did not invite such connections. “The relationship between machine and crew,” Klein says, “[became] cold and impersonal, a trend that in modern life is hardly confined to the diesel.”

Though the merits of diesels were more or less apparent to locomotive manufacturers, the old-line ones “had trouble getting out from under their preoccupation with, and their investment in, steam locomotives,” writes Wallace W. Abbey, former managing editor of *Trains*. That left an opening for newcomer Electro-Motive Co., which had a diesel freight locomotive, FT-103, for sale in 1940. By the time of Pearl Harbor, railroads had ordered 45 of the powerful freight diesels.

But the restrictions and demands of World War II slowed the diesel's spread. Diesel locomotives for freight trains "weren't produced in significant numbers until well into the war," Abbey notes, and diesels for passenger trains weren't produced at all. By

the end of 1944, there were only about 3,000 diesel locomotives in service—compared with nearly 40,000 steam locomotives. When the diesel did triumph after the war, a raft of new problems confronted America's railroads.

The Paradox of Child Labor

"Eliminating Child Labor" by Miriam Wasserman, in *Regional Review* (Apr.–June 2000), Federal Reserve Bank of Boston, P.O. Box 2076, Boston, Mass. 02106–2076.

Many Americans have been horrified to learn that shoes, clothing, soccer balls, and other goods imported from developing nations were made with child labor. Yet those nations themselves strongly oppose any talk of a ban. They use child labor extensively, for much more than just exports, observes Wasserman, an associate editor of *Regional Review*. A glance at U.S. history makes the widespread practice—and the difficulty in uprooting it—easier to understand.

About 120 million children between the ages of five and 14 work full-time today in the developing world, and another 130 million work part-time. Children also do much unpaid work at home. Probably less than five percent of all child workers are employed in manufacturing or mining, producing the kinds of exported goods that attract worldwide attention. More than 70 percent work on farms. Populous Asia has the largest number of child workers (more than 150 million), while poverty-stricken Africa has the highest proportion of them (41 percent of all children aged five to 14).

"The plight of working children in the developing world today is not very different, and in some cases even less harsh, than that prevalent in countries such as the United States and England during the 19th and early 20th centuries," says Wasserman. In 1900, an estimated 1.75 million American children between 10 and 15 years old—or about 18 percent of children that age—were employed. They worked, for the most part, on farms, she notes, "but young children also worked long hours in factories and textile mills, in the anthracite coal mines of Pennsylvania, and in many other industries."

By then, however, "child labor was clearly on the decline," Wasserman points out.

Americans' views had changed since the early 18th century, when work was considered helpful to "a child's character and moral upbringing," and child labor was vital to the agricultural and handicraft economy. As more children appeared in the mills, public acceptance started to diminish. Americans also came to regard play and leisure as important for children's healthy development, not as vices to be avoided. Between 1880 and 1910, 36 states established a minimum age (of 14, on average) for manufacturing workers. Pressure for federal legislation mounted, despite opposition in the South from those who claimed that the richer North was trying to limit their region's development. In 1938, a federal law setting 16 as the minimum age was finally enacted. But some economists think that such laws had less impact than other factors. The long, slow process of reducing child labor, Wasserman writes, "required a host of changes in family income, education policy, production technologies, and cultural norms."

As the American experience shows, the problem is not a simple one, she notes. Well-intended efforts can leave the children involved *worse* off. In 1993, garment manufacturers in Bangladesh, fearing a possible U.S. ban on imports made with child labor, fired an estimated 50,000 children. Some of the children turned to street hustling and prostitution. Fortunately, the International Labor Organization and the United Nations Children's Fund reached an agreement with the Bangladesh Garment Manufacturers and Exporters Association to give the fired children monthly stipends and to jointly sponsor schools. By 1997, more than 300 schools were serving 9,710 children. But in many other countries, Wasserman points out, not only are