

Covered Bridges and the Birth of American Engineering.
Edited by Justine Christianson and Christopher H. Marston. Washington, DC: Historic American Engineering Record, National Park Service, 2015. 234 pp., diag., color and b&w illus., notes, bibliog., index.

(Editor's note: The Historic American Engineering Record is distributing this publication to members of the covered bridge community nationwide. Paper copies may be requested while supplies last by contacting Christopher H. Marston at christopher_marston@nps.gov. The book is also available for download.)

"The American Covered Bridge: An Encyclopedia" might be a better title for this book on covered-bridge preservation wrapped around another, larger book on covered-bridge history, design, and construction, considering the enormous amount of information that the editors, Justine Christianson and Christopher Marston, have packed into 234 pages and 299 footnotes. At its core are four substantial essays addressing "the birth of American engineering" (as the title promises), expanding the discussion beyond bridge history into broader engineering history. While rarely stopping to say so, they make the point that "covered" is the least significant engineering element of a "covered" bridge. It's the truss that counts—covered or not—so these chapters present a history of truss design and construction in wood, from the earliest examples into the twentieth century.

Let's jump into midstream with Chapter 3, Lola Bennett's essay on the "History of Covered Bridges in the United States." As the author of the National Historic Landmark context study of covered bridges, Bennett provides a solid narrative introduction that touches on the content of every other essay in the volume. She explains that the earliest builders learned that an uncovered wood bridge may last fifteen years, but one with siding and a roof can last indefinitely, pointing to 400-year-old examples in Europe. The rest of the book is an orderly, informed, and thorough march from America's first covered bridge, over Philadelphia's Schuylkill River (1804–05), coated in ornamental plaster and stone dust to resemble a stone bridge,

through the peak period in the 1870s when an estimated 10,000 covered bridges dotted the American landscape. The Oregon State Highway Commission designed and built the last functional examples in the 1940s and 50s. After that, covered bridges became the love object of tourists and preservationists.

Chapters 4 and 5 are engineer-authored bridge and truss studies so technically complex, apparently, that they were further edited by historians. Dario Gasparini, Rachel H. Sangree, and James Barker discuss "The Engineering Design of Covered Bridges" in Chapter 4, which is edited by David A. Simmons and Michael R. Harrison. The authors immerse the reader in a crash course on "Basic Engineering Concepts," including force, moment of a force, and force equilibrium, as well as geometrically compatible member axial deformations and joint movements. This takes us to the "transformative work" of Claude-Louis Navier on truss theory and then structural design, design loads, design criteria, foundations, joinery, and other topics, concluding with "present-day engineering design and covered bridges."

Chapter 5, "The Development of the American Truss," by Gasparini, Sangree, and Matthew Reckard, edited by Simmons, builds on the engineering background with a lesson in basic truss forms, including discourses on the Burr-Arch, Town Lattice, and Stephen H. Long's trusses, followed by the Howe, Pratt, and Smith trusses. The need for reliable truss bridges, the authors observe, spurred the development of structural engineering science.

These two engineering chapters are profoundly serious and important, providing thoroughly documented analyses rarely presented to the casual or even professional historian of bridges, to say nothing of covered bridges. At times they try too hard, lapsing into technical language and diagrams that are off-putting in their complexity, as in: "The magnitude of the moment of a planar force about an axis perpendicular to its plane equals the force magnitude by the perpendicular distance from the line of action of the force to the axis" (p. 78). Such a sentence prompts even the most dedicated reader to skip ahead. Nevertheless, these two

engineering chapters separate this book from others that rarely venture beyond familiar chronologies of types, materials, and builders.

The history section ends with Chapter 6, Joseph D. Conwill's "Builders and Practices." As the editors note, Conwill is the only person to have visited all 672 surviving covered bridges in the U.S. His central contribution is a series of introductions to some dozen covered bridge builders, both historical figures and present-day timber framers and bridge preservationists.

Chapters 1, 2, and 7, as well as a brief introductory piece, address a range of covered-bridge preservation topics, focusing on multiple aspects of the Historic American Engineering Record (HAER) and the National Historic Covered Bridge Preservation (NHCBP) program, the latter a joint effort of HAER and the Federal Highway Administration. The editors' introduction explains the work of HAER's National Covered Bridges Recording Project (2002–2015), which resulted in the documentation of eighty structures. In Chapter 1, HAER Chief Richard O'Connor summarizes the agency's various covered-bridge projects and introduces the online and searchable World Guide to Covered Bridges. In her Chapter 2 overview of the NHCBP, Sheila Rimal Duwadi introduces its grants program that has saved some 200 bridges and identifies many potentially useful reports, manuals, guides, and studies, both published and forthcoming, to support preservation work. Check the footnotes for links to online versions of the cited documents.

In Chapter 7, the editors present a whirlwind summary of "The Preservation and Future of Covered Bridges in the United States." The book also includes Marston's "Portfolio of Covered Bridge Trusses Recorded by HAER," with forty-two full- and half-page photos, some in color, of truss types. In addition to a detailed bibliography that includes government publications, patents, websites, and covered-bridge societies, the book offers a ten-page appendix listing all historic wood-truss bridges, covered and uncovered, in the HABS/HAER Collection, organized by state.

This one-volume paperback reference to "all things covered bridge" is not only available at no cost, an online copy can be downloaded. What are you waiting for?

Robert M. Frame III

City of Steel: How Pittsburgh Became the World's Steelmaking Capital during the Carnegie Era. By Ken Kobus. Lanham, MD: Rowman & Littlefield, 2015. 299 pp., illus., notes, index. \$47.00 cloth

Pittsburgh figures prominently in studies of American iron- and steelmaking, but few authors have succeeded in showcasing Pittsburgh's contributions to these iconic industries as well as has Ken Kobus in *City of Steel: How Pittsburgh Became the World's Steelmaking Capital during the Carnegie Era*. Suited for historians of technology, industrial archeologists, and general audiences, this richly detailed study guides readers from the early ironmaking industries of southwestern Pennsylvania to the three steelmaking plants of Andrew Carnegie that made Pittsburgh the nation's leading supplier of steel in the nineteenth century.

Kobus, a railroad historian and veteran of the steel industry, begins *City of Steel* with a brief account of making wrought iron in the puddling and rolling mills of Pittsburgh and its environs in the decades before the Civil War. He moves next to the less frequently told history of crucible steelmaking: the small-batch method of making high-carbon steel that thrived in the Pittsburgh region before and after the coming of Bessemer steel. Though informative, this discussion makes no direct connections between crucible steelmaking and later large-batch methods. Kobus returns to the main thrust of the book when he outlines the development of the vast bituminous coal beds of southwestern Pennsylvania, which spurred the region's iron- and steel-making capacity. He neatly summarizes the importance of the nearby Connellsville coal and coke district, its native son Henry Clay Frick, and the impact of railroad and river navigation improvements on the industry. In a sidebar, he traces the relationship of the region's bountiful natural gas fields to later open-hearth steelmaking—a regional advantage almost entirely overlooked in previous accounts of Pittsburgh steelmaking.

Kobus focuses the remainder of *City of Steel* on Andrew Carnegie's first three steelworks: Edgar Thompson, Homestead, and Duquesne. He begins by retracing the early Bessemer period of the Edgar Thompson Works along the Monongahela River in Braddock, just south of Pittsburgh. Built from scratch in the mid-1870s to profit from the lucrative but volatile post-Civil War rail market, Kobus outlines the outsize role of Captain William "Bill" R. Jones as superintendent. Kobus credits much of the success of the new plant to Jones' cost