The American Society of Mechanical Engineers

Chicago, Burlington & Quincy Railroad Roundhouse

Regional Mechanical Engineering Heritage Site

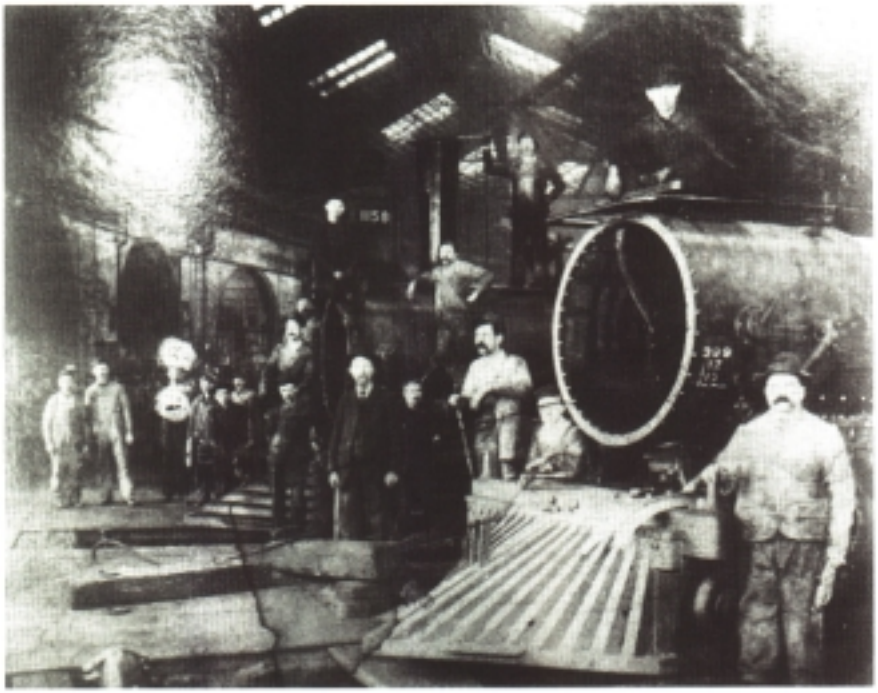
Aurora, Illinois May 14, 1988

The CB&Q roundhouse and attached backshop building have been preserved by the city of Aurora. The backshop has been renovated as the Concourse of the Aurora Transportation Center which opened to the public in January of 1988 and provides service to commuters using the Burlington Northern Railroad and all regional buses. The concourse contains displays that describe and illustrate the history of the roundhouse and Aurora.

Historic Engineering Significance of the Roundhouse

The railroad roundhouse is a legacy from those years when railroads had taken on the major burden of providing transportation for passengers and freight. During this time the western portion of the United States was opened to commerce in large part due to the westward expansion of the railroad system.

The Chicago, Burlington and Quincy Railroad was the first railroad to form the link between the center of trade at Chicago and the major inland transportation artery, the Mississippi River. This accomplishment began with the issuance of a charter to the Aurora and Chicago Railroad, formerly the Aurora Branch Railroad, by the state of Illinois in 1854. The Aurora Branch Railroad existed as a short rail segment to Aurora from Turner Junction, the present city of West Chicago, where it connected with a predecessor of the Chicago and North Western Railway, the Galena and Chicago Union. The 1854 charter allowed the combination of the Aurora and Chicago with the Central Military Tract, the Northern Cross and the Peoria and Oquawka Railroads. Each of these railroads controlled critical segments of trackage to the Mississippi River.



Photographs of Roundhouse Interior, Stalls 18-23, Showing Shop Crew and Two Locomotives. Locomotive # 1158 is a Class A -2 American Built at Aurora in 1881.
(Original at the Aurora Historical Society)

Since Aurora's founding in 1837, primarily as the site of Samuel McCarty's mills, the town had become a crossroads for horse drawn wagon and stage travel. At Aurora the main route to the west from Chicago intersected the north/south traffic along the Fox River. By 1849, the Galena and Chicago Union Railroad had extended track from Chicago to Turner Junction, some 12 miles to the north of Aurora on the Fox River. This rail line decreased the round trip travel time to Chicago from three days by horse and wagon to a single day. However, Aurora was bypassed in the process.

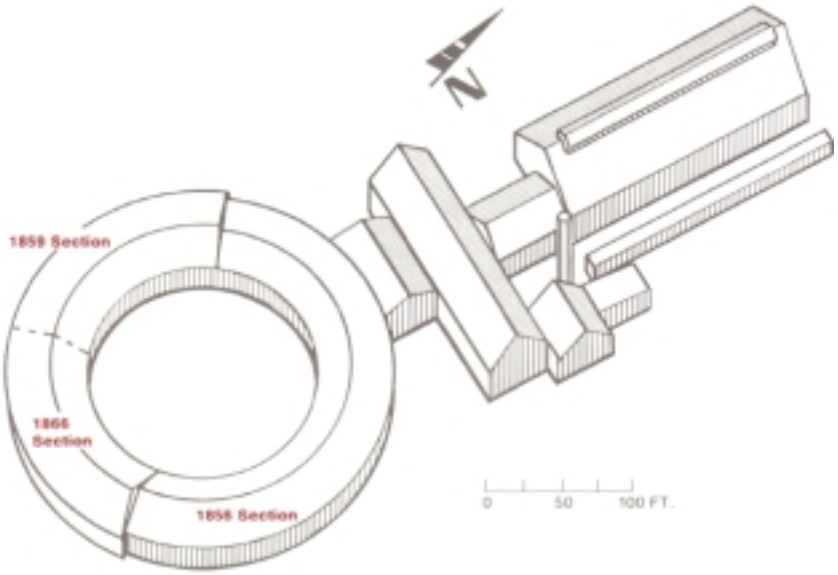
On February 12, 1849 Lorenzo D. Brady, a member of the Illinois legislature from Kane County in which Aurora was located, obtained a state charter to establish the Aurora Branch Railroad. The creation of the Aurora Branch Railroad was a matter of survival for the city. A. C. Gibson, Benjamin Hackney, Charles Hoyt and Stephen Gale joined with Mr. Brady as the railroad's first management. Without the efforts of these men, the roundhouse probably would not exist, and the city of Aurora and the CB&Q would have had significantly different histories.

As traffic on the Aurora Branch Railroad increased, so did the rail car and locomotive equipment. In 1850, a temporary structure served as depot and shop near the site of the roundhouse. After completing the mergers allowed by the 1854 charter, the need for a shop site became critical. First report of the roundhouse construction in Aurora was given in the September 14, 1855, issue of the *Aurora Beacon*.

The roundhouse and shop complex grew to become the major repair and construction site for the CB&Q during the late 1800s. As many as 2000 workers were employed at this location during periods of peak activity. Many of these men had unique technical skills which were put to use in the design and construction of steam locomotives, passenger cars, freight cars and tools and machines used in the repair and construction processes. More will be said about these men later, but it must be remarked that their technical and engineering innovations make the CB&Q Roundhouse a site of regional significance to the mechanical engineering profession.

Technical Background and Description of the Railroad Roundhouse

In the June 1857 report to stockholders, the CB&Q proudly stated that ''the expensive Machine and Repairing Shops at Aurora have been completed." The new shops had cost $150,000 and included seven buildings: A roundhouse 264 feet in diameter and 18 feet high above grade, a machine shop measuring 180 feet in length, 50 feet in width and 32 feet in height, a blacksmith shop, a car shop, a paint shop, a carpenter shop and an engine room surmounted by an 85-foot chimney. The 40-stall full circle roundhouse was built of stone, wood and wrought iron. The original 22-stall section of 1855-56 has dressed limestone walls as do the 8-stall addition of 1859 and the final 10-stall section of 1866. The buff colored limestone was quarried in Batavia, a nearby town to the north. Iron Fink trusses supported the roof. The top chord of the truss and the diagonal compression members are cast iron I-beams; the bottom chords and tension members are eyehooked wrought iron rods. The top chords of adjacent trusses are linked laterally by small queen truss purlins made of angle iron and iron bars. The 18-foot high exterior walls have rectangular window and door openings with stone lintels and sills. An interior wall of approximately 160-foot diameter is constructed of red brick supported by iron columns and circular arches. Large arched locomotive doorways of limestone are supported by cast-iron frames although most of these doorways have been modified over time. The original roof included skylights, monitors and ventilators at various locations. Information about the turntable is scant since it was removed from the roundhouse in about 1925. Pictures of a typical turntable of the period show that it would have a single track width, and be a cable braced framed structure. The turntable would be rotated manually by pushing on a lever arm that could be folded out of the way.



Axonometric View of the Roundhouse and Backshops as they appeared in September of 1878 Showing Stages of Roundhouse Completion (Based on 1983 H.A.E.R. Report)

Steam locomotives were produced in the "erecting shops" at Aurora starting in 1860. The locomotive frame came from the frame shop, the boiler from the boiler shop, and the wheels, axles, main rods, side rods, cylinders and other precision parts from the machine shops. The machine shop included conventional and wheel lathes, a radial drill, shaping or slotting machine, horizontal boring machine, planers, drills and a punching machine. The following description of the engine used to drive the machinery was taken from an 1868 issue of the *Aurora City Gazetteer*, "A substantial 20-inch bore and 24 inch stroke condensing engine of 100 horse-power, built at the Cuyahoga Works, Cleveland, drives all the machinery of the Locomotive Department."

In 1857, approximately 350 shop and operating personnel were employed at the roundhouse. During these early years of the CB&Q, about one half of the railroad's locomotives were based in Aurora, the number of locomotives ranging from 58 in 1858 to 165 in 1872. At least 250 locomotives were built here between 1871 and 1910. Many different types were built, such as the American or 4-4-0 and the Class E 0-4-0. The CB&Q's first Mogul or 2-6-0 locomotives were designed and constructed here in 1888.

Early Contributors to Engineering Technology at the Roundhouse

No description of the Aurora Roundhouse would be complete without mentioning some of the early contributors to engineering technology at the roundhouse. The names of C. F. Allen, Superintendent of Wood Work and Car Repairs, James Clark, Master Mechanic, and J. R. Coulter, Master Mason, are on an 1859 lithograph of the CB&Q Railroad shop complex.

Mr. Allen was in charge of the department where plans were drawn for some of George Pullman's passenger cars. The Pullman "hotel" car, *The City of New York*, was built here in 1866. The first American diner, *The Delmonico*, was built for Pullman in 1868. Allen's work led to several patents, such as those of 1866 and 1867 for truck designs, including one for an eight wheel truck. Together with Luther W. Campbell, Allen obtained patents for an "Apparatus for Drying and Seasoning Lumber by Super-heated Steam," a "Heating and Ventilating Apparatus for Railway Cars", and a "Piston Packing" system. Campbell went on to create patented designs for a coach truss and a center bearing for locomotive trucks.

Photocopy of Lithograph Based on an Ambrotype by D. C. Pratt, circa 1857. (Original at Aurora Historical Society)

James Clark's successor as Master Mechanic was Charles Jauriet of the Michigan Central Railroad. A gifted man of wide experience, he came to the Galesburg shops before moving to Aurora, and would become Superintendent of Motive Power and Machinery.

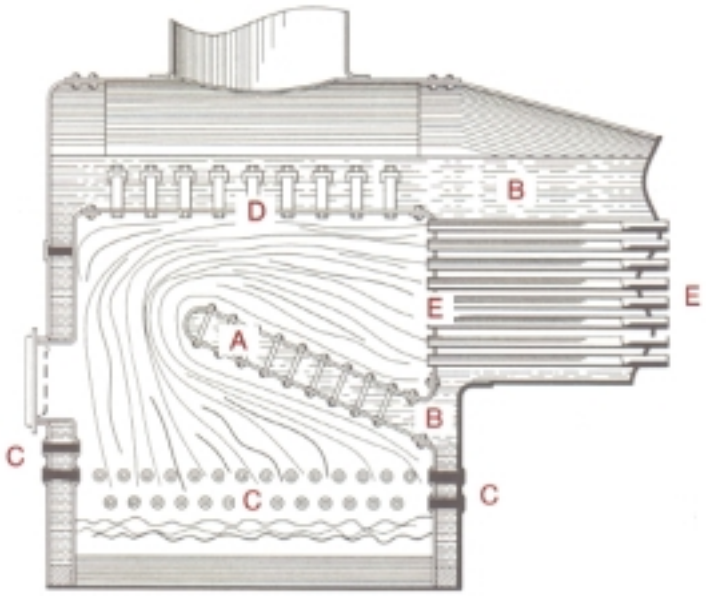
Mr. Jauriet made several valuable locomotive improvements. He designed a special locomotive truck which incorporated lateral swing motion to avoid excessive friction on sharp curves. At a time when the use of Illinois bituminous coal was essential because of the unavailability of a local source of the more commonly used anthracite coal, Jauriet designed a special compatible firebox. This invention sped the conversion from wood to coal on the CB&Q. A description of the improved firebox design can be found in U. S. Patent 52945, dated February 27, 1866. As stated by Jauriet, "the nature of my invention consists in an improved construction of fire-boxes with water-bridges, whereby every part of the bridge of the fire-box is exposed to the circulating water, and thus an equable distribution of heat maintained over the whole surface of the bridge, and also whereby an uninterrupted circulation of the water through the chamber of the bridge, both at the back end and at both sides of the bridge, is secured . . ." Several advantages were said to be gained by this new design. The unique circulation of the water through the water-bridge resulted in more uniform heating of the firebox components and reduced the possibility of explosion from uneven thermal expansion of the metal parts. The bridge also trapped the combustion products in the area just above the fuel where hollow stay-bolts admitted outside air for more complete combustion of the bituminous coal. Finally, the water-bridge directed the flames upward and forward to provide more even heating of the upper or crown sheet of the firebox while preventing ash from being drawn into the flues or fire tubes.

As stated in the third Annual Report of the American Railway Master Mechanics Association (1870), the Jauriet firebox is credited with being "perhaps the most successful firebox in use for burning bituminous coal. . . and which is now having a wider range of service than any other improves [sic] furnace known to your committee . . . The

(continued)

savings in fuel, . . . as compared with ordinary plain firebox, is in no instance less than 25 percent."

As one stands on the grounds of the roundhouse in 1988, the feeling of the hustle and bustle of another time is pervading. The sounds of the locomotives as they came to speed, the clanging hammers in the blacksmith shop, and the aroma of fresh-cut wood from the car shop are all just memories today. However, such recollections define the site of the CB&Q railroad roundhouse as a significant contributor to the mechanical engineering history of our nation.



The Jauriet Improved Firebox Design for Efficient Burning of Bituminous Coal (Drawing by W. R. Halliar)

A. Water-Bridge

B. Circulating Water

C. Hollow Stay Bolts

D. Crown Sheet

E. Flues

REGIONAL MECHANICAL ENGINEERING HERITAGE SITE
CHICAGO, BURLINGTON & QUINCY ROUNDHOUSE
AURORA, ILLINOIS
1866-1974

THIS FORTY-STALL ROUNDHOUSE AND BACKSHOPS WAS A REPAIR AND CONSTRUCTION FACILITY THAT BUILT MORE LOCOMOTIVES AND CARS, INCLUDING THE FIRST DINER *Delmonico* (1868), THAN ANY OTHER CB&Q INSTALLATION. THE DEVELOPMENT IN THE SHOPS OF THE JAURIET FIREBOX, WHICH IMPROVED COMBUSTION EFFICIENCY, AND THE KERR COAL CHUTE, WHICH ASSISTED LOCOMOTIVE COALING, ENCOURAGED THE INTRODUCTION OF COAL-FIRED LOCOMOTIVES.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS — 1988

FOX VALLEY SECTION

C B & Q

"The city of Aurora owes a great portion of her prosperity to the CB&Q R. R.; and on this account our people have more than ordinary interest in the affairs and prosperity of the road."

Aurora City Gazetter - 1868

Bibliography

American Railway Master Mechanics Association Third Annual Report from convention in Philadelphia, September 1870, pp. 47-48

Aurora City Gazeteer, Knickerbocker and Hodder, 1868, pp. 30-41

Corbin, Bernard G. and William Kerka, Jr., *Steam Locomotives of the Burlington Route*, Bonanza Books, New York, 1978

Forney, Matthias N., *Catechism of the Locomotive*, Railroad Gazette, New York, 1883, pp. 399-400

Kolp, John G., *The Chicago, Burlington and Quincy Railroad Roundhouse and Backshop Complex, An Historic American Engineering Record Documentation Project*, Dennet, Muessig, Ryan & Associates, Ltd., Iowa City, Iowa, National Park Service, HAER-IL-83, 1983

United States Patent Office Gazette for patents: 52945, 54085 (1866), 63014, 64398, 65788, 70495, 70521 and 70522 (1867), 143398 (1873) and 210749 (1878)

White, John H., Jr., *The American Railroad Passenger Car*, Johns Hopkins University Press, Baltimore, 1978, pp. 502-505, p. 648

White, John H. Jr., *A History of the American Locomotive*, Baltimore, Johns Hopkins Press, 1968, p. 98

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The History and Heritage Program of ASME

The ASME History and Heritage Program began in September 1971. To implement and achieve its goals, ASME formed a History and Heritage Committee, composed of mechanical engineers, historians of technology, and the Curator of Mechanical and Civil Engineering at the Smithsonian Institution. The Committee provides a public service by examining, noting, recording, and acknowledging mechanical engineering achievements of particular significance.

The Chicago, Burlington and Quincy Railroad Roundhouse is the fifth Mechanical Engineering Heritage Site to be designated and the first regional site. Since the ASME History and Heritage Program began, 119 Historic Mechanical Engineering Landmarks, five Mechanical Engineering Heritage Sites, and a Mechanical Engineering Heritage Collection have been recognized. Each reflects its influence on society, either in its immediate locale, nationwide, or throughout the world. A Landmark represents a progressive step in the evolution of mechnical engineering. Site designations note an event or development of clear historical importance to mechanical engineers. Collections mark the contributions of a number of objects with special significance to the historical development of mechanical engineering.

The ASME Hlstory and Heritage Program illuminates our technological heritage and serves to encourage the preservation of the physical remains of historically important works. It provides an annotated roster for engineers, students, educators, historians, and travelers, and helps establish enduring reminders of where we have been and where we are going along the divergent paths of discovery. For further information, please contact the American Society of Mechanical Engineers, 346 East 47th Street, New York, NY 10017, 212-705-7740.

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